INFORMATICS KNOWLEDGE, SKILLS AND TRAINING NEEDS OF HOSPITAL PHARMACISTS

By

Miss Teeraporn Chonsilapawit

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree

Master of Pharmacy

Department of Health Informatics

Graduate School, Silpakorn University

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ความรู้ ทักษะ และความต้องการการฝึกอบรมด้านสารสนเทศศาสตร์ของเภสัชกรโรงพยาบาล

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นางสาวธีรพร ชลศิลปวิทย์

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาเภสัชศาสตรมหาบัณฑิต

สาขาวิชาสารสนเทศศาสตร์ทางสุขภาพ

บัณฑิตวิทยาลัย มหาวิทยาลัยศิลปากร

ปีการศึกษา 2558

The Graduate School, Silpakorn University has approved and accredited the thesis title of “Informatics knowledge, skills and training needs of hospital pharmacists” submitted by Miss Teeraporn Chonsilapawit as a partial fulfillment of the requirements for the degree of Master of Pharmacy in Health Informatics.

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As information technology is employed in pharmacy practice and healthcare considerably, informatics skills are required for all health professions in order to handle information and utilization information technology effectively. Therefore, in addition to professional knowledge and skills, pharmacy schools should also educate and train their students on informatics. However, most current pharmacy curricula in Thailand scarcely address informatics principle and skills. Thai pharmacists generally acquire computer literacy and informatics skills through personal-interest training and self-study. In this study, we surveyed Thai hospital pharmacists' informatics skills and their training needs which would be basis information for course development. Self-assessment postal surveys of 73 questions were developed and sent to 2002 pharmacists in 601 hospitals throughout Thailand. A total of 805 (40.2%) questionnaires were returned after 3 months. Averagely, respondents rated their internet skills, computer skills, and communication skills as proficient, competent, and competent, respectively. They rated themselves on information literacy skills as advance beginners whereas they rated their information technology and database design knowledge and skills as novices. The low level skills were correlated with high level of training needs as information literacy skills and technology and database design knowledge and skills got the high need score. The factors that affected their skill levels were gender, age, income, education levels and time of practice. The factors that affected their attitude to training needs were age, income, education levels and time of practice. There were no relationship between skill levels and training needs.

In conclusion, Thai pharmacists were confident in using computer and internet. They realized their limitation of informatics knowledge and skills, and needed more training. Of concern were their technology and database design knowledge and skills. Although training needs was rated as high, the skills level was rated as novice and got the lowest necessity toward work score. This information will be useful for pharmacy curriculum development.

Department of Health Informatics Graduate School, Silpakorn University
Student's signature …….……..…….. Academic Year 2015
Thesis Advisor's signature …….……..……..…….....

54363201: สาขาวิชาสารสนเทศศาสตร์ทางสุขภาพ
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ธีรพร ชลศิลปวิทย์: ความรู้ ทักษะ และความต้องการการฝึกอบรมด้านสารสนเทศศาสตร์ของเภสัชกรโรงพยาบาล. อาจารย์ที่ปรึกษาวิทยานิพนธ์: ภก.ผศ.ดร.สรวง รุ่งประกายพรรณ. 108 หน้า.

เทคโนโลยีสารสนเทศได้เข้ามามีบทบาทสำคัญต่องานด้านเภสัชกรรม ดังนั้น ความรู้และทักษะด้านสารสนเทศศาสตร์จึงมีความสำคัญต่อผู้ปฏิบัติงาน อย่างไรก็ตาม แม้ว่าหลักสูตรเภสัชศาสตร์ในประเทศไทยได้มีการเปลี่ยนแปลงจากหลักสูตร 5 ปี เป็น 6 ปี แต่ยังคงมีการเรียนการสอนเน้นทางด้านสารสนเทศศาสตร์ค่อนข้างน้อย ผู้ที่มีความสนใจต้องศึกษาด้วยตนเองเป็นส่วนมาก ในการศึกษานี้ ผู้วิจัยได้ทำการสำรวจทักษะด้านสารสนเทศศาสตร์ที่มีในเภสัชกรโรงพยาบาล รวมถึงความต้องการในการฝึกอบรมด้านสารสนเทศศาสตร์ ซึ่งจะนำไปใช้ในการพัฒนาหลักสูตรด้านสารสนเทศศาสตร์ของเภสัชกรในประเทศไทย ผู้วิจัยทำการเก็บรวบรวมข้อมูลโดยใช้แบบสอบถามซึ่งประกอบด้วยคำถามที่เกี่ยวข้องกับการประเมินตนเองในเรื่องความรู้และทักษะด้านสารสนเทศศาสตร์ และสอบถามความคิดเห็นเรื่องความจำเป็นต่องานและความต้องการในการฝึกอบรมในหัวข้อต่างๆ จำนวนคำถามรวมทั้งสิ้น 73 ข้อ แบบสอบถามได้ถูกส่งไปยังเภสัชกรในโรงพยาบาล 601 แห่ง ทั่วประเทศจำนวนทั้งสิ้น 2002 ฉบับ เป็นระยะเวลา 3 เดือน แบบสอบถามจำนวน 805 ฉบับได้ถูกส่งกลับมา (40.2%) เมื่อนำไปวิเคราะห์พบว่า ผู้ตอบแบบสอบถามประเมินว่าตนเองมีทักษะด้านอินเทอร์เน็ต, ทักษะด้านคอมพิวเตอร์ และทักษะด้านการสื่อสาร ในระดับ ดีมาก, ดี, ดี ตามลำดับ มีความรู้และทักษะด้านการจัดการข้อมูลในระดับพอใช้ ในขณะที่ความรู้และทักษะด้านเทคโนโลยีและการออกแบบฐานข้อมูลอยู่ในระดับต่ำ ผลการประเมินความรู้และทักษะสอดคล้องกับผลการสอบถามความคิดเห็นในเรื่องความต้องการการฝึกอบรม โดยพบว่า หัวข้อความรู้และทักษะด้านการจัดการข้อมูล และหัวข้อความรู้และทักษะด้านเทคโนโลยีและการออกแบบฐานข้อมูลได้รับการประเมินว่ามีความต้องการการฝึกอบรมในระดับสูง เมื่อนำไปวิเคราะห์ปัจจัยที่มีผลต่อระดับทักษะและระดับความคิดเห็น พบว่า เพศ อายุ รายได้ การศึกษา และระยะเวลาปฏิบัติงานมีผลต่อระดับทักษะในขณะที่ อายุ รายได้ การศึกษา และระยะเวลาปฏิบัติงานมีผลต่อระดับความคิดเห็นในเรื่องความต้องการการฝึกอบรม อย่างไรก็ตาม ระดับความรู้และทักษะของผู้ตอบแบบสอบถาม ไม่มีความสัมพันธ์กับระดับความคิดเห็นเรื่องความต้องการการฝึกอบรม

โดยสรุปแล้ว เภสัชกรไทยมีความเชี่ยวชาญในการใช้คอมพิวเตอร์และอินเทอร์เน็ตเป็นอย่างดี นอกจากนั้นยังตระหนักถึงข้อจำกัดของตนเองซึ่งส่งผลให้มีความต้องการการฝึกอบรมในหัวข้อความรู้ทักษะทางสารสนเทศศาสตร์ในระดับสูง อย่างไรก็ตาม จากการที่ความรู้และทักษะด้านเทคโนโลยีและการออกแบบฐานข้อมูลได้รับการประเมินในระดับต่ำ และผลการประเมินระดับความคิดเห็นในเรื่องความจำเป็นต่องานอยู่ในระดับกลาง และได้คะแนนต่ำกว่าหัวข้ออื่นๆ แสดงให้เห็นว่าเภสัชกรไทยยังคงขาดความตระหนักถึงความสำคัญในหัวข้อดังกล่าว

สาขาสารสนเทศศาสตร์ทางสุขภาพ บัณฑิตวิทยาลัย มหาวิทยาลัยศิลปากร

ลายมือชื่อนักศึกษา..... ปีการศึกษา 2558

ลายมือชื่ออาจารย์ที่ปรึกษาวิทยานิพนธ์ .....

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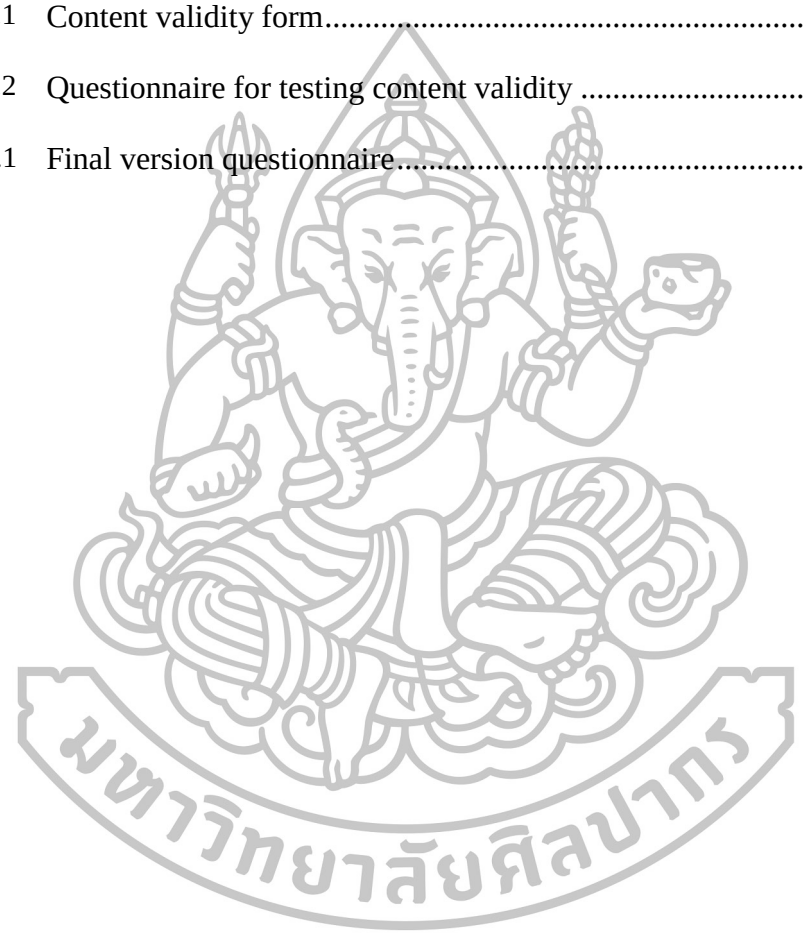


CHAPTER 1

INTRODUCTION

1. Statement and significance of the research problem

Informatics knowledge and skills have been studied in many health professions, especially physician and nurse. Many medical and nursing informatics researches have been conducted throughout decades [1-4]. However, pharmacy informatics researches are relatively small compared to those of other professions. As an informative profession, modern pharmacists must possess informatics knowledge and skills to handle information flow in their routine work. Previous data revealed that technologies such as Computer Provider Order Entry (CPOE), e-Prescribing (E-Rx) and Clinical Decision Support (CDSS) helped pharmacists to retrieve, analyze and present data effectively [5-9]. Moreover, these technologies can remarkably help reduce operation cost [10,11].

As a matter of fact, information technologies are very important to pharmacy practice, and competent pharmacists are needed to cope with such technologies. Published document from American Health Information Association (AHIMA) and American Medical Informatics Association (AMIA) concluded that the need for IT expert was increasing rapidly whereas the number of informatics professional was not growing fast enough to meet the demand [12]. Many health professional organizations had realized the need of informatics education. In 2000, The International medical informatics association (IMIA) had published "Recommendation of the International Medical Informatics Association on Education in Biomedical and Health Informatics" which revealed informatics competencies that health professionals should hold [13]. In 2001, a report from The Institute of Medicine (IOM) Quality Chasm stated that flaws in system was the major cause that lead to error and patient deaths [14]. IOM then outlined five core competencies for all health professional, one of which was using information technology [15]. Following the IMIA and IOM guidelines, the Accreditation Council for Pharmacy Education (ACPE), who is responsible for accreditation of pharmacy curriculum in the US, had launched accreditation standard and guidelines for professional programs in pharmacy leading to the doctor of pharmacy degree. The requirement 12.1 declared that informatics competencies should be possessed in all Pharmacists [16]. In the United Kingdom, The Royal Pharmaceutical Society of Great Britain (RPSGB) also specified IT competencies pharmacists should have [17].

In Thailand, multidisciplinary health professions had established Thai Medical Informatics Association (TMI), health informatics center of Thailand, with 724 registered members at present [18]. TMI had become a national member of IMIA since 2009. However, pharmacy informatics are still an emerging field in Thailand since there is only one education institute that conducts the pharmacy informatics program even pharmacy curriculum in Thailand has been changed from 5-year to 6-year course since 2008.This study aimed to investigate informatics knowledge, skills and training needs of hospital pharmacists in Thailand. Results from this study will be very useful for development of pharmacy curriculum and pharmacy informatics training programs in Thailand.

2. Objectives of this research

2.1 To assess basic computer and informatics skills of Thai hospital pharmacists.

2.2 To assess attitude about necessity of informatics toward work and training needs of Thai hospital pharmacists.

2.3 To study relationship between demographic details and informatics skill levels of Thai hospital pharmacists.

2.4 To study relationship between informatics skill levels and attitude about necessity of informatics toward work and training needs of Thai hospital pharmacists.

3. Research hypothesis

3.1 Thai hospital pharmacists still lack some important informatics knowledge and skills according to international standards.

3.2 Thai hospital pharmacists need more training on informatics knowledge and skills.

4. Study framework

Using self-assessment questionnaire survey, this study investigated computer and Internet skills, informatics knowledge and skills of hospital pharmacists in Thailand, and assessed their opinion on necessity of informatics skills toward work, and training needs.

CHAPTER 2

LITERATURE REVIEWS

1. Definitions

1.1. Informatics is the use of computers to manage data and information. [19]

1.2. Medical informatics or health informatics is the field of information science concerned with the analysis, use and dissemination of medical data and information through the application of computers to various aspects of health care and medicine. [20]

1.3. Pharmacy informatics is one of medical informatics disciplines. As stated in the American Society of Health-System Pharmacists (ASHP) statement on the pharmacist's role in informatics, pharmacy informatics focused on the use of information technology and drug information to optimize medication use. [21]

2. History of Health informatics

Health informatics began to be a field of study in 1960s [22]. The term medical informatics first appeared in France. In early 1960s, university specialized departments and training programs were established in France, Germany, Belgium and The Netherlands. After that, medical informatics researches were also appeared in Poland and U.S. Since then, medical informatics research, education, infrastructure and application have become specific goals of both the European and U.S. [23].A survey of the international management and technology training needs of doctors in an acute NHS an acute NHS trust in the United Kingdom revealed that half of participant doctors needed training on the use of database software [2]. A study of nursing informatics competencies required by nurse in Taiwan provided master list of nursing informatics competency [3]. There were many exemplary informatics researches from various fields published as shown in table 2.1

Table 2.1 Example of health related informatics publication

Title	Author	Publish year	Field
Developing curriculum in nursing informatics in Europe [1]	J. Mantas	1998	Nursing informatics
Pharmacist Computer Skills and Needs Assessment Survey [24]	R.M. Balen P Jewesson	2004	Pharmacy informatics
Skill needs for nurses in their role as health informatics professional: A survey in the context of global health informatics education [4]	S. Garde et al	2005	Nursing informatics
Building health informatics skills for health professionals: results from the Australian Health Informatics Skill Needs Survey [25]	S. Garde et al	2006	Health informatics
An international summer school on health informatics: A collaborative effort of the Amsterdam Medical Informatics Program and IΦE-the International Partnership for Health Informatics Education [26]	M.W.Jasper et al	2007	Health informatics
Implementing Pharmacy Informatics in College Curricula: The AACP Technology in Pharmacy Education and Learning Special Interest Group [27]	AACP TiPEL SIG	2007	Pharmacy informatics
ASHP national survey on informatics: Assessment of the adoption and use of pharmacy informatics in U.S. hospitals [28]	ASHP	2008	Pharmacy informatics
A Computer literacy skills profile of pharmacists residing in two counties of England [29]	P.Thomas et al	2008	Pharmacy informatics
Pharmacy Informatics Syllabi in Doctor of Pharmacy Program in the US [30]	B.I.Fox	2008	Pharmacy informatics
Nursing informatics competencies required of nurse in Taiwan [3]	J.Chang et al	2011	Nursing informatics
Knowledge, Skills, and Resources for Pharmacy Informatics Education [31]	B.I.Fox et al	2011	Pharmacy informatics

While information technologies are rapidly advanced and widely implemented in healthcare settings, competent personals are needed to handle the technologies. Published documents from American Health Information Association (AHIMA) and American Medical Informatics Association (AMIA) concluded that the need for IT expert was increasing rapidly whereas the number of informatics professional was not growing fast enough to meet the demand [12]. There was an attempt to form a health informatics organization. The International Medical Informatics Association (IMIA) was established to handle this issue. IMIA, an international organization, was founded in 1967 as a technical committee in International Federation for Information Processing (IFIP), and then became an independent

organization in 1979. IMIA maintains its relationship with IFIP as an affiliated organization and also works together with the World Health Organization (WHO) as a non-government organization (NGO) [32].

IMIA plays an important role in application of information sciences and technology in healthcare and medical researches, health and bio-informatics [32]. At present, IMIA has more than 50 country members throughout the world including Thailand [33].In 2000, IMIA released the "Recommendation of the International Medical Informatics Association on Education in Biomedical and Health Informatics" (revised in 2010) which outlined skills and knowledge for healthcare professionals [13].

The recommendation is divided into four domains. The first domain is about biomedical and health informatics core knowledge and skills which include evolution of informatics, use of personal application software, and management of information system in healthcare. The second domain is about medicine, health and biosciences, and health system organization. This domain addresses fundamental of human functioning and biosciences, fundamental of what constitute health, principles of clinical/ medical decision making and diagnostic. The third domain is about informatics/ computer science, mathematics, biometry which includes basic informatics terminology, ability to use personal computer, and ability to communicate electronically. The last domain of the recommendation is about optional modules such as biomedical imaging and signal processing, clinical/medical bioinformatics, and computational biology. The IMIA recommendation has been used as a reference to define healthcare core competencies in many countries.

2.1 Health informatics in The United States

In the United State, the Institute of Medicine (IOM), an independent, nonprofit organization that work outside of government to provide unbiased and authoritative advice to decision makers and the public, reported flaw in the system that lead to error and patient deaths [14]. IOM then published five core competencies for all health professional, one of which is using information technology [15]. The American Medical Informatics Association (AMIA), an organization that takes care especially of informatics in the U.S., had launched the project AMIA 10 x 10 courses which aimed to educate 10,000 health professionals to be health informatics leader within 10 years. Fourteen universities attend this project at present [34]. AMIA is also one of IMIA member societies. Both the AMIA 10x10 and IOM core competencies demonstrated that the U.S. is paying full attention to health informatics.

2.2 Health informatics in Europe

In Europe, health informatics began during 1960s in France, Germany, Belgium, and Netherland [23]. The University of Heidelberg and University of Applied Sciences, Heilbronn in Germany are ones of the first universities that have health informatics training courses [35]. European Federation for Medical Informatics (EMFI) is an organization that takes care of medical informatics in Europe and also one of IMIA regional member [36].

There were also attempts to established health informatics training courses in Europe. Project EDUCTRA and IT-EDUCTRA explored informatics knowledge in health professional and tried to create learning material covering board area of health informatics[37]. Project NIGHTINGALE (Nursing Informatics: Generic High-Level Training in Informatics for Nurse; General Application for Learning and Education) aimed to educated health informatics knowledge for nurse [38].

Majority of EMFI members had started health informatics education in university. They also had their national organizations responsible for health informatics and became IMIA members as shown in table 2.2. Some also had master degree education as shown in table 2.3.

Table 2.2 Situation of health informatics among EMFI countries [33,36,39]

Countries	IMIA membership	National organization	Teaching in university	Countries	IMIA membership	National organization	Teaching in university
Austria	✓	✓	✓	France	✓	✓	✓
Belgium	✓	✓	✓	Germany	✓	✓	✓
Bosnia-Herzegovina	✓	✓	N/A	Greece	✓	✓	✓
Croatia	✓	✓	✓	Hungary	-	✓	✓
Cyprus	-	✓	N/A	Iceland	-	✓	N/A
Czech Republic	✓	✓	✓	Ireland	✓	✓	✓
Denmark	✓	✓	✓	Israel	✓	✓	✓
Finland	✓	✓	✓	Italy	✓	✓	✓
Moldova	-	-	N/A	Slovenia	✓	✓	✓
Netherlands	✓	✓	✓	Spain	✓	✓	✓
Norway	✓	✓	✓	Sweden	✓	✓	✓
Poland	-	-	N/A	Switzerland	✓	✓	✓

Table 2.2 Situation of health informatics among EMFI countries [33,36,39] (Continued)

Countries	IMIA membership	National organization	Teaching in university	Countries	IMIA membership	National organization	Teaching in university
Portugal	-	-	✓	Turkey	✓	✓	N/A
Romania	✓	✓	✓	Ukraine	✓	✓	✓
Russia	-	✓	N/A	England	✓	✓	✓
Serbia	-	✓	N/A				

Table 2.3 List of countries and universities which teach health informatics in Europe [40]

Countries	Universities	Countries	Universities
Germany	Johannes-KeplerUniversitat Linz	Ireland	Dublin University , Trinity College
Belgium	VrijeUniversiteitBrussel Universiteit Gent KatholiekeUniversiteit Leuven	Greece	Ethniko Metsovio Polytechnio, Panepistimio Patron, PatraPanepistimioPireos, Piraeus
Italy	Politecnico di Milano Universita degli studi di Torino	Finland	University of Oulu University of Tampere
Denmark	KψbenhavnsUniversitet	England	University of Glasgow London School of Economics City University, London The University of Manchester United Medical & Dental Schools
Spain	Universidad Politecnica de Madrid		
Netherlands	Rijksuniversiteit Maastricht		
Sweden	Gφteborg University		

2.3 Health informatics in Asia Pacific

Health informatics in Asia Pacific has begun in 1970s [41]. In 1993, Asia Pacific countries had established the “Asia Pacific Association for Medical Informatics” (APAMI) with 13 members at the beginning. At present, APAMI became IMIA regional member with 15 country members [42]. Many Asia Pacific countries have emphasized on developing health informatics which resulted in many projects such as Telemedicine in Australia and Japan, Hong Kong patient card project, Thai telemedicine project, Health ONE on Singapore ONE project [41]. Many APAMI countries have training courses in universities. They also have national organizations on health informatics and become ones of IMIA society as shown in table 2.4

Table 2.4 Situation of health informatics among APAMI countries [33,39,42]

Countries	IMIA membership	National organization	Teaching in University	Countries	IMIA membership	National organization	Teaching in University
Australia	✓	✓	✓	India	✓	✓	✓
China	✓	✓	✓	Philippines	✓	✓	✓
Hong Kong	✓	✓	✓	Singapore	✓	✓	?
Japan	✓	✓	✓	Taiwan	✓	✓	✓
Korea	✓	✓	✓	Thailand	✓	✓	✓
Malaysia	-	✓	N/A	Sri Lanka	✓	✓	✓
New Zealand	✓	✓	✓	Vietnam	-	N/A	N/A
Indonesia	-	✓	N/A				

3. Importance of informatics and information technologies in pharmaceutical sciences

Pharmacy informatics is a subset of health informatics. It focuses on the use and integration of data, information, knowledge, technology and automation in medication use process for the purpose of improving health outcomes [19]

As an informative profession, pharmacists require informatics knowledge and skills to handle information flowing in their work. Technologies such as computer provider order entry (CPOE), e-prescribing (E-Rx) and clinical decision support (CDSS) were proven helpful for pharmacists to manage data and information effectively. [5-9]. Moreover, these technologies can remarkably help reducing operation cost [10,11].

3.1 Information Technologies in Pharmacy Practice

3.1.1 Computerized provider order entry (CPOE)

CPOE is a process of electronic entry of medical provider instructions for the treatment of patients. CPOE helps eliminate illegible handwriting, reduce medical errors and improve patient care [5]. CPOE has been shown to positively impact patient care and to reduce incidences of serious medication error [43,44].

3.1.2 Electronic prescribing (E-Rx)

E-Rx is a prescription that is entered directly into an electronic format by a prescriber, verified and processed in an electronic format by all required parties, resulting in a labeled medication product, supportive documentation and an updated shareable patient electronic medication profile. E-Rx can help reducing medication error and deducting

operation cost. Study from Johnston et al. showed that using E-Rx could save around $27 billion per year in U.S [45,46].

3.1.3 Clinical decision support system (CDSS)

A technology that also helps pharmacists to make a decision correctly and precisely, CDSS has been used to support decision making in a variety of clinical fields. Musen et al. defined CDSS as "any computer program designed to provide expert support for health professionals making clinical decisions" [47]. Another definition of CDSS from Johnston et al. is "computer software employing a knowledge base designed for use by a clinician involved in patient care as a direct aid to clinical decision making" [48]. CDSS composes of three basic components. The first one is an inference engine – the reasoning engine or "brain" of CDSS – functioning to link patient-specific information with information from knowledge base. The second component is a knowledge base – consisting of clinical knowledge such as treatment guidelines, drug interactions, and diagnosis. The last component is a communication mechanism – allowing user to enter patient information into the application and send relevant information back to clinician [49].

CDSS can be used in various stages of patient care, such as reminding vaccination and Pap smears for preventive care, providing potential decision making based on signs and symptoms in diagnosis to reduce diagnostic errors in medicine, planning or implementation of specific treatments for patients and follow-up. A study form Shea et al. evaluated computer-based clinical reminder systems for preventive care in the ambulatory setting. Results showed that implementation of computer reminders could increase preventive practice by 77% compared with a control group [50]. CDSS were used in more than 40 disease management studies. Sixty-four percent of these studies showed improvement in performance [6].

3.1.4 Electronic health record (EHR)/ Electronic medical record (EMR)

EMR is an electronic record of health-related information on an individual that can be created, gathered, managed and consulted by authorized clinicians and staffs within one healthcare organization, while EHR is an aggregation of individual EMRs and can be accessed across more than one healthcare organizations [51]. Implementation of effective EMR systems could improve efficiency and safety, and save more than $81 billion annually [52].

4. Pharmacy informatics worldwide

In many countries, pharmacy informatics experts gather into a group and launched guidelines or requirements regarding informatics knowledge and skills pharmacists should hold after graduation. In the United States, the Accreditation Council for Pharmacy Education (ACPE), who is responsible for accreditation of pharmacy curriculum, had launched accreditation standards and guidelines for the professional program in pharmacy leading to doctor of pharmacy degree. The requirement 12.1 stated that informatics competencies should be possessed in all pharmacists [16]. According to ACPE standard, informatics competencies comprise of:

Basic terminology (data, information, knowledge, hardware, software, networks, information systems, information systems management

Reason for systemic processing of data, information and knowledge in health care.

Use of data in continuous quality improvement initiatives

Benefits and current constraints in using information and communication technology in healthcare

To clarify ACPE requirement, a group of pharmacy informatics experts in the US had developed a set of pharmacy informatics competencies in the fall of 2005 [53]. The competencies were grouped into five domains. Entry-level Doctor of Pharmacy graduates should be able to use information technology to:

Store, retrieve and analyze health informatics

Optimize the medication prescribing/ordering process

Aid in clinical decision making

Automatic the medication delivery processes

Facilitate pharmacy management

Even ACPE standard had been announced since 2007 (revised to ver.2.0 in Jan 2011) a study from Fox,B.I.in 2008 revealed that only 39% of pharmacy curriculums in the US complied with the standard [30]. In the United Kingdom, The Royal Pharmaceutical Society of Great Britain (RPSGB) also specified IT competencies pharmacists should have [17]. A study by Peter Thomas and Paul Ruttert in 2008 investigated computer literacy skills profile of pharmacists residing in two counties of England. Finding reflected that pharmacists in the UK were proficient in basic computing skills but in greatest need of training on medical databases [29]. A research document from Balen and Jewesson, which investigated computer skills and needs of Canadian hospital clinical pharmacist prior to implementation of an applied informatics program, showed that most pharmacists needed to upgrade their computer

skills, and medical database and Internet searching skills were the most needed for improvement [24].

5. Pharmacy informatics skills and knowledge

According to IMIA guideline [13], ACPE standard [16], a book chapter in building core competencies in pharmacy informatics [53] and the research paper "Whiter in pharmacy informatics" [54], pharmacy curricula should outline the skills and knowledge as described below in order to meet pharmacy informatics standard.

Basic computer and Internet skills

Using basic computer component such as mouse, keyboard, and printer effectively.

Effective use of office application such as word processing, spreadsheet, presentation, easy-to-use database management software and also can install application.

Skill in file and folder management and also can use help command to find their solution.

Skill in using e-mail and webpage, searching online information, access and retrieve data related to patient care

Skill in using social media

Informatics skills

Skill in selection data source and assess data source reliability

Skill in providing appropriate data service and choosing appropriate channel

Skill in commination

Skill in system analysis, system design and database management

Skill in programming

Management skills

Project management

Change management

Risk management

Demonstrate knowledge of

Pharmacy information system such as drug dispensing system, drug inventory system

Pharmacy data, information and knowledge management such as data collection

Health informatics standard such as HL7

Operating system

Pharmacy information technology such as CPOE, E-prescribing, E-health record,

Clinical decision support system

Telepharmacy, Network and protocols

6. Health informatics and Pharmacy informatics in Thailand

In Thailand, multidisciplinary professions had established Thai Medical Informatics Association (TMI), health informatics center of Thailand, with 724 registered members at present [18]. TMI had become a national member of IMIA since 2009. On 2011, there was a research explored Thai hospitals' adoption of information technology conducted by Theera-Ampornpunt N. Results stated that the adoption of basic EHR (included demographics, medication order entry, laboratory result viewing and clinical notes) was 49.8% nationwide, while comprehensive EHR (included basic EHR plus laboratory and imaging order entry, image viewing, drug allergy checking and drug interaction checking) was only 5.3% nationwide. The adoption of order entry of medication was 90.2 % nationwide whereas order entry of all order was 79.4%nationwide. Results also suggested that adoption of health technology in Thailand was fast growing and more competent persons were needed to handle those technologies. However, health informatics education in Thailand is still an emerging field with only few training programs available as shown in table 2.5

Table 2.5 Certificate, undergraduate and graduate health informatics programs in Thailand [55]

Level	Program & institution	Notes
Certificate and diploma	ICD-10 Basic and Advanced Certificate Programs, Thai Medical Informatics Association	Target medical coders and health information management professional
	Graduate Diploma Program in Biomedical and Health Informatics (International Program), Faculty of Tropical Medicine, Mahidol University	Targeting informatics practitioners especially those who work in the area of public health
	Healthcare CIO Certificate Program, Hospital Administration School, Faculty of Medicine Ramathibodi Hospital, Mahidol University	Targets Chief Informatics Officers (CIOs) or IT executives of healthcare organizations
	Dental Informatics Certificate Program, Institute of Dentistry, Ministry of Public Health	Focusing on dental informatics

Table 2.5 Certificate, undergraduate and graduate health informatics programs in Thailand [55] (Continued)

Level	Program & institution	Notes
Undergraduate	Bachelor of Science Program in Information and Communication Technology, Faculty of Information and Communication Technology, Mahidol University	First undergraduate ICT or computer science program with informatics contents
	Doctor of Pharmacy Program in Health Informatics (Pharm.D.), Faculty of Pharmacy, Silpakorn University	Major in health informatics
	Doctor of Pharmacy Program in Pharmaceutical Sciences (Pharm.D.), Faculty of Pharmaceutical Sciences Chulalongkorn University	Pharmacy informatics is a sub-major in the social and administrative pharmacy major
	Bachelor of Public Health, Kanchanabhishek Institute of Medical and Public Health Technology, Ministry of Public Health	Focusing on health information management and medical coding
	Bachelor of Nursing Program, Ramathibodi Nursing School, Faculty of Medicine Ramathibodi Hospital, Mahidol University	Nursing informatics a required course for undergraduate students
Graduate	Master of Science Program in Health Informatics, Institute of Health Science Ramkhamhaeng University	First informatics graduate program in Thailand
	Master of Science Program Health Informatics (International Program), Faculty of Public Health, Mahidol University	Targeting informatics practitioners, biostatisticians, and data analysis
	Master of Science Program in Biomedical and Health Informatics (International Program), Faculty of Tropical Medicine, Mahidol University	Targeting informatics practitioners and project managers, especially those who work in the area of public health
	Master of Pharmacy Program in Health Informatics, Faculty of Pharmacy, Silpakorn University	Targeting pharmacy practitioners
	Master of Science and Doctor of Philosophy Programs in Social and Administrative Pharmacy (International Program), Faculty of Pharmaceutical Sciences, Chulalongkorn University	Student research in informatics areas exist. Informatics courses available for students who aim to conduct research in informatics or related areas
	Master of Engineering Program in Industrial Engineering, Faculty of Engineering, Mahidol University	Student research in informatics area exist
	Doctor of Philosophy Program in Oral Health Science, Faculty of Dentistry, Thammasart University	Student research in informatics area exist

Source: Otero PD, Perrin C, Geissbuhler A, Cheung NT, Theera-Ampornpunt N, Lun KC. Informatics education in low resource settings. In: Berner ES, editor. Informatics education in healthcare: lessons learned. London: Springer; 2014 p.197-222

Focusing on pharmacy informatics in Thailand, although in 2008 The Pharmacy Council of Thailand had revised pharmacy curriculum and extend the length of study from 5-year to 6-year undergraduate program, pharmacy informatics still has not been entitled in the revised curriculum. The only information-related competency stated in the 3thdomainof Thai pharmacist's core competencies was "selection and assessment of data sources, and communication skills" [56]. However, there are pharmacy informatics programs, both undergraduate and master degree, at Silpakorn University [57-73]. A research from Ubon Ratchathani University, studied characteristics of drug information service in Thailand in 2009, revealed that primary problems of hospital pharmacists was lack of competent persons,

not enough equipment, and limited reference sources [74]. Another research investigating knowledge management in drug information service at hospitals in Ubon Ratchathani in 2012concludedthat identification of knowledge for pharmacy information service was highly problematic [75]. Those results suggested that development of pharmacy informatics education in Thailand was necessary. Compare to other countries, pharmacy informatics in Thailand is only beginning and need many more researches to be conducted. This study is the first document to investigate informatics knowledge, skills and training needs of hospital pharmacists in Thailand. Even though there were a few similar researches conducted in other countries [2,24,29], the difference of education programs, technologies or even race and religion may lead to different results. Findings will be valuable for development and planning of continuing pharmacy education programs, trainings, and undergraduate pharmacy curriculum. Finally, it will be useful as basis information for revision of the pharmacist core competency of the Pharmacy Council and every pharmacy curriculum in Thailand.

CHAPTER 3

MATERIALS AND METHODS

1. Questionnaire development

After reviewing related literature, a 69 question survey was created based on IMIA recommendation and core competencies from the Pharmacy Council of Thailand. The format of the questionnaire was based on a work of Garde S [76]. Closed-ended questions with Benner's 5 levels of competencies [77] were applied to measure the degree of competency. Additionally, the option "Do not know" was added in case those respondents do not know the skill/ knowledge at all. After that, the survey was validated its content validity by 5 informatics experts. After revising the survey following the expert's suggestion, the final version of the survey with 73 informatics-related questions was developed. The survey was divided into 5 parts:

Part 1: Demographic information – collecting respondents' general information such as gender, age, income, education, work scope, and time of practice.

Part 2: Computer and Internet skills – searching for respondents' computer and Internet skills. Closed-ended questions with the Likert 5-point scale were used to measure the degree of attitude.

Part 3: Informatics knowledge and skills –searching for respondents' informatics knowledge and skills. Closed-ended questions with the Likert 5-point scale were used to measure the degree of attitude. Questions on this part based on IMIA recommendation, core competencies of The Pharmacy Council of Thailand and "Whither pharmacy informatics" from American Journal of Health-System pharmacy [54].

Part 4: Assessment of necessity and training needs – exploring necessity of skills toward work and informatics training needs of respondents.

Part 5: Suggestion

2. Questionnaire verification

2.1 Content validity

1. Five informatics experts reviewed the questionnaire, and assessed whether each question was appropriate (score = 1), inappropriate (score = -1), or uncertain (score = 0).
2. Item Objective Congruence index (IOC) of each question was calculated using
   IOC = ∑R/N
   R = Total score of each question from every expert
   N = number of experts
3. Each question should get at least 0.5 IOC [78].

2.2 Content Reliability

1. Following experts' advice, the survey was revised. (69 questions were transformed into 73 questions survey).
2. The revised questionnaire then was tested for reliability. In this study, 30 hospital pharmacists from Ramathibodi hospital were selected as the sample population for testing reliability of the questionnaire.
3. Reliability of the questionnaire was analysed via Cronbach alpha coefficient (α) [79] using SPSS.

$$\alpha = \frac{k}{k-1}\left[1 - \frac{\sum_{i=1}^{k} s_i^2}{s_t^2}\right]$$

α≥0.7 for survey research

α≥0.8 for basic research

α≥0.9for important research

The result of α-coefficient must be fall among 0-1

The more α-coefficient, the more reliability.

In this study, the criterion of α-coefficient was ≥ 0.7 and α-coefficient of the returned 30 questionnaires was 0.941.

3. Questionnaire distribution

Sample size calculation

Sample size was calculated using Taro Yamane formula [80]

$$n = \frac{N}{1 + Ne^2}$$

n = the sample size

N = the population size

e = the acceptable sampling error

The number of hospital pharmacist in Thailand in 2010 = 8,134 [81] (round up to 9,000)

$$n = \frac{9000}{1 + 9000(0.05)^2} = 382.97 \approx 400$$

Thus, the number of questionnaire needed to be returned was 400.

Considering return rate at 20%, then 2000 surveys were sent to hospital pharmacists throughout country.

The scale used to measure level of ability to use or understanding informatics skills, attitude of necessity toward work and training needs are illustrated in table 3.1

Table 3.1 Measurement score interpretation

Score	Level	Attitude of necessity toward work	Training needs
5	Expert/Excellent understanding	Highest necessary	Highest need
4	Proficient/Very well understanding	High necessary	High need
3	Competent/Good understanding	Moderate necessary	Moderate need
2	Advance beginner/Normal understanding	Low necessary	Low need
1	Novice/Poor understanding	Lowest necessary	Lowest need
0	Do not know/ Do not understand	Unnecessary	Do not need

4. Data collection

Sample size was calculated according to Taro Yamane formula [80]. Since the number of hospital pharmacists in Thailand was 8,134 [81], thus at least 400 respondents were required to complete the survey. Considered response rate at 20 percent, 2002 postal surveys were distributed to 601 hospitals throughout all regions of Thailand. The survey required only hospital pharmacists as respondents. The numbers of surveys sent to each hospital were decided by hospital type as shown in table 3.2. The questionnaires were collected during October to December 2013.

Table 3.2 Sampling plan

Type of hospital	The numbers of hospitals in Thailand [82,83]	The numbers of sampling hospitals	The numbers of surveys sent to each hospital	Total sent
Government hospital				
Hospital under Ministry of public health				
Center hospital	26	26	10	260
Metropolis hospital	8	8	5	40
General hospital	74	74	5	370
Community hospital	752	240	2	480
North region	163	51		
North-east region	272	88		
East region	56	18		
Central region	126	40		
South region	135	43		
Hospital under Bangkok metropolitan	8	8	5	40
University hospital	11	11	10	110
Others	67	67	3	201
Private hospital	321	167	3	501
Total Amount		**601**		**2002**

5. Data analysis

Data were analyzed using the statistical program SPSS. Personal information, computer and Internet skills, informatics knowledge and skills, and assessment of attitude toward necessity and training needs were analyzed in forms of frequency distribution, mean, and standard deviation. The degree of competencies, which were given values from 0-5, were considered as an interval scale that can be analyzed for mean and standard deviation [84]. The range of score used to interpret mean values were calculated by the following formula [85]:

$$\text{Range of score} = \frac{\text{Maximum score} - \text{Minimum score}}{6} = \frac{5-0}{6} = 0.83$$

The ranges of score used to interpret data were shown in table 3.3.

Table 3.3 Range of score and interpretation

Score mean	Skill Level	Attitude of necessity toward work	Training needs
4.16 – 5.00	Expert/Excellent understanding	Highest necessary	Highest need
3.33 – 4.15	Proficient/Very well understanding	High necessary	High need
2.50 – 3.32	Competent/Good understanding	Moderate necessary	Moderate need
1.67 – 2.49	Advance beginner/Normal understanding	Low necessary	Low need
0.84 – 1.66	Novice/Poor understanding	Lowest necessary	Lowest need
0.00 – 0.83	Do not know/Do not understand	Unnecessary	Do not need

To analyze factors that affected skill level and attitude, inferential statistics with 95% confidence was used to find which factor gave significantly different average value within group. As general information and skill levels/ attitude were nominal scale and interval scale data respectively, independent sample t-test was used to test factors that separated into 2 group such as gender (male and female) and education levels (bachelor and master degree). For factors that had more than 2 groups such as age, income and time of practice, one-way ANOVA was used to analyze the data.

To analyze the relationship between skill levels and attitude, Pearson correlation was used to test the data as skill levels and attitude of necessity and training needs were both interval scale data.

CHAPTER 4

RESULTS AND DISCUSSION

Total of 2002 questionnaires were sent to the target hospitals, and 805of them (40.21%) were returned after 3 months. Data were analyzed using descriptive statistics (frequency and mean) and inferential statistic (t-test, One-way ANOVA) with 95% confidence. The results of this study are devidedinto5 parts and presented as following:

1. Demographic Characteristics (Personal Information)
2. Computer and Internet skills
3. Informatics knowledge and skills
4. Assessment of attitude toward necessity and training needs
5. Analysis of relationship
   - 5.1 Relationship between general information and computer and Internet skills
   - 5.2 Relationship between general information and informatics knowledge and skills
   - 5.3 Relationship between general information and attitude toward necessity and training needs
   - 5.4 Relationship between computer and Internet skills and attitude to necessity and training needs
   - 5.5 Relationship between informatics knowledge and skills and attitude to necessity and training needs

Results

1. Demographic Characteristics (Personal Information)

After 3 months, 805 copies of questionnaires were returned. General information about respondents is summarized as shown in table 4.1.

Table 4.1 Frequency and percentage of respondents classified by personal information (N=805)

General Characteristics	Frequency
1. Gender	
Male	21.6% (n=174)
Female	78.4% (n=631)
2. Age	
Less than 30 years	35.3% (n=284)
30-40 years	47.0% (n=378)
41-50 years	15.9% (n=128)
51-60 years	1.8% (n=15)
More than 60 years	-
3. Income/ month	
10,000-20,000 THB	8.1% (n=65)
20,001-30,000 THB	41.1% (n=331)
30,001-40,000 THB	34.7% (n=279)
More than 40,000 THB	16.1% (n=130)
4. Highest education	
Bachelor's Degree	77.9% (n=627)
Master's Degree	22.1% (n=178)
PhD.	-
5. Work scope (Choose more than one)	
OPD	65.6% (n=528)
Production	10.7% (n=86)
IPD	49.1% (n=395)
Information service	25.6% (n=206)
Primary care unit	10.6% (n=85)
Administration (Chief/ Team leader)	18.6% (n=150)
Drug Inventory Control	13.2% (n=106)
Others	9.7% (n=78)

Table 4.1 Frequency and percentage of respondents classified by personal information (N=805) (Continued)

General Characteristics	Frequency
6. Hospital type	
Hospital under Ministry of Public Health	69.7% (n=561)
Hospital under Bangkok Metropolitan	3.7% (n=30)
University hospital	4.7% (n=38)
Private Hospital	16.3% (n=131)
Others	5.6% (n=45)
7. Number of Bed	
10 - 120 beds	36.2% (n=292)
120 - 500 beds	37.8% (n=304)
More than 500 beds	26.0% (n=209)
8. Hospital Location	
North region	19.1% (n=154)
North-east region	20.6% (n=166)
East region	7.8% (n=63)
South region	16.3% (n=131)
Central region (not include Bangkok and vicinity)	19.8% (n=159)
Bangkok and vicinity	16.4% (n=132)
9. Time of practice in Hospital pharmacy work scope	
Less than 5 years	36.3% (n=292)
5-10 years	20.6% (n=166)
11 - 20 years	34.7% (n=279)
21 - 30 years	7.7% (n=62)
More than 30 years	0.7% (n=6)

2. Computer and Internet skills

The second part of questionnaire searched for the respondents' computer and Internet skills. Closed-ended questions with the Likert 5-point scale were used to measure the skill level. The findings were shown in the form of frequency distribution, mean and statistic deviation in table 4.2 and table 4.3.

Table 4.2 Level of computer skills $\begin{bmatrix} \% \\ (n) \end{bmatrix}$ (N=805)

Knowledge/ skills	5	4	3	2	1	0	Mean	S.D.	Interpretation
Computer skills									
Skill in using basic computer devices ex. mouse, keyboard, printer	31.3 (252)	39.3 (316)	24.2 (195)	4.0 (32)	0.1 (1)	1.1 (9)	3.94	0.95	Proficient
Skill in file and folder management	34.3 (276)	35.3 (284)	21.6 (174)	7.0 (56)	1.2 (10)	0.6 (5)	3.93	1.02	Proficient
Skill in using Word processing application	17.1 (138)	43.1 (347)	32.4 (261)	7.0 (56)	0.2 (2)	0.1 (1)	3.70	0.85	Proficient
Skill in using Presentation application	9.4 (76)	32.9 (265)	42.5 (342)	12.0 (97)	2.4 (19)	0.7 (6)	3.33	0.94	Proficient
Skill in using Spreadsheet application	9.8 (79)	30.7 (247)	41.5 (334)	15.4 (124)	2.4 (19)	0.2 (2)	3.29	0.94	Competent
Skill in searching file	14.7 (118)	29.2 (235)	31.3 (252)	16.5 (133)	6.8 (55)	1.5 (12)	3.24	1.18	Competent
Skill in application installation	12.0 (97)	17.8 (143)	27.2 (219)	21.6 (174)	12.9 (104)	8.4 (68)	2.69	1.44	Competent
Skill in using help command	3.5 (28)	12.8 (103)	29.4 (237)	25.3 (204)	20.5 (165)	8.4 (68)	2.28	1.26	Advance beginner
Skill in using Database Management application	1.7 (14)	5.1 (41)	18.1 (146)	29.3 (236)	28.8 (232)	16.9 (136)	1.71	1.19	Advance beginner
Overall computer skills	5.7 (46)	30.9 (249)	46.6 (375)	14.2 (114)	1.9 (15)	0.7 (6)	3.22	0.88	Competent

According to table 4.2, the results show that respondents are proficient with the highest mean on “Skill in using basic computer device” (mean=3.51), followed by “Skill in file and folder management” (mean=3.93), while they are advance beginners with the lowest mean on “Skill in using Database Management application” (mean=1.71). Mean of overall computer skills is 3.22 (competent).

Table 4.3 Level of Internet skills $\begin{bmatrix} \% \\ (n) \end{bmatrix}$ (N=805)

Knowledge/ skills	5	4	3	2	1	0	Mean	S.D.	Interpretation
Internet skills									
Skill in attaching file/ open attached file in e-mail	29.1 (234)	40.7 (328)	22.9 (184)	5.6 (45)	1.1 (9)	0.6 (5)	3.89	0.97	Proficient
Skill in searching desired data/information in Internet using search engine	27.0 (217)	42.5 (342)	24.6 (198)	5.1 (41)	0.2 (2)	0.6 (5)	3.89	0.91	Proficient
Skill in using e-mail to communicate with others	27.2 (219)	40.4 (325)	25.3 (204)	5.8 (47)	0.9 (7)	0.4 (3)	3.86	0.94	Proficient
Skill in downloading file from Internet	22.7 (183)	35.3 (284)	30.8 (248)	8.9 (72)	1.7 (14)	0.5 (4)	3.67	1.01	Proficient
Skill in using Save command to save webpage	21.9 (176)	32.8 (264)	29.6 (238)	11.8 (95)	3.0 (24)	1.0 (8)	3.56	1.10	Proficient
Skill in using social media	20.6 (166)	36.3 (292)	27.8 (224)	10.8 (87)	2.9 (23)	1.6 (13)	3.56	1.11	Proficient
Skill in bookmarking webpage or adding webpage to favorite menu	22.7 (183)	30.1 (242)	26.1 (210)	12.4 (100)	5.7 (46)	3.0 (24)	3.43	1.28	Proficient
Skill in creating group contact in e-mail	14.9 (120)	26.1 (210)	32.4 (261)	17.4 (140)	5.8 (47)	3.4 (27)	3.17	1.24	Competent
Skill in searching health information using online database	10.1 (81)	27.8 (224)	37.0 (298)	18.0 (145)	5.8 (47)	1.2 (10)	3.15	1.09	Competent
Skill in accessing information in online database	9.6 (77)	24.0 (193)	33.4 (269)	22.2 (179)	8.9 (72)	1.9 (15)	2.97	1.17	Competent
Overall Internet skills	11.8 (95)	37.8 (304)	37.6 (303)	11.4 (92)	1.4 (11)	-	3.47	0.89	Proficient

From table 4.3, the results show that respondents are proficient with the highest mean on “Skill in attaching file/ open attached file in e-mail” (mean=3.89), followed by “Skill in searching desired data/information in Internet using search engine” (mean=3.89), while they are competent with the lowest mean on “Skill in accessing information in online database” (mean=2.97). Mean of overall Internet skills is 3.47 (proficient).

3. Informatics knowledge and skills

The third part asked about respondents' informatics knowledge and skills, which were divided into information management skills, communication skills, technology and database design knowledge and skills, management skills. The findings are shown in the form of frequency distribution, mean and statistic deviation in table 4.4, 4.5, 4.6 and 4.7.

Table 4.4 Level of information management skills $\begin{bmatrix} \% \\ (n) \end{bmatrix}$ (N=805)

Knowledge/ skills	5	4	3	2	1	0	Mean	S.D.	Interpretation
Information management skills									
Pharmacy information systems	4.2 (34)	24.0 (193)	43.1 (347)	21.7 (175)	4.8 (39)	2.1 (17)	2.95	1.00	Competent
Skill in assessment of data source reliability	5.7 (46)	24.2 (195)	37.6 (303)	20.2 (163)	8.6 (69)	3.6 (29)	2.87	1.15	Competent
Skill in selecting data source correspond to user requirement	4.2 (34)	22.0 (177)	39.6 (319)	22.0 (177)	8.1 (65)	4.1 (33)	2.80	1.12	Competent
Pharmacy data, information and knowledge management	3.4 (27)	20.9 (168)	41.1 (331)	24.1 (194)	7.0 (56)	3.6 (29)	2.79	1.07	Competent
Standard drug code	1.2 (10)	7.8 (63)	25.1 (202)	30.1 (242)	21.4 (172)	14.4 (116)	1.94	1.21	Advance beginner
Health informatics standard	0.7 (6)	2.6 (21)	13.3 (107)	26.6 (214)	22.4 (180)	34.4 (277)	1.30	1.19	Novice
Overall informatics management skills	2.2 (18)	15.5 (125)	43.7 (352)	27.7 (223)	7.8 (63)	3.0 (24)	2.68	1.00	Competent

From table 4.4, the results show that respondents are competent with the highest mean on "Pharmacy information systems" (mean=2.95), followed by "Skill in assessment of data source reliability" (mean=2.87). However, they are novice with the lowest mean on "Health informatics standard" (mean=1.30). Mean of overall informatics management skills is 2.68 (competent).

Table 4.5 Level of communication skills $\begin{bmatrix} \% \\ (n) \end{bmatrix}$ (N=805)

Knowledge/ skills	5	4	3	2	1	0	Mean	S.D.	Interpretation
Communication skills									
Skill in providing appropriate data service to each patient	4.1 (33)	35.5 (286)	44.0 (354)	13.2 (106)	2.0 (16)	1.2 (10)	3.23	0.89	Competent
Skill in communication for improving patient-care efficiency	5.2 (42)	33.2 (267)	43.2 (348)	14.7 (118)	2.6 (21)	1.1 (9)	3.20	0.92	Competent
Skill in handling of communication barrier	3.2 (26)	28.1 (226)	49.3 (397)	13.8 (111)	3.2 (26)	2.4 (19)	3.07	0.94	Competent
Skill in choosing appropriate public channel for each kind of data	4.0 (32)	24.7 (199)	44.6 (359)	19.4 (156)	5.6 (45)	1.7 (14)	2.97	0.99	Competent
Overall communication skills	3.4 (27)	27.7 (223)	47.6 (383)	16.1 (130)	2.7 (22)	2.5 (20)	3.05	0.95	Competent

From table 4.5, the results show that respondents are competent with the highest mean on “Skill in providing appropriate data service to each patient” (mean=3.23), followed by “Skill in communication for improving patient-care efficiency” (mean=3.20), while they are competent with the lowest mean on “Skill in choosing appropriate public channel for each kind of data” (mean=2.97). Mean of overall communication skills is 3.05 (competent).

Table 4.6 Level of technology and database design knowledge and skills $\begin{bmatrix} \% \\ (n) \end{bmatrix}$ (N=805)

Knowledge/ skills	5	4	3	2	1	0	Mean	S.D.	Interpretation
Technology and Database Design knowledge and skills									
Electronic patient record/ Electronic health record	2.4 (19)	11.9 (96)	26.6 (214)	22.5 (181)	16.0 (129)	20.6 (166)	2.00	1.39	Advance beginner
Operating system	3.0 (24)	9.4 (76)	26.1 (210)	24.0 (193)	18.8 (151)	18.8 (151)	1.98	1.36	Advance beginner
E-prescribing	2.6 (21)	10.9 (88)	25.7 (207)	21.5 (173)	17.3 (139)	22.0 (177)	1.94	1.41	Advance beginner
Skill in database querying	1.4 (11)	7.3 (59)	24.3 (196)	23.7 (191)	19.0 (153)	24.2 (195)	1.76	1.33	Advance beginner
Clinical decision support system	1.2 (10)	7.8 (63)	19.5 (157)	22.6 (182)	20.2 (163)	28.6 (230)	1.61	1.35	Novice
Skill in system analysis/ user requirement identification	1.5 (12)	5.0 (40)	21.0 (169)	22.0 (177)	21.7 (175)	28.8 (232)	1.56	1.31	Novice
Computerized provider order entry; CPOE	1.2 (10)	7.5 (60)	17.5 (141)	22.5 (181)	18.9 (152)	32.4 (261)	1.52	1.36	Novice
Network and protocols	0.9 (7)	4.5 (36)	18.0 (145)	24.0 (193)	23.5 (189)	29.2 (235)	1.48	1.25	Novice
Skill in database management	1.5 (12)	4.5 (36)	18.3 (147)	23.4 (188)	20.7 (167)	31.7 (255)	1.48	1.30	Novice
Skill in system design/ technical requirement	1.4 (11)	5.3 (43)	17.8 (143)	22.1 (178)	21.2 (171)	32.2 (259)	1.47	1.32	Novice
Telepharmacy	0.5 (4)	3.7 (30)	16.0 (129)	23.0 (185)	21.0 (169)	35.8 (288)	1.32	1.24	Novice
Skill in database design	1.2 (10)	2.5 (20)	16.0 (129)	22.1 (178)	19.9 (160)	38.3 (308)	1.28	1.26	Novice
Skill in user interface design	1.0 (8)	3.1 (25)	15.4 (124)	22.9 (184)	17.9 (144)	39.8 (320)	1.27	1.27	Novice
Skill in programming	0.4 (3)	2.1 (17)	8.1 (65)	13.3 (107)	20.4 (164)	55.8 (449)	0.81	1.11	Do not know
Overall technology and database design knowledge and skills	0.5 (4)	2.5 (20)	16.5 (133)	22.1 (178)	28.0 (225)	30.4 (245)	1.34	1.17	Novice

From table 4.6, the results show that respondents are advance beginners with the highest mean on “Electronic patient record/ Electronic health record” (mean=2.00), followed by “Operating system” (mean=1.98). However, they answered “do not know” with the lowest mean on “Skill in programming” (mean=0.81). Mean of overall technology and database design knowledge and skills is 1.34 (novice).

Table 4.7 Level of management skills $\begin{bmatrix} \% \\ (n) \end{bmatrix}$ (N=805)

Knowledge/ skills	5	4	3	2	1	0	Mean	S.D.	Interpretation
Management skills									
Skill in risk management	2.0 (16)	11.4 (92)	35.5 (286)	24.3 (196)	15.7 (126)	11.1 (89)	2.27	1.23	Advance beginner
Skill in project management	2.0 (16)	10.3 (83)	33.9 (273)	27.0 (217)	16.1 (130)	10.7 (86)	2.23	1.21	Advance beginner
Skill in change management	1.9 (15)	9.7 (78)	34.8 (280)	27.1 (218)	15.9 (128)	10.7 (86)	2.22	1.20	Advance beginner
Overall management skills	1.2 (10)	9.3 (75)	36.0 (290)	26.7 (215)	16.4 (132)	10.3 (83)	2.21	1.17	Advance beginner

From table 4.7, the results show that respondents are advance beginners with the highest mean on "Skill in risk management" (mean=2.27), followed by "Skill in project management" (mean=2.23), while they are advance beginners with the lowest mean on "Skill in change management" (mean=2.22). Mean of overall management skills is 2.21 (advance beginner).

4. Assessment of attitude toward necessity and training needs

The fourth part of the survey asked respondents to assess necessity of informatics in their practice and also their needs on informatics training. Closed-ended question with the Likert 5-point scale were used to measure the degree of attitude. The findings are shown in the form of frequency distribution, mean and statistic deviation in table 4.8 and 4.9

Table 4.8 Necessity of informatics knowledge and skills for work $\begin{bmatrix} \% \\ (n) \end{bmatrix}$ (N=805)

Knowledge/ skills	5	4	3	2	1	0	Mean	S.D.	Interpretation
Computer skills	44.0 (354)	32.9 (265)	14.5 (117)	4.0 (32)	1.5 (12)	3.1 (25)	4.05	1.17	High
Communication skills	41.6 (335)	32.7 (263)	17.4 (140)	4.8 (39)	0.7 (6)	2.7 (22)	4.01	1.14	High
Internet skills	40.7 (328)	34.3 (276)	16.1 (130)	4.2 (34)	1.5 (12)	3.1 (25)	3.99	1.17	High
Information management skills	36.8 (296)	34.4 (277)	18.1 (146)	5.2 (42)	2.4 (19)	3.1 (25)	3.89	1.21	High
Management skills	30.2 (243)	32.2 (259)	23.6 (190)	7.6 (61)	3.1 (25)	3.4 (27)	3.69	1.25	High
Technology and Database design knowledge and skills	22.4 (180)	22.2 (179)	27.0 (217)	14.0 (113)	8.9 (72)	5.5 (44)	3.19	1.44	Moderate

From table 4.8, the results show that respondents rated “Computer skills” as highly necessary with the highest mean (mean=4.05), followed by “Communication skills” (mean=4.01), whereas “Technology and Database design knowledge and skills” are ranked as moderately necessary with the lowest mean (mean=3.19).

Table 4.9 Level of training needs $\begin{bmatrix} \% \\ (n) \end{bmatrix}$ (N=805)

Knowledge/ skills	**5**	**4**	**3**	**2**	**1**	**0**	**Mean**	**S.D.**	**Interpretation**
Information management skills	43.1 (347)	29.9 (241)	18.9 (152)	4.5 (36)	1.9 (15)	1.7 (14)	4.03	1.12	High
Management skills	40.7 (328)	28.9 (233)	19.3 (155)	6.2 (50)	2.9 (23)	2.0 (16)	3.93	1.19	High
Communication skills	31.3 (252)	27.3 (220)	28.1 (226)	8.1 (65)	3.4 (27)	1.9 (15)	3.70	1.19	High
Technology and Database design knowledge and skills	37.9 (305)	24.8 (200)	18.4 (148)	9.9 (80)	4.7 (38)	4.2 (34)	3.69	1.40	High
Computer skills	30.1 (242)	26.2 (211)	23.7 (191)	8.8 (71)	5.7 (46)	5.5 (44)	3.50	1.42	High
Internet skills	26.7 (215)	25.0 (201)	24.7 (199)	11.1 (89)	6.2 (50)	6.3 (51)	3.36	1.46	High

From table 4.9, the results show that respondents rated their needs of training as “high” in every informatics skills. The “Information management skills” got the highest mean of 4.03, followed by “Management skills” (mean=3.93), while “Internet skills” got the lowest mean (mean=3.36).

5. Analysis of relationship

General information of respondents was group as stated in table 4.10. The last group of age and time of practice that gave less than 30 frequencies was combined with the upper group for more reliable result.

Table 4.10 New personal information group (N=805)

General Characteristics	Frequency	Percent	General Characteristics	Frequency	Percent
1. Gender			**1. Gender**		
Male	174	21.6	Male	174	21.6
Female	631	78.4	Female	631	78.4
2. Age			**2. Age**		
Less than 30 years	284	35.3	Less than 30 years	284	35.2
30-40 years	378	47.0	30-40 years	378	47.0
41-50 years	128	15.9	41-60 years	143	17.8
51-60 years	15	1.8			
More than 60 years	-	-			
3. Income/ month			**3. Income/ month**		
10,000-20,000 THB	65	8.1	10,000-20,000 THB	65	8.1
20,001-30,000 THB	331	41.1	20,001-30,000 THB	331	41.1
30,001-40,000 THB	279	34.7	30,001-40,000 THB	279	34.7
More than 40,000 THB	130	16.1	More than 40,000 THB	130	16.1
4. Highest education			**4. Highest education**		
Bachelor's Degree	627	77.9	Bachelor's Degree	627	77.9
Master's Degree Major	178	22.1	Master's Degree Major	178	22.1
PhD.	-	-	PhD.	-	-
5. Time of practice in Hospital pharmacy work scope			**5. Time of practice in Hospital pharmacy work scope**		
Less than 5 years	292	36.3	Less than 5 years	292	36.3
5-10 years	166	20.6	5-10 years	166	20.6
11 - 20 years	279	34.7	11 - 20 years	279	34.7
21 - 30 years	62	7.7	More than 20 years	68	8.4
More than 30 years	6	0.7			

5.1 Relationship between general information and computer and Internet skills.

5.1.1 Relationship between gender and computer and Internet skills.

Since gender and skill level were nominal and interval scale respectively, and the sample size was large (more than 30), z-test was suitable for relationship analysis. However, since z-test and t-test are the same when the sample size is large, and the SPSS program does not have the z-test menu, the independent sample t-test was selected. As the sample size was large, the data were assumed to have normal distribution [86]. The results are shown in table 4.11

Table 4.11 T-test of computer and Internet skills between male and female respondents

Skills	Gender		t	Sig.
	Male	Female		
1. Computer skills	**3.38**	**3.05**	**4.947**	**0.000***
1.1 Skill in using basic computer component	4.01	3.93	0.986	0.324
1.2 Skill in using word processing application	3.71	3.69	0.297	0.766
1.3 Skill in using spreadsheet application	3.44	3.26	2.261	0.024*
1.4 Skill in using presentation application	3.44	3.30	1.728	0.084
1.5 Skill in using database management application	2.13	1.59	5.373	0.000*
1.6 Skill in file and folder management	4.07	3.89	2.097	0.036*
1.7 Skill in application installation	3.38	2.50	7.383	0.000*
1.8 Skill in using help command	2.79	2.14	6.203	0.000*
1.9 Skill in searching file	3.52	3.16	3.540	0.000*
1.10 Overall computer skills	3.43	3.16	3.497	0.001*
2. Internet skills	**3.68**	**3.47**	**2.797**	**0.005***
2.1 Skill in using e-mail to communicate with others	3.99	3.82	2.125	0.034*
2.2 Skill in attaching file/ open attached file in e-mail	4.02	3.86	2.026	0.043*
2.3 Skill in creating group contact in e-mail	3.32	3.13	1.784	0.075
2.4 Skill in searching desired data/information in Internet using search engine	4.02	3.85	2.189	0.029*
2.5 Skill in using Save command to save webpage	3.71	3.52	2.094	0.037*
2.6 Skill in downloading file from Internet	3.87	3.61	2.956	0.003*
2.7 Skill in bookmarking webpage or adding webpage to favorite menu	3.83	3.32	5.212	0.000*

Table 4.11 T-test of computer and Internet skills between male and female respondents (Continued)

Skills	Gender		t	Sig.
	Male	Female		
2.8 Skill in searching health information using online database	3.28	3.11	1.788	0.074
2.9 Skill in accessing information in online database	3.11	2.94	1.797	0.073
2.10 Skill in using social media	3.64	3.54	1.099	0.272
2.11 Overall Internet skills	3.63	3.43	2.683	0.007*

*Significant at level 0.05 (95% level of confidence)

Results from table 4.11 show that the differences of computer skills and Internet skills between male and female are significant, implying that pharmacists with different gender have different computer skills and Internet skills. Male respondents tend to be more competent in these skills than female respondents, which are quite natural because male are normally more interested in technology than female.

5.1.2 Relationship between age and computer and Internet skills.

Since age and skill levels were nominal and interval scale respectively and samples were more than 2 groups, one-way ANOVA was used to analyze the data. When the sample size was large, the data were assumed to have normal distribution and equal variance [86]. Analysis results are shown in table 4.12

Table 4.12 One-way ANOVA of computer and Internet skills among age groups

Skill	Age			F	Sig.
	Less than 30 years	30-40 years	41-60 years		
1. Computer skills	**3.23**	**3.14**	**2.86**	**10.745**	**0.000***
1.1 Skill in using basic computer component	4.07	3.97	3.63	10.592	0.000*
1.2 Skill in using word processing application	3.81	3.71	3.43	10.135	0.000*
1.3 Skill in using spreadsheet application	3.21	3.41	3.15	5.401	0.005*
1.4 Skill in using presentation application	3.49	3.34	2.96	16.108	0.000*
1.5 Skill in using database management application	1.71	1.76	1.57	1.395	0.248
1.6 Skill in file and folder management	4.13	3.91	3.55	16.427	0.000*
1.7 Skill in application installation	2.97	2.62	2.32	10.731	0.000*
1.8 Skill in using help command	2.37	2.26	2.17	1.230	0.293
1.9 Skill in searching file	3.39	3.23	2.97	5.980	0.003*
1.10 Overall computer skills	3.31	3.24	3.01	5.738	0.003*
2. Internet skills	**3.79**	**3.47**	**3.06**	**35.938**	**0.000***
2.1 Skill in using e-mail to communicate with others	4.09	3.86	3.41	26.244	0.000*
2.2 Skill in attaching file/ open attached file in e-mail	4.14	3.87	3.44	27.048	0.000*
2.3 Skill in creating group contact in e-mail	3.41	3.17	2.67	17.642	0.000*
2.4 Skill in searching desired data/information in Internet using search engine	4.11	3.89	3.44	27.604	0.000*
2.5 Skill in using Save command to save webpage	3.83	3.50	3.17	18.637	0.000*
2.6 Skill in downloading file from Internet	3.95	3.63	3.21	27.493	0.000*
2.7 Skill in bookmarking webpage or adding webpage to favorite menu	3.71	3.40	2.93	18.492	0.000*
2.8 Skill in searching health information using online database	3.43	3.08	2.73	21.746	0.000*
2.9 Skill in accessing information in online database	3.25	2.91	2.59	16.585	0.000*
2.10 Skill in using social media	3.98	3.48	2.97	45.773	0.000*
2.11 Overall Internet skills	3.76	3.40	3.08	32.244	0.000*

*Significant at level 0.05 (95% level of confidence)

One-way ANOVA analysis shows that differences of computer and Internet skills among age groups are significant (table 4.12). Therefore, pharmacists with different age would have different computer and Internet skills. Almost all sub-skills in the group of

computer and Internet skills are significantly different among age groups. The higher the age of respondents, the lower the computer and Internet skill level. This may be because respondents who were less than 30 years old grew up with computer and Internet so they have high skill level while older respondents grew up when information technologies were less advanced. However, difference of skill in using database management application and skill in using help command is not significant among age groups. Respondents of all ages were not accustomed to database software and scarcely used help command to find their solution.

5.1.3 Relationship between income and computer and Internet skills.

Since income and skill levels were nominal and interval scale respectively and sample has more than 2 groups, one-way ANOVA was used to analyze the data. As sample size was large, the data were assumed to have normal distribution and equal variance [86]. The results are shown in table 4.13

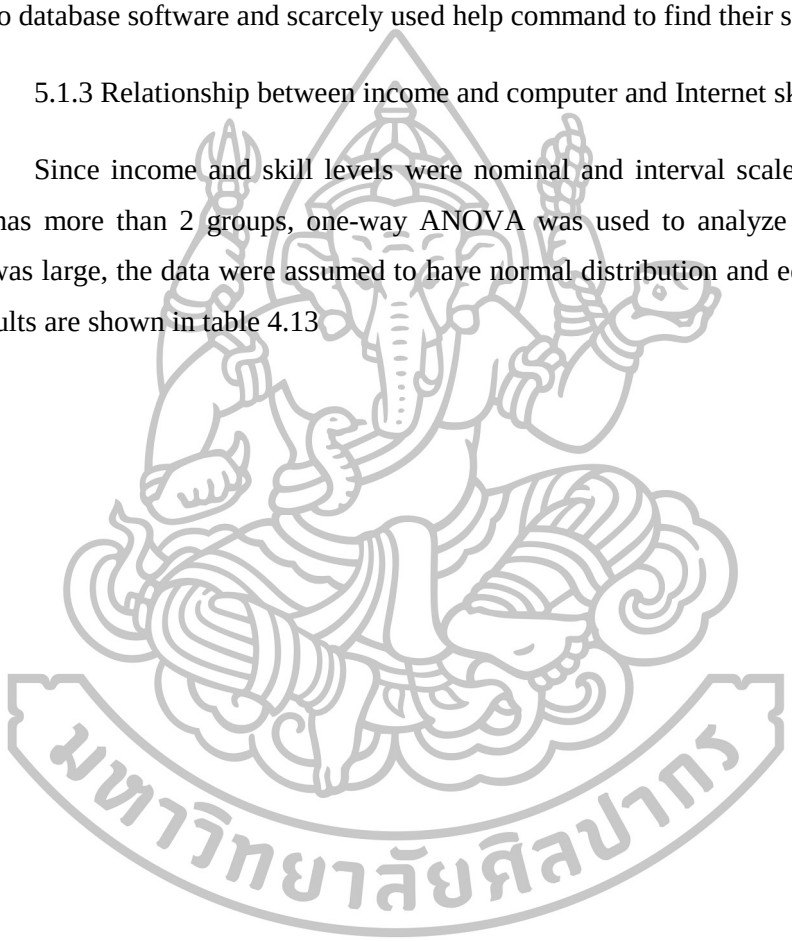


Table 4.13 One-way ANOVA of computer and Internet skills among respondents with different incomes

Skills	Income/month				F	Sig.
	10,000-20,000 THB	20,001-30,000 THB	30,001-40,000 THB	More than 40,000 THB		
1. Computer skills	**3.13**	**3.15**	**3.12**	**3.05**	**0.487**	**0.692**
1.1 Skill in using basic computer component	3.91	3.96	4.00	3.79	1.528	0.206
1.2 Skill in using Word processing application	3.74	3.72	3.71	3.57	1.158	0.325
1.3 Skill in using Spreadsheet application	3.26	3.26	3.34	3.31	0.373	0.772
1.4 Skill in using Presentation application	3.40	3.39	3.27	3.26	1.191	0.312
1.5 Skill in using Database Management application	1.69	1.73	1.74	1.58	0.594	0.619
1.6 Skill in file and folder management	3.94	3.98	3.90	3.83	0.771	0.511
1.7 Skill in application installation	2.77	2.77	2.64	2.57	0.815	0.486
1.8 Skill in using help command	2.31	2.30	2.25	2.30	0.102	0.959
1.9 Skill in searching file	3.09	3.24	3.29	3.20	0.556	0.644
1.10 Overall computer skills	3.18	3.21	3.24	3.23	0.077	0.973
2. Internet skills	**3.67**	**3.59**	**3.46**	**3.32**	**3.996**	**0.008***
2.1 Skill in using e-mail to communicate with others	3.95	3.94	3.84	3.67	2.893	0.035*
2.2 Skill in attaching file/ open attached file in e-mail	3.97	3.99	3.84	3.71	3.258	0.021*
2.3 Skill in creating group contact in e-mail	3.43	3.25	3.10	2.95	3.060	0.028*
2.4 Skill in searching desired data/information in Internet using search engine	4.06	3.96	3.89	3.62	5.298	0.001*
2.5 Skill in using Save command to save webpage	3.69	3.61	3.54	3.39	1.608	0.186
2.6 Skill in downloading file from Internet	3.86	3.76	3.61	3.45	4.107	0.007*
2.7 Skill in bookmarking webpage or adding webpage to favorite menu	3.45	3.55	3.33	3.32	1.786	0.148
2.8 Skill in searching health information using online database	3.45	3.21	3.08	2.98	3.436	0.017*
2.9 Skill in accessing information in online database	3.17	3.04	2.94	2.79	2.098	0.099
2.10 Skill in using social media	3.75	3.67	3.49	3.35	3.598	0.013*
2.11 Overall Internet skills	3.60	3.54	3.43	3.31	2.818	0.038*

*Significant at level 0.05 (95% level of confidence)

From table 4.13, one-way ANOVA analysis shows that difference of computer skills among respondents with different income is insignificant, while difference of their Internet skills is significant. Respondents with high income tended to have lower skill level than the lower income respondents. Generally, income of pharmacists increases along practicing time and age. Therefore, the relationships between income and computer and Internet skills are quite similar to the relationships between age and computer and Internet skills. However, since there is a huge difference of income between governmental and private pharmacists, the relationships of income of the two groups were analyzed separately, and results are shown in table 4.14 and table 4.15.

5.1.3.1 Relationship between income and computer and Internet skills of pharmacists in government hospitals.

Since income was divided into more than 2 groups, one-way ANOVA was used to analyze the data. As sample size was large, the data were assumed to have normal distribution and equal variance [86]. Analysis results are shown in table 4.14

Table 4.14 One-way ANOVA of computer and Internet skills among respondents from government hospitals with different incomes

Skills	Income/month				F	Sig.
	10,000-20,000 THB	20,001-30,000 THB	30,001-40,000 THB	More than 40,000 THB		
1. Computer skills	**3.13**	**3.13**	**3.12**	**3.04**	**0.389**	**0.761**
1.1 Skill in using basic computer component	3.95	3.95	4.01	3.73	2.249	0.081
1.2 Skill in using Word processing application	3.74	3.71	3.72	3.57	0.982	0.401
1.3 Skill in using Spreadsheet application	3.26	3.27	3.37	3.30	0.558	0.643
1.4 Skill in using Presentation application	3.41	3.37	3.29	3.25	0.814	0.487
1.5 Skill in using Database Management application	1.71	1.69	1.67	1.59	0.226	0.878
1.6 Skill in file and folder management	3.91	3.97	3.93	3.80	0.760	0.517
1.7 Skill in application installation	2.76	2.73	2.67	2.58	0.378	0.769
1.8 Skill in using help command	2.29	2.29	2.20	2.32	0.347	0.791
1.9 Skill in searching file	3.09	3.22	3.30	3.14	0.740	0.529
1.10 Overall computer skills	3.16	3.19	3.23	3.22	0.143	0.934
2. Internet skills	**3.69**	**3.59**	**3.45**	**3.29**	**4.040**	**0.007***
2.1 Skill in using e-mail to communicate with others	3.98	3.95	3.82	3.65	3.008	0.030*
2.2 Skill in attaching file/ open attached file in e-mail	4.00	4.00	3.85	3.68	3.317	0.020*
2.3 Skill in creating group contact in e-mail	3.43	3.25	3.06	2.88	3.598	0.013*
2.4 Skill in searching desired data/information in Internet using search engine	4.07	3.96	3.88	3.60	5.130	0.002*
2.5 Skill in using Save command to save webpage	3.71	3.61	3.53	3.35	1.970	0.117
2.6 Skill in downloading file from Internet	3.84	3.78	3.62	3.42	4.057	0.007*
2.7 Skill in bookmarking webpage or adding webpage to favorite menu	3.43	3.54	3.30	3.27	1.954	0.120
2.8 Skill in searching health information using online database	3.52	3.19	3.09	2.95	3.676	0.012*
2.9 Skill in accessing information in online database	3.24	3.02	2.94	2.77	2.305	0.076
2.10 Skill in using social media	3.74	3.63	3.45	3.33	2.942	0.032*
2.11 Overall Internet skills	3.59	3.53	3.44	3.28	2.476	0.060

*Significant at level 0.05 (95% level of confidence)

From table 4.14, one-way ANOVA analysis shows that difference of computer skills among respondents from government hospitals with different income is insignificant, while difference of their Internet skills is significant. Respondents who have higher income tend to have lower skill level than respondents who have lower income. The possible reason is that respondents who have lower income were younger, and the younger tend to possess higher skills as shown previously in the relationship between age and computer and Internet skill levels.

5.1.3.2 Relationship between income and computer and Internet skills of pharmacists from private hospitals.

Since income was divided into more than 2 groups, one-way ANOVA was used to analyze the data. As sample size was large, the data were assumed to have normal distribution and equal variance [86]. Analysis results are shown in table 4.15

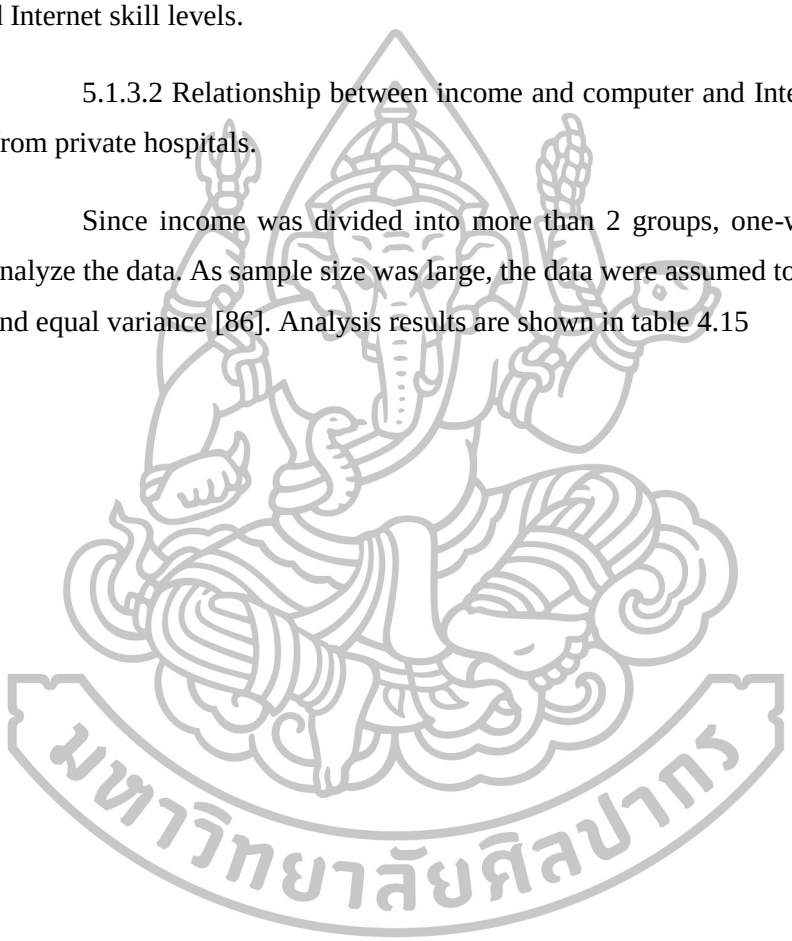


Table 4.15 One-way ANOVA of computer and Internet skills among respondents from private hospitals with different incomes

Skills	Income/month				F	Sig.
	10,000-20,000 THB	20,001-30,000 THB	30,001-40,000 THB	More than 40,000 THB		
1. Computer skills	**3.14**	**3.24**	**3.12**	**3.10**	**0.246**	**0.864**
1.1 Skill in using basic computer component	3.57	4.02	3.96	4.10	0.471	0.703
1.2 Skill in using Word processing application	3.71	3.77	3.67	3.57	0.285	0.836
1.3 Skill in using Spreadsheet application	3.29	3.21	3.20	3.33	0.108	0.955
1.4 Skill in using Presentation application	3.29	3.48	3.20	3.33	0.728	0.537
1.5 Skill in using Database Management application	1.57	1.98	2.04	1.57	1.051	0.373
1.6 Skill in file and folder management	4.14	4.06	3.76	4.00	0.748	0.525
1.7 Skill in application installation	2.86	2.96	2.51	2.52	0.893	0.447
1.8 Skill in using help command	2.43	2.31	2.45	2.19	0.266	0.850
1.9 Skill in searching file	3.14	3.33	3.25	3.52	0.360	0.782
1.10 Overall computer skills	3.43	3.35	3.27	3.29	0.138	0.937
2. Internet skills	**3.55**	**3.63**	**3.50**	**3.50**	**0.249**	**0.862**
2.1 Skill in using e-mail to communicate with others	3.71	3.90	3.89	3.76	0.202	0.895
2.2 Skill in attaching file/ open attached file in e-mail	3.71	3.96	3.80	3.86	0.310	0.818
2.3 Skill in creating group contact in e-mail	3.43	3.29	3.27	3.33	0.045	0.987
2.4 Skill in searching desired data/information in Internet using search engine	4.00	3.96	3.91	3.76	0.283	0.838
2.5 Skill in using Save command to save webpage	3.57	3.60	3.58	3.62	0.008	0.999
2.6 Skill in downloading file from Internet	4.00	3.69	3.56	3.62	0.435	0.728
2.7 Skill in bookmarking webpage or adding webpage to favorite menu	3.57	3.56	3.44	3.62	0.162	0.922
2.8 Skill in searching health information using online database	2.86	3.33	3.04	3.10	0.934	0.426
2.9 Skill in accessing information in online database	2.57	3.13	2.93	2.90	0.680	0.566
2.10 Skill in using social media	3.86	3.88	3.64	3.48	1.007	0.392
2.11 Overall Internet skills	3.71	3.63	3.40	3.48	0.823	0.483

*Significant at level 0.05 (95% level of confidence)

From table 4.15, one-way ANOVA analysis shows that difference of both computer and Internet skills among respondents from private hospitals with different incomes are insignificant. Usually income of pharmacists from private hospitals is not related to their age.

5.1.4 Relationship between education levels and computer and Internet skills.

Since education level and skill level were nominal and interval scale respectively, and the sample size was large (more than 30), z-test was suitable for relationship analysis. However, since z-test and t-test are the same when the sample size is large, and the SPSS program does not have the z-test menu, the independent sample t-test was selected. As the sample size was large, the data were assumed to have normal distribution [86]. The results are shown in table 4.16

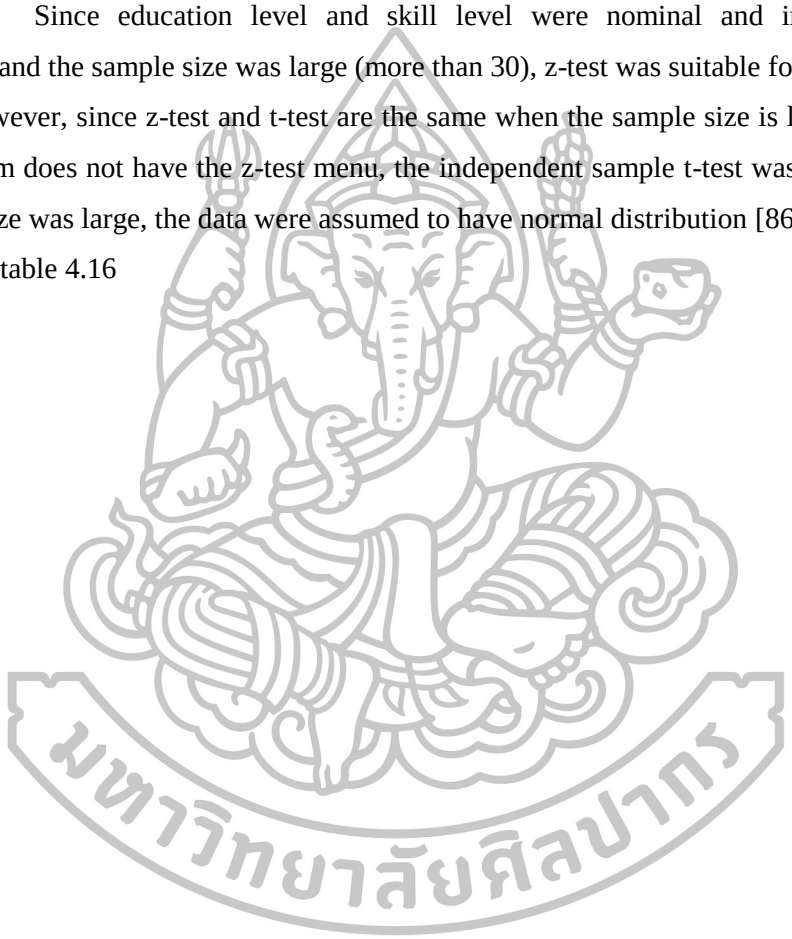


Table 4.16 T-test of computer and Internet skills between bachelor and master graduated respondents

Skills	Education levels		t	Sig.
	Bachelor's Degree	Master's Degree		
1. Computer skills	**3.07**	**3.31**	**-3.618**	**0.000***
1.1 Skill in using basic computer component	3.91	4.07	-1.986	0.047*
1.2 Skill in using word processing application	3.65	3.84	-2.798	0.005*
1.3 Skill in using spreadsheet application	3.23	3.52	-3.602	0.000*
1.4 Skill in using presentation application	3.27	3.53	-3.332	0.001*
1.5 Skill in using database management application	1.70	1.75	-.551	0.582
1.6 Skill in file and folder management	3.88	4.10	-2.848	0.005*
1.7 Skill in application installation	2.61	2.96	-3.177	0.002*
1.8 Skill in using help command	2.20	2.55	-3.563	0.000*
1.9 Skill in searching file	3.17	3.47	-2.928	0.004*
1.10 Overall computer skills	3.16	3.44	-3.742	0.000*
2. Internet skills	**3.48**	**3.63**	**-2.081**	**0.038***
2.1 Skill in using e-mail to communicate with others	3.83	3.98	-2.095	0.037*
2.2 Skill in attaching file/ open attached file in e-mail	3.87	3.98	-1.341	0.180
2.3 Skill in creating group contact in e-mail	3.11	3.38	-2.620	0.009*
2.4 Skill in searching desired data/information in Internet using search engine	3.86	4.00	-1.916	0.056
2.5 Skill in using Save command to save webpage	3.53	3.64	-1.195	0.233
2.6 Skill in downloading file from Internet	3.64	3.76	-1.349	0.178
2.7 Skill in bookmarking webpage or adding webpage to favorite menu	3.40	3.53	-1.276	0.203
2.8 Skill in searching health information using online database	3.07	3.42	-3.863	0.000*
2.9 Skill in accessing information in online database	2.91	3.20	-2.962	0.003*
2.10 Skill in using social media	3.57	3.53	.401	0.689
2.11 Overall Internet skills	3.46	3.52	-.878	0.381

*Significant at level 0.05 (95% level of confidence)

From table 4.16, computer and Internet skills of respondents with bachelor and master degree are significantly different. Therefore, pharmacists with different education level will have different computer and Internet skills. Respondents who had higher education level showed higher score on every skill except the skill in database management application

which all respondents gave low score. This could confirm that Thai hospital pharmacists lack database management skill which is identified as a necessary skill for health professional in IMIA [13]. For Internet skills, respondents who have higher education level showed higher score on every skills. However, there was no significance between education level and Internet skills on the following topics:

Skill in using social media

Skill in searching desired data/information in Internet using search engine

Skill in using Save command to save webpage

Skill in downloading file from Internet

Skill in bookmarking webpage or adding webpage to favorite menu

Skill in attaching file/ open attached file in e-mail

Because these skills are very general, there is no difference between respondents with the two education levels.

5.1.5 Relationship between time of practice and computer and Internet skills.

Since time of practice was divided into more than 2 groups, one-way ANOVA was used to analyze the data. As sample size was large, the data were assumed to be normal distribution and equal variance [86]. Analysis results are shown in table 4.17

Table 4.17 One-way ANOVA of computer and Internet skills among respondents with different time of practice

Skills	Time of practice				F	Sig.
	Less than 5 years	5-10 years	11 - 20 years	More than 20 years		
1. Computer skills	**3.23**	**3.15**	**3.04**	**2.89**	**4.975**	**0.002***
1.1 Skill in using basic computer component	4.08	4.01	3.83	3.66	5.787	0.001*
1.2 Skill in using Word processing application	3.80	3.73	3.63	3.43	4.614	0.003*
1.3 Skill in using Spreadsheet application	3.22	3.43	3.34	3.12	2.743	0.042*
1.4 Skill in using Presentation application	3.49	3.39	3.22	2.93	8.654	0.000*
1.5 Skill in using Database Management application	1.76	1.69	1.66	1.75	0.400	0.753
1.6 Skill in file and folder management	4.09	3.97	3.83	3.50	7.491	0.000*
1.7 Skill in application installation	2.96	2.66	2.49	2.43	6.262	0.000*
1.8 Skill in using help command	2.38	2.25	2.22	2.21	0.980	0.402
1.9 Skill in searching file	3.37	3.21	3.19	2.93	2.971	0.031*
1.10 Overall computer skills	3.29	3.26	3.18	3.01	2.291	0.077
2. Internet skills	**3.78**	**3.61**	**3.29**	**3.02**	**25.292**	**0.000***
2.1 Skill in using e-mail to communicate with others	4.06	3.99	3.69	3.38	15.180	0.000*
2.2 Skill in attaching file/ open attached file in e-mail	4.12	4.02	3.72	3.34	17.763	0.000*
2.3 Skill in creating group contact in e-mail	3.40	3.36	2.92	2.72	11.539	0.000*
2.4 Skill in searching desired data/information in Internet using search engine	4.10	4.02	3.72	3.35	18.934	0.000*
2.5 Skill in using Save command to save webpage	3.84	3.68	3.29	3.15	16.156	0.000*
2.6 Skill in downloading file from Internet	3.94	3.77	3.45	3.15	19.173	0.000*
2.7 Skill in bookmarking webpage or adding webpage to favorite menu	3.72	3.57	3.15	2.97	13.449	0.000*
2.8 Skill in searching health information using online database	3.46	3.10	2.95	2.72	15.500	0.000*
2.9 Skill in accessing information in online database	3.28	2.99	2.72	2.62	13.817	0.000*
2.10 Skill in using social media	3.96	3.64	3.28	2.82	32.069	0.000*
2.11 Overall Internet skills	3.75	3.57	3.25	2.97	25.187	0.000*

*Significant at level 0.05 (95% level of confidence)

From table 4.17, one-way ANOVA analysis shows that difference of both computer and Internet skills among respondents with different time of practice is significant. Therefore, pharmacists who had different time of practice would possess different computer skills and Internet skills. Respondents who worked less than 5 years showed the highest mean on these skills while respondents who worked 5-10, 11-20 and more than 20 years had lower mean, respectively. Time of practice usually relates to age of respondents. Therefore, relationships between time of practice and computer and Internet skills were similar to that of ages. However, skills in database management and help command are not related to time of practice, confirming that Thai pharmacists are not used to database software and scarcely use help command to find their solution.

5.2 Relationship between general information and informatics knowledge and skills.

5.2.1 Relationship between gender and informatics knowledge and skills.

Since gender and skill levels were nominal and interval scale respectively, and the sample size was large (more than 30), z-test was suitable for relationship analysis. However, since z-test and t-test are the same when the sample size is large, and the SPSS program does not have the z-test menu, the independent sample t-test was selected. As sample size was large, the data were assumed to be normal distribution [86]. The results were shown in table 4.18

Table 4.18 T-test of informatics knowledge and skills between male and female respondents

Informatics knowledge and skills	Gender		t	Sig.
	Male	Female		
1. Information management	**2.66**	**2.42**	**3.084**	**0.002***
1.1 Pharmacy information systems	3.14	2.89	2.938	0.003*
1.2 Pharmacy data, information and knowledge management	3.01	2.73	3.138	0.002*
1.3 Standard drug code	2.13	1.89	2.266	0.024*
1.4 Health informatics standard	1.55	1.23	3.232	0.001*
1.5 Skill in selecting data source correspond to user requirement	2.89	2.77	1.205	0.229
1.6 Skill in assessment of data source reliability	3.01	2.84	1.700	0.090
1.7 Overall information management skills	2.86	2.63	2.768	0.006*
2. Communication skills	**3.17**	**3.09**	**1.254**	**0.210**
2.1 Skill in providing appropriate data service to each individual patient	3.29	3.21	.985	0.325
2.2 Skill in choosing appropriate public channel for each kind of data	3.05	2.95	1.246	0.213
2.3 Skill in communication for improving patient-care efficiency	3.26	3.19	.979	0.328
2.4 Skill in handling of communication barrier	3.15	3.05	1.226	0.221
2.5 Overall communication skills	3.12	3.03	1.054	0.292
3. Technology and Database Design knowledge and skills	**1.96**	**1.45**	**5.236**	**0.000***
3.1 Operating system	2.45	1.84	5.325	0.000*
3.2 Computerized provider order entry	1.93	1.41	4.514	0.000*
3.3 E-prescribing	2.30	1.84	3.876	0.000*
3.4 Electronic patient record/Electronic health record	2.32	1.91	3.437	0.001*
3.5 Clinical decision support system	1.93	1.53	3.517	0.000*
3.6 Telepharmacy	1.68	1.23	4.366	0.000*
3.7 Network and protocols	1.89	1.36	4.924	0.000*
3.8 Skill in system analysis/user requirement identification	1.94	1.45	4.390	0.000*
3.9 Skill in system design/technical requirement specification	1.93	1.34	5.308	0.000*
3.10 Skill in database management	1.90	1.36	4.948	0.000*
3.11 Skill in database design	1.72	1.16	5.299	0.000*
3.12 Skill in database querying	2.13	1.65	4.195	0.000*
3.13 Skill in user interface design	1.70	1.15	5.119	0.000*
3.14 Skill in programming	1.20	.71	4.631	0.000*
3.15 Overall technology and database design knowledge and skills	1.71	1.24	4.444	0.000*
4. Management skills	**2.54**	**2.15**	**3.942**	**0.000***
4.1 Skill in project management	2.55	2.14	3.922	0.000*
4.2 Skill in change management	2.55	2.13	4.097	0.000*
4.3 Skill in risk management	2.55	2.19	3.477	0.001*
4.4 Overall management skills	2.49	2.14	3.589	0.000*

*Significant at level 0.05 (95% level of confidence)

Results from table 4.18 show that the differences of information management skills, technology and database design knowledge and skills and management skills between male and female are significant, implying that pharmacists with different gender have different information management skills, technology and database design knowledge and skills and management skills. Male respondents tend to have more informatics knowledge and skills than female. However, difference of communication skills between male and female is not significant which may be because of communication skills were taught in all pharmacy curricula.

5.2.2 Relationship between age and informatics knowledge and skills.

Since age and skill levels were nominal and interval scale respectively and sample has more than 2 groups, one-way ANOVA was used to analyze the data. When sample size was large, the data were assumed to have normal distribution and equal variance [86]. The results are shown in table 4.19

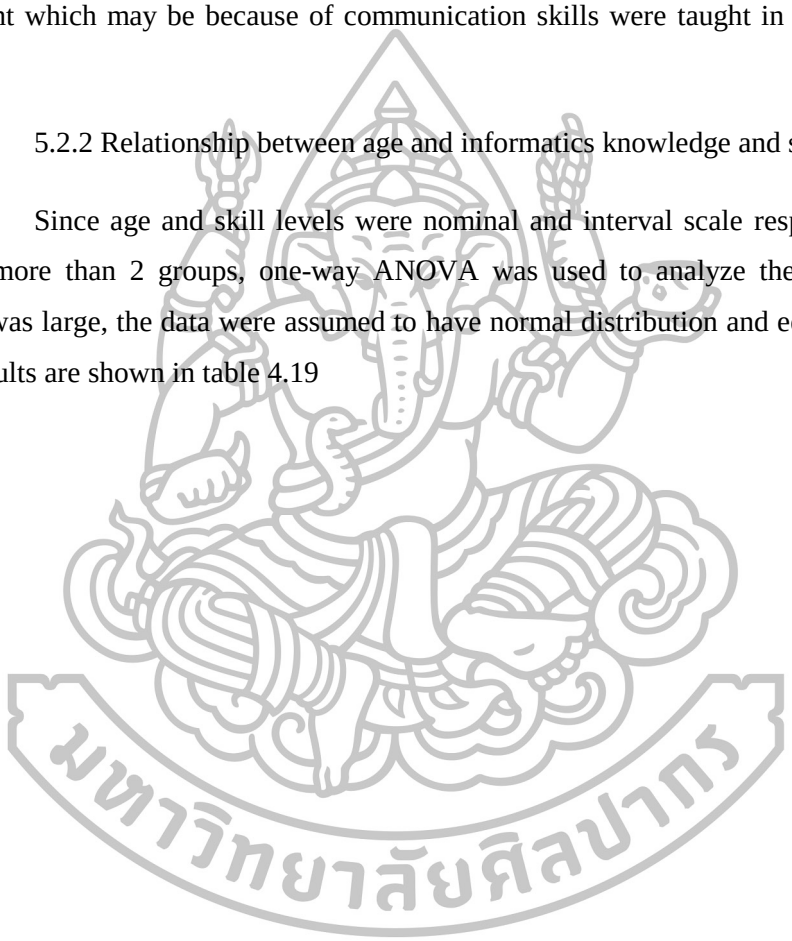


Table 4.19 One-way ANOVA of informatics knowledge and skills among age groups

Informatics knowledge and skills	Age			F	Sig.
	Less than 30 years	30-40 years	41-60 years		
1. Information management skills	**2.57**	**2.48**	**2.28**	**5.234**	**0.006***
1.1 Pharmacy information systems	2.92	2.99	2.90	0.579	0.561
1.2 Pharmacy data, information and knowledge management	2.80	2.84	2.62	2.174	0.114
1.3 Standard drug code	1.87	1.98	2.00	0.821	0.440
1.4 Health informatics standard	1.45	1.23	1.17	3.700	0.025*
1.5 Skill in selecting data source correspond to user requirement	3.05	2.75	2.45	14.461	0.000*
1.6 Skill in assessment of data source reliability	3.14	2.86	2.40	20.607	0.000*
1.7 Overall information management skills	2.78	2.70	2.41	6.654	0.001*
2. Communication skills	**3.23**	**3.09**	**2.88**	**9.187**	**0.000***
2.1 Skill in providing appropriate data service to each individual patient	3.35	3.22	2.99	7.892	0.000*
2.2 Skill in choosing appropriate public channel for each kind of data	3.14	2.97	2.64	12.709	0.000*
2.3 Skill in communication for improving patient-care efficiency	3.33	3.17	3.05	5.068	0.006*
2.4 Skill in handling of communication barrier	3.19	3.06	2.86	5.951	0.003*
2.5 Overall communication skills	3.16	3.05	2.85	5.185	0.006*
3. Technology and Database Design knowledge and skills	**1.68**	**1.47**	**1.55**	**2.669**	**0.070**
3.1 Operating system	2.19	1.88	1.81	5.448	0.004*
3.2 Computerized provider order entry	1.68	1.38	1.59	4.065	0.018*
3.3 E-prescribing	2.03	1.85	2.02	1.629	0.197
3.4 Electronic patient record/Electronic health record	2.12	1.96	1.89	1.770	0.171
3.5 Clinical decision support system	1.73	1.54	1.59	1.663	0.190
3.6 Telepharmacy	1.45	1.26	1.24	2.432	0.089
3.7 Network and protocols	1.56	1.40	1.50	1.385	0.251
3.8 Skill in system analysis/user requirement identification	1.68	1.46	1.58	2.237	0.107
3.9 Skill in system design/technical requirement specification	1.57	1.37	1.54	2.165	0.115
3.10 Skill in database management	1.61	1.38	1.47	2.697	0.068
3.11 Skill in database design	1.36	1.23	1.27	0.831	0.436
3.12 Skill in database querying	1.90	1.65	1.76	2.967	0.052
3.13 Skill in user interface design	1.40	1.16	1.31	3.082	0.046*
3.14 Skill in programming	.94	.76	.71	2.797	0.062
3.15 Overall technology and database design knowledge and skills	1.43	1.26	1.38	1.869	0.155
4. Management skills	**2.13**	**2.23**	**2.47**	**4.223**	**0.015***
4.1 Skill in project management	2.13	2.21	2.46	3.560	0.029*
4.2 Skill in change management	2.14	2.21	2.45	3.280	0.038*
4.3 Skill in risk management	2.13	2.27	2.51	4.484	0.012*
4.4 Overall management skills	2.10	2.21	2.45	4.326	0.014*

*Significant at level 0.05 (95% level of confidence)

From table 4.19, one-way ANOVA analysis shows that difference of informatics management skills among age groups is significant. Respondents who were less than 30 years old got higher score than others. A possible reason is that they grew up with information technology and social media so they have high skill level while older respondents were born in the era which information technology was less developed and not yet widespread.

The difference of communication skills and management skills among age groups is also significant, implying that pharmacists with different age will have different communication skills and management skills. Respondents who were younger than 30 years old got higher score on communication skills than others, while respondents who were 41-60 years old got the lowest mean. In contrary, respondents who were higher age got higher score on management skills. This may be because the higher age groups have to focus their works more on management tasks and always have to deal with management issues more than other groups.

However, the difference of technology and database design knowledge and skills among age groups is insignificant, implying that pharmacists with different age would not have significantly different technology and database design knowledge and skills. Respondents of every age group rated themselves with low score in every skill. It is demonstrating that Thai pharmacists still lack these important skills.

5.2.3 Relationship between income and informatics knowledge and skills.

Since income and skill levels were nominal and interval scale respectively, sample has more than 2 groups. One-way ANOVA was used to analyze the data. As sample size was large, the data were assumed to have normal distribution and equal variance [86]. The results are shown in table 4.20

Table 4.20 One-way ANOVA of informatics knowledge and skills among respondents with different incomes

Informatics knowledge and skills	Income/month				F	Sig.
	10,000-20,000 THB	20,001-30,000 THB	30,001-40,000 THB	More than 40,000 THB		
1. Information management skills	**2.47**	**2.47**	**2.46**	**2.51**	**0.094**	**0.963**
1.1 Pharmacy information systems	2.85	2.89	2.96	3.12	1.792	0.147
1.2 Pharmacy data, information and knowledge management	2.88	2.75	2.77	2.89	0.766	0.513
1.3 Standard drug code	1.82	1.89	1.92	2.19	2.335	0.073
1.4 Health informatics standard	1.35	1.26	1.30	1.35	0.214	0.887
1.5 Skill in selecting data source correspond to user requirement	2.80	2.86	2.80	2.66	0.954	0.414
1.6 Skill in assessment of data source reliability	2.86	2.96	2.87	2.67	1.962	0.118
1.7 Overall information management skills	2.72	2.68	2.65	2.71	0.184	0.907
2. Communication skills	**3.09**	**3.11**	**3.14**	**3.04**	**0.456**	**0.713**
2.1 Skill in providing appropriate data service to each individual patient	3.18	3.23	3.25	3.18	0.239	0.869
2.2 Skill in choosing appropriate public channel for each kind of data	2.89	3.03	2.98	2.82	1.512	0.210
2.3 Skill in communication for improving patient-care efficiency	3.20	3.18	3.25	3.17	0.333	0.802
2.4 Skill in handling of communication barrier	3.08	3.06	3.10	3.05	0.107	0.956
2.5 Overall communication skills	3.09	3.04	3.11	2.95	0.890	0.446
3. Technology and Database Design knowledge and skills	**1.55**	**1.50**	**1.53**	**1.77**	**1.860**	**0.135**
3.1 Operating system	2.20	1.97	1.94	1.96	0.664	0.574
3.2 Computerized provider order entry	1.48	1.44	1.51	1.78	1.922	0.125
3.3 E-prescribing	1.78	1.78	1.99	2.33	5.164	0.002*
3.4 Electronic patient record/Electronic health record	1.95	1.89	2.02	2.27	2.301	0.076
3.5 Clinical decision support system	1.66	1.49	1.64	1.85	2.256	0.081
3.6 Telepharmacy	1.35	1.30	1.29	1.44	0.479	0.697
3.7 Network and protocols	1.49	1.43	1.43	1.68	1.470	0.221
3.8 Skill in system analysis/user requirement identification	1.60	1.49	1.52	1.79	1.748	0.156
3.9 Skill in system design/technical requirement specification	1.38	1.44	1.41	1.72	1.955	0.119
3.10 Skill in database management	1.49	1.45	1.41	1.66	1.140	0.332
3.11 Skill in database design	1.22	1.27	1.20	1.51	1.812	0.143
3.12 Skill in database querying	1.63	1.75	1.67	2.02	2.321	0.074
3.13 Skill in user interface design	1.34	1.24	1.20	1.48	1.666	0.173
3.14 Skill in programming	.74	.84	.79	.84	0.245	0.865
3.15 Overall technology and database design knowledge and skills	1.25	1.31	1.30	1.57	2.003	0.112
4. Management skills	**2.13**	**2.08**	**2.30**	**2.54**	**5.595**	**0.001***
4.1 Skill in project management	2.09	2.08	2.31	2.49	4.378	0.005*
4.2 Skill in change management	2.17	2.08	2.28	2.52	4.546	0.004*
4.3 Skill in risk management	2.20	2.10	2.32	2.61	5.564	0.001*
4.4 Overall management skills	2.06	2.05	2.28	2.55	6.324	0.000*

*Significant at level 0.05 (95% level of confidence)

From table 4.20, one-way ANOVA analysis shows that differences of informatics management skills, communication skills, technology and database design knowledge and skills among respondents with different income are insignificant while difference of their management skills is significant. Respondents who have highest income got higher score than others. Generally, income of pharmacists increases along practicing time and age. Therefore, the relationships between income and informatics knowledge and skills are quite similar to the relationships between age and informatics knowledge and skills. This result can be implied that respondents who have high income were respondents that were high age thus have to deal with management issues more often than others.

However, since there is highly different income between pharmacists from government hospital and private hospital, separated analysis were done to clarify the results as shown in table 4.21 and table 4.22

5.2.3.1 Relationship between income and informatics knowledge and skills of pharmacists from government hospitals.

Since income was divided into more than 2 groups, one-way ANOVA was used to analyze the data. As sample size was large, the data were assumed to be normal distribution and equal variance [86]. The results are shown in table 4.21

Table 4.21 One-way ANOVA of informatics knowledge and skills among respondents from government hospitals with different incomes

Informatics knowledge and skills	Income/month				F	Sig.
	10,000-20,000 THB	20,001-30,000 THB	30,001-40,000 THB	More than 40,000 THB		
1. Information management skills	**2.41**	**2.45**	**2.47**	**2.50**	**0.142**	**0.935**
1.1 Pharmacy information systems	2.81	2.87	2.95	3.07	1.295	0.275
1.2 Pharmacy data, information and knowledge management	2.84	2.75	2.76	2.83	0.263	0.852
1.3 Standard drug code	1.71	1.89	1.96	2.28	3.852	0.010*
1.4 Health informatics standard	1.28	1.20	1.22	1.36	0.507	0.678
1.5 Skill in selecting data source correspond to user requirement	2.74	2.82	2.83	2.61	1.144	0.331
1.6 Skill in assessment of data source reliability	2.81	2.94	2.92	2.65	1.903	0.128
1.7 Overall information management skills	2.67	2.70	2.64	2.67	0.116	0.951
2. Communication skills	**3.09**	**3.09**	**3.14**	**3.03**	**0.433**	**0.729**
2.1 Skill in providing appropriate data service to each individual patient	3.16	3.21	3.28	3.17	0.490	0.689
2.2 Skill in choosing appropriate public channel for each kind of data	2.90	3.02	3.01	2.84	0.990	0.397
2.3 Skill in communication for improving patient-care efficiency	3.22	3.16	3.25	3.16	0.473	0.701
2.4 Skill in handling of communication barrier	3.05	3.04	3.09	3.05	0.146	0.932
2.5 Overall communication skills	3.10	3.04	3.08	2.94	0.620	0.602
3. Technology and Database Design knowledge and skills	**1.44**	**1.46**	**1.50**	**1.74**	**1.687**	**0.168**
3.1 Operating system	2.09	1.94	1.89	1.90	0.321	0.810
3.2 Computerized provider order entry	1.34	1.39	1.45	1.73	1.909	1.27
3.3 E-prescribing	1.59	1.75	1.96	2.25	4.489	0.004*
3.4 Electronic patient record/Electronic health record	1.79	1.87	2.00	2.17	1.513	0.210
3.5 Clinical decision support system	1.52	1.43	1.61	1.82	2.335	0.073
3.6 Telepharmacy	1.21	1.25	1.25	1.43	0.698	0.553
3.7 Network and protocols	1.38	1.39	1.42	1.69	1.627	0.182
3.8 Skill in system analysis/user requirement identification	1.47	1.46	1.48	1.76	1.504	0.212
3.9 Skill in system design/technical requirement specification	1.34	1.37	1.39	1.70	1.788	0.148
3.10 Skill in database management	1.38	1.41	1.39	1.64	1.054	0.368
3.11 Skill in database design	1.16	1.24	1.17	1.49	1.658	0.175
3.12 Skill in database querying	1.52	1.72	1.66	2.01	2.271	0.079
3.13 Skill in user interface design	1.26	1.19	1.16	1.45	1.374	0.249
3.14 Skill in programming	0.69	0.80	0.74	0.84	0.393	0.758
3.15 Overall technology and database design knowledge and skills	1.14	1.26	1.27	1.54	2.037	0.107
4. Management skills	**2.09**	**2.06**	**2.26**	**2.51**	**4.408**	**0.004***
4.1 Skill in project management	2.05	2.05	2.27	2.47	3.609	0.013
4.2 Skill in change management	2.14	2.05	2.25	2.48	3.482	0.016
4.3 Skill in risk management	2.17	2.08	2.27	2.59	4.436	0.004
4.4 Overall management skills	2.02	2.04	2.24	2.51	4.924	0.002

*Significant at level 0.05 (95% level of confidence)

From table 4.21, one-way ANOVA analysis shows that difference of information management skills, communication skills, technology and database design knowledge and skills among respondents from government hospitals with different income are insignificant, while difference of their management skills is significant. Respondents who have highest income got higher score than others. This result is similar to result from relationship between income and informatics knowledge and skills from 5.2.3 and implies that respondents who have high income were respondents that were high age thus have to deal with management issues more often than others.

5.2.3.2 Relationship between income and informatics knowledge and skills of pharmacists from private hospitals.

Since income was divided into more than 2 groups, one-way ANOVA was used to analyze the data. As sample size was large, the data were assumed to be normal distribution and equal variance [86]. The results were shown in table 4.22

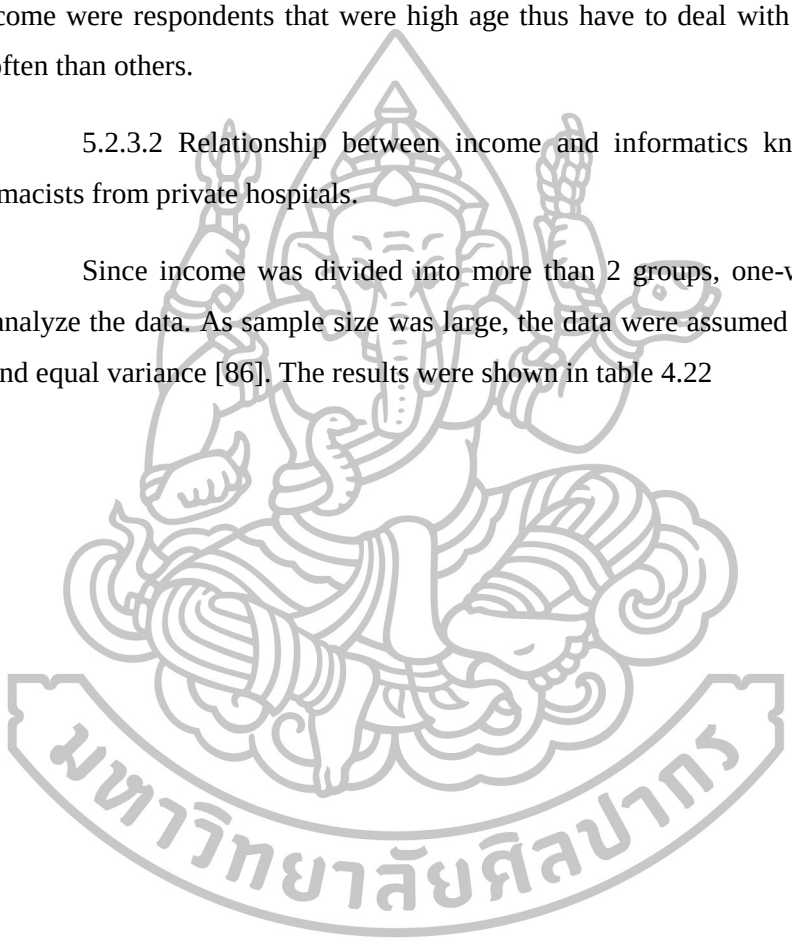


Table 4.22 One-way ANOVA of informatics knowledge and skills among respondents from private hospitals with different incomes

Informatics knowledge and skills	Income/month				F	Sig.
	10,000-20,000 THB	20,001-30,000 THB	30,001-40,000 THB	More than 40,000 THB		
1. Information management skills	**2.96**	**2.57**	**2.44**	**2.59**	**0.791**	**0.501**
1.1 Pharmacy information systems	3.14	3.00	2.98	3.33	0.911	0.438
1.2 Pharmacy data, information and knowledge management	3.14	2.73	2.80	3.19	1.257	0.292
1.3 Standard drug code	2.71	1.90	1.75	1.71	1.433	0.236
1.4 Health informatics standard	2.00	1.60	1.62	1.29	0.612	0.609
1.5 Skill in selecting data source correspond to user requirement	3.29	3.10	2.64	2.95	2.192	0.092
1.6 Skill in assessment of data source reliability	3.29	3.04	2.67	2.76	1.261	0.291
1.7 Overall information management knowledge and skills	3.14	2.60	2.65	2.90	1.002	0.394
2. Communication skills	**3.11**	**3.20**	**3.12**	**3.07**	**0.190**	**0.903**
2.1 Skill in providing appropriate data service to each individual patient	3.43	3.38	3.16	3.24	0.789	0.502
2.2 Skill in choosing appropriate public channel for each kind of data	2.86	3.10	2.87	2.71	1.061	0.368
2.3 Skill in communication for improving patient-care efficiency	3.00	3.31	3.24	3.24	0.307	0.821
2.4 Skill in handling of communication barrier	3.29	3.17	3.11	3.10	0.134	0.940
2.5 Overall communication skills	3.00	3.02	3.24	3.05	0.736	0.532
3. Technology and Database Design knowledge and skills	**2.54**	**1.76**	**1.67**	**1.97**	**1.526**	**0.211**
3.1 Operating system	3.14	2.17	2.13	2.29	1.517	0.213
3.2 Computerized provider order entry	2.57	1.79	1.76	2.00	0.912	0.437
3.3 E-prescribing	3.43	2.00	2.11	2.76	3.511	0.017*
3.4 Electronic patient record/Electronic health record	3.29	2.02	2.09	2.81	3.145	0.028*
3.5 Clinical decision support system	2.86	1.85	1.78	2.00	1.343	0.264
3.6 Telepharmacy	2.57	1.58	1.47	1.48	1.776	0.155
3.7 Network and protocols	2.43	1.71	1.45	1.67	1.595	0.194
3.8 Skill in system analysis/user requirement identification	2.71	1.69	1.71	1.95	1.739	0.162
3.9 Skill in system design/technical requirement specification	1.71	1.79	1.51	1.86	0.628	0.598
3.10 Skill in database management	2.43	1.69	1.51	1.76	1.259	0.291
3.11 Skill in database design	1.71	1.48	1.35	1.62	0.417	0.741
3.12 Skill in database querying	2.57	1.88	1.75	2.10	1.237	0.299
3.13 Skill in user interface design	2.00	1.48	1.36	1.67	0.784	0.505
3.14 Skill in programming	1.14	1.10	1.00	0.81	0.350	0.789
3.15 Overall technology and database design knowledge and skills	2.14	1.58	1.44	1.71	1.108	0.349
4. Management skills	**2.43**	**2.22**	**2.46**	**2.69**	**1.083**	**0.359**
4.1 Skill in project management	2.43	2.27	2.49	2.62	0.597	0.618
4.2 Skill in change management	2.43	2.23	2.42	2.71	1.015	0.388
4.3 Skill in risk management	2.43	2.21	2.49	2.71	1.085	0.358
4.4 Overall management skills	2.43	2.17	2.45	2.71	1.364	0.257

*Significant at level 0.05 (95% level of confidence)

From table 4.22, one-way ANOVA analysis shows that difference of all informatics knowledge and skills among respondents from private hospitals with different incomes is insignificant. Usually income of pharmacists from private hospitals is does not relate to their age.

5.2.4 Relationship between education levels and informatics knowledge and skills.

Since education levels and skill levels were nominal and interval scale respectively, and sample size was large (more than 30), z-test was suitable for relationship analysis. However, since z-test and t-test are the same when the sample size is large, and the SPSS program does not have the z-test menu, the independent sample t-test was selected. As sample size was large, the data were assumed to be normal distribution [86]. The results are shown in table 4.23

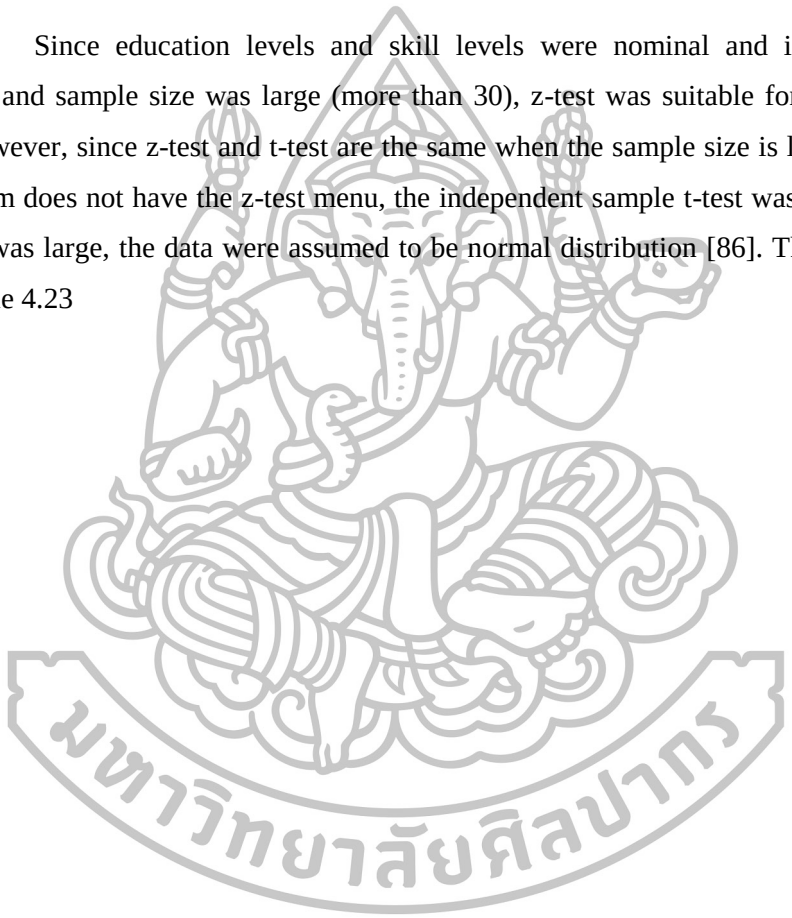


Table 4.23 T-test of informatics knowledge and skills between bachelor and master graduated respondents

Informatics knowledge and skills	Education levels		t	Sig.
	Bachelor's Degree	Master's Degree		
1. Information management skills	**2.41**	**2.69**	**-3.969**	**0.000***
1.1 Pharmacy information systems	2.87	3.22	-4.144	0.000*
1.2 Pharmacy data, information and knowledge management	2.74	2.97	-2.536	0.011*
1.3 Standard drug code	1.88	2.15	-2.618	0.009*
1.4 Health informatics standard	1.28	1.35	-0.670	0.503
1.5 Skill in selecting data source correspond to user requirement	2.74	3.02	-3.144	0.002*
1.6 Skill in assessment of data source reliability	2.79	3.16	-3.742	0.000*
1.7 Overall information management skills	2.59	2.98	-4.878	0.000*
2. Communication skills	**3.05**	**3.29**	**-3.364**	**0.001***
2.1 Skill in providing appropriate data service to each individual patient	3.16	3.46	-3.883	0.000*
2.2 Skill in choosing appropriate public channel for each kind of data	2.92	3.13	-2.455	0.014*
2.3 Skill in communication for improving patient-care efficiency	3.16	3.36	-2.562	0.011*
2.4 Skill in handling of communication barrier	3.02	3.25	-2.826	0.005*
2.5 Overall communication skills	3.00	3.25	-3.098	0.002*
3. Technology and Database Design knowledge and skills	**1.53**	**1.66**	**-1.363**	**0.173**
3.1 Operating system	1.96	2.02	-.512	0.609
3.2 Computerized provider order entry	1.48	1.66	-1.544	0.123
3.3 E-prescribing	1.89	2.11	-1.776	0.076
3.4 Electronic patient record/Electronic health record	1.95	2.17	-1.865	0.063
3.5 Clinical decision support system	1.59	1.69	-0.853	0.394
3.6 Telepharmacy	1.29	1.43	-1.321	0.187
3.7 Network and protocols	1.44	1.61	-1.567	0.117
3.8 Skill in system analysis/user requirement identification	1.52	1.71	-1.703	0.089
3.9 Skill in system design/technical requirement specification	1.44	1.56	-1.059	0.290
3.10 Skill in database management	1.45	1.58	-1.194	0.233
3.11 Skill in database design	1.26	1.37	-0.983	0.326
3.12 Skill in database querying	1.73	1.85	-1.046	0.296
3.13 Skill in user interface design	1.27	1.29	-0.172	0.863
3.14 Skill in programming	.82	.81	0.081	0.936
3.15 Overall technology and database design knowledge and skills	1.32	1.41	-0.883	0.377
4. Management skills	**2.13**	**2.61**	**-4.945**	**0.000***
4.1 Skill in project management	2.12	2.61	-4.839	0.000*
4.2 Skill in change management	2.13	2.57	-4.436	0.000*
4.3 Skill in risk management	2.16	2.63	-4.507	0.000*
4.4 Overall management skills	2.10	2.61	-5.143	0.000*

*Significant at level 0.05 (95% level of confidence)

From table 4.23, information management skills, communication skills and management skills of respondents with bachelor and master degree is significantly different. Therefore, pharmacists with different education level will have different information management skills, communication skills and management skills. Master degree respondents got higher mean than bachelor degree respondents which was not surprise as master degree respondents have more experience on these skills than bachelor degree respondents.

However, for technology and database design knowledge and skills, there is no significantly difference between bachelor and master degree. Therefore, pharmacists with different education levels will not have different and technology and database design knowledge and skills and this topic also got low score. This can be implied that Thai pharmacy curricula lack of training on this skill thus there is no difference between bachelor and master degree.

5.2.5 Relationship between time of practice and informatics knowledge and skills.

Since time of practice was divided into more than 2 groups, one-way ANOVA was used to analyze the data. As sample size was large, the data were assumed to be normal distribution and equal variance [86]. The results are shown in table 4.24

Table 4.24 One-way ANOVA of informatics knowledge and skills among respondents with different time of practice

Informatics knowledge and skills	Time of practice				F	Sig.
	Less than 5 years	5-10 years	11 - 20 years	More than 20 years		
1. Information management skills	**2.54**	**2.65**	**2.34**	**2.30**	**5.950**	**0.001***
1.1 Pharmacy information systems	2.88	3.17	2.89	2.91	3.648	0.012*
1.2 Pharmacy data, information and knowledge management	2.78	3.02	2.68	2.66	3.992	0.008*
1.3 Standard drug code	1.84	2.07	1.95	2.04	1.409	0.239
1.4 Health informatics standard	1.43	1.37	1.14	1.18	3.479	0.016*
1.5 Skill in selecting data source correspond to user requirement	2.98	2.95	2.61	2.47	8.368	0.000*
1.6 Skill in assessment of data source reliability	3.11	3.11	2.59	2.46	15.779	0.000*
1.7 Overall information management knowledge and skills	2.76	2.88	2.53	2.41	6.573	0.000*
2. Communication skills	**3.20**	**3.19**	**3.03**	**2.81**	**5.674**	**0.001***
2.1 Skill in providing appropriate data service to each individual patient	3.33	3.31	3.14	2.97	4.401	0.004*
2.2 Skill in choosing appropriate public channel for each kind of data	3.12	3.02	2.88	2.56	7.342	0.000*
2.3 Skill in communication for improving patient-care efficiency	3.28	3.30	3.13	2.97	3.369	0.018*
2.4 Skill in handling of communication barrier	3.15	3.16	3.01	2.78	3.647	0.012*
2.5 Overall communication skills	3.13	3.16	2.97	2.79	3.905	0.009*
3. Technology and Database Design knowledge and skills	**1.67**	**1.65**	**1.37**	**1.66**	**4.034**	**0.007***
3.1 Operating system	2.19	2.10	1.72	1.84	6.560	0.000*
3.2 Computerized provider order entry	1.66	1.59	1.28	1.79	5.194	0.001*
3.3 E-prescribing	1.98	2.11	1.72	2.26	4.454	0.004*
3.4 Electronic patient record/Electronic health record	2.10	2.22	1.73	2.13	5.610	0.001*
3.5 Clinical decision support system	1.74	1.66	1.46	1.62	2.247	0.081
3.6 Telepharmacy	1.44	1.42	1.16	1.25	2.807	0.039*
3.7 Network and protocols	1.54	1.52	1.38	1.50	0.951	0.415
3.8 Skill in system analysis/user requirement identification	1.68	1.61	1.37	1.69	3.053	0.028*
3.9 Skill in system design/technical requirement specification	1.55	1.52	1.29	1.72	3.052	0.028*
3.10 Skill in database management	1.62	1.52	1.28	1.56	3.443	0.016*
3.11 Skill in database design	1.36	1.39	1.13	1.35	2.259	0.080
3.12 Skill in database querying	1.87	1.84	1.54	1.94	3.874	0.009*
3.13 Skill in user interface design	1.39	1.36	1.07	1.37	3.744	0.011*
3.14 Skill in programming	.94	.86	.68	.72	2.744	0.042*
3.15 Overall technology and database design knowledge and skills	1.41	1.40	1.19	1.51	2.560	0.054
4. Management skills	**2.11**	**2.27**	**2.27**	**2.50**	**2.383**	**0.068**
4.1 Skill in project management	2.12	2.29	2.25	2.49	2.028	0.108
4.2 Skill in change management	2.13	2.27	2.23	2.51	1.954	0.119
4.3 Skill in risk management	2.13	2.30	2.33	2.53	2.569	0.053
4.4 Overall management skills	2.08	2.22	2.29	2.46	2.566	0.053

*Significant at level 0.05 (95% level of confidence)

From table 4.24, one-way ANOVA analysis shows that difference of information management skills, communication skills and technology and database design knowledge and skills among respondents with different time of practice is significant. Therefore, pharmacists who had different time of practice would possess different information management skills, communication skills and technology and database design knowledge and skills. However, there is no significantly difference among respondents with different time of practice in management skills. Respondents who have lesser time of practice tend to have higher score on every skill than respondents who have more time of practice except management skills. This result was similar to result from age and can be implied that respondents who have higher time of practice were respondents that were high age thus have to deal with management issues more often than others.

5.3 Relationship between general information and attitude toward necessity and training needs.

5.3.1 Relationship between gender and attitude toward necessity and training needs.

Since gender and opinion level were nominal and interval scale respectively, and sample size was large (more than 30), z-test was suitable for relationship analysis. However, since z-test and t-test are the same when the sample size is large and SPSS program does not have the z-test menu, the independent sample t-test was selected. As sample size was large, the data were assumed to have normal distribution [86]. The results are shown in table 4.25

Table 4.25 T-test of attitude toward necessity and training needs between male and female respondents

Attitude toward necessity and training needs	Gender		t	Sig.
	Male	Female		
1. Necessity	**3.72**	**3.82**	**-1.199**	**0.231**
1.1 Computer skills	3.84	4.10	-2.337	0.020*
1.2 Internet skills	3.80	4.05	-2.295	0.023*
1.3 Information management skills	3.84	3.90	-0.520	0.603
1.4 Communication skills	3.83	4.06	-2.449	0.015*
1.5 Technology and Database design knowledge and skills	3.34	3.14	1.581	0.114
1.6 Management skills	3.66	3.69	-0.310	0.756
2. Training needs	**3.71**	**3.70**	**0.114**	**0.909**
2.1 Computer skills	3.46	3.51	-0.388	0.698
2.2 Internet skills	3.24	3.39	-1.269	0.205
2.3 Information management skills	4.01	4.03	-0.211	0.833
2.4 Communication skills	3.73	3.69	0.427	0.670
2.5 Technology and Database design knowledge and skills	3.78	3.66	1.019	0.308
2.6 Management skills	4.01	3.90	1.076	0.282

*Significant at level 0.05 (95% level of confidence)

Results from table 4.25, shows that the difference of attitude toward necessity and training needs between male and female respondents are insignificant, implying that, pharmacists with different gender will not have different attitude toward necessity and training needs.

When see in the detail, there were three skills that show significant different between gender and attitude toward necessity; computer skills, Internet skills and communication skills. Female respondents got higher score. The result suggested that female respondents assessed these skills necessary to their work more than male.

5.3.2 Relationship between age and attitude toward necessity and training needs.

Since age and opinion levels were nominal and interval scale respectively, sample has more than 2 groups. One- way ANOVA was used to analyze the data. As sample size was large, the data were assumed to have normal distribution and equal variance [86]. The results are shown in table 4.26

Table 4.26 One-way ANOVA of attitude toward necessity and training needs among age groups

Attitude toward necessity and training needs	Age			F	Sig.
	Less than 30 years	30-40 years	41-60 years		
1. Necessity	**3.99**	**3.75**	**3.58**	**8.702**	**0.000***
1.1 Computer skills	4.25	3.96	3.87	7.233	0.001*
1.2 Internet skills	4.23	3.92	3.71	10.826	0.000*
1.3 Information management skills	4.06	3.85	3.63	6.395	0.002*
1.4 Communication skills	4.28	3.95	3.65	16.435	0.000*
1.5 Technology and database design knowledge and skills	3.32	3.18	2.94	3.211	0.041*
1.6 Management skills	3.78	3.63	3.64	1.172	0.310
2. Training needs	**3.83**	**3.72**	**3.39**	**9.645**	**0.000***
2.1 Computer skills	3.71	3.45	3.18	7.112	0.001*
2.2 Internet skills	3.53	3.33	3.09	4.530	0.011*
2.3 Information management skills	4.16	4.03	3.76	6.295	0.002*
2.4 Communication skills	3.87	3.70	3.36	8.828	0.000*
2.5 Technology and database design knowledge and skills	3.70	3.85	3.22	10.682	0.000*
2.6 Management skills	3.99	3.96	3.71	2.807	0.061

*Significant at level 0.05 (95% level of confidence)

From table 4.26, one-way ANOVA analysis shows that difference of attitude toward necessity and training needs among age groups is significant. Therefore, pharmacists with different age will have different attitude toward necessity and training needs.

When see in the details, respondents who were less than 30 years old got higher score than respondents who were 30-40 years old and 41-60 years old respectively. This result can be implied that respondents who were less than 30 years old realize the important of these skills more than other groups.

5.3.3 Relationship between income and attitude toward necessity and training needs.

Since income and opinion levels were nominal and interval scale respectively and sample has more than 2 groups, one-way ANOVA was used to analyze the data. As sample size was large, the data were assumed to have normal distribution and equal variance [86]. The results are shown in table 4.27

Table 4.27 One-way ANOVA of attitude toward necessity and training needs among respondents with different incomes

Attitude toward necessity and training needs	Income/month				F	Sig.
	10,000-20,000 THB	20,001-30,000 THB	30,001-40,000 THB	More than 40,000 THB		
1. Necessity	**4.20**	**3.81**	**3.83**	**3.51**	**6.915**	**0.000***
1.1 Computer skills	4.45	4.03	4.09	3.79	4.739	0.003*
1.2 Internet skills	4.34	4.00	4.03	3.71	4.635	0.003*
1.3 Information management skills	4.34	3.91	3.91	3.56	6.373	0.000*
1.4 Communication skills	4.43	4.07	4.01	3.66	7.535	0.000*
1.5 Technology and database design knowledge and skills	3.71	3.21	3.20	2.84	5.492	0.001*
1.6 Management skills	3.94	3.65	3.75	3.52	2.016	0.110
2. Training needs	**3.92**	**3.78**	**3.68**	**3.42**	**5.306**	**0.001***
2.1 Computer skills	3.91	3.61	3.44	3.12	5.839	0.001*
2.2 Internet skills	3.66	3.47	3.33	2.98	4.711	0.003*
2.3 Information management skills	4.17	4.06	4.06	3.80	2.343	0.072
2.4 Communication skills	3.80	3.83	3.61	3.47	3.684	0.012*
2.5 Technology and database design knowledge and skills	3.86	3.76	3.74	3.30	4.097	0.007*
2.6 Management skills	4.14	3.93	3.89	3.87	0.865	0.459

*Significant at level 0.05 (95% level of confidence)

From table 4.27, one-way ANOVA analysis shows that difference of attitude toward necessity and training needs among respondents with different income is significant therefore, pharmacists with different income will have different attitude toward necessity and training needs.

When see in details, respondents who have lower income got higher score than respondents who have higher income. This result was similar to result from age and can be implied that the lower income they have, the younger they were. Thus confirm that respondent who were younger tend to realize the important of these skills than other groups.

However, when try to separate sample group into two groups from government and private hospital as shown in table 4.28 and table 4.29. The result from government hospital showed the same result as above which can confirm that age of

respondents affected the attitude toward necessity and training needs while the result from private hospital showed no significant in all topics. This result may because of income of respondents in private hospital did not have relationship with their age and time of practice.

5.3.3.1 Relationship between income and attitude toward necessity and training needs of pharmacists from government hospital.

Since income and opinion levels were nominal and interval scale respectively and sample has more than 2 groups, one-way ANOVA was used to analyze the data. As sample size was large, the data were assumed to be normal distribution and equal variance [86]. The results are shown in table 4.28

Table 4.28 One-way ANOVA of attitude toward necessity and training needs among respondents from government hospital with different incomes

Attitude toward necessity and training needs	Income/month				F	Sig.
	10,000-20,000 THB	20,001-30,000 THB	30,001-40,000 THB	More than 40,000 THB		
1. Necessity	**4.23**	**3.80**	**3.84**	**3.50**	**6.274**	**0.000***
1.1 Computer skills	4.45	4.01	4.11	3.76	4.424	0.004*
1.2 Internet skills	4.34	3.99	4.04	3.71	3.842	0.010*
1.3 Information management skills	4.41	3.91	3.94	3.58	6.018	0.000*
1.4 Communication skills	4.48	4.06	4.00	3.61	7.674	0.000*
1.5 Technology and database design knowledge and skills	3.72	3.20	3.21	2.86	4.537	0.004*
1.6 Management skills	3.97	3.63	3.75	3.50	2.064	0.104
2. Training needs	**3.92**	**3.75**	**3.66**	**3.40**	**4.338**	**0.005***
2.1 Computer skills	3.95	3.59	3.41	3.08	5.547	0.001*
2.2 Internet skills	3.67	3.44	3.29	2.94	4.049	0.007*
2.3 Information management skills	4.16	4.04	4.04	3.77	1.988	0.114
2.4 Communication skills	3.79	3.81	3.59	3.41	3.315	0.020*
2.5 Technology and database design knowledge and skills	3.84	3.73	3.77	3.32	2.908	0.034*
2.6 Management skills	4.12	3.91	3.87	3.86	0.690	0.558

*Significant at level 0.05 (95% level of confidence)

5.3.3.2 Relationship between income and attitude toward necessity and training needs of pharmacists from private hospital.

Since income and opinion levels were nominal and interval scale respectively, sample has more than 2 groups. One-way ANOVA was used to analyze the data. As sample size was large, the data were assumed to be normal distribution and equal variance [86]. The results are shown in table 4.29

Table 4.29 One-way ANOVA of attitude toward necessity and training needs among respondents from private hospital with different incomes

Attitude toward necessity and training needs	Income/month				F	Sig.
	10,000-20,000 THB	20,001-30,000 THB	30,001-40,000 THB	More than 40,000 THB		
1. Necessity	**3.95**	**3.88**	**3.79**	**3.56**	**0.782**	**0.506**
1.1 Computer skills	4.43	4.15	4.00	3.95	0.676	0.568
1.2 Internet skills	4.29	4.10	4.02	3.71	0.976	0.406
1.3 Information management skills	3.71	3.90	3.78	3.48	0.784	0.505
1.4 Communication skills	4.00	4.15	4.05	3.90	0.327	0.806
1.5 Technology and database design knowledge and skills	3.57	3.23	3.15	2.71	0.986	0.402
1.6 Management skills	3.71	3.77	3.75	3.62	0.104	0.958
2. Training needs	**3.93**	**3.93**	**3.74**	**3.54**	**1.378**	**0.253**
2.1 Computer skills	3.57	3.71	3.58	3.29	0.560	0.642
2.2 Internet skills	3.57	3.69	3.47	3.14	0.911	0.438
2.3 Information management skills	4.29	4.21	4.11	3.95	0.509	0.677
2.4 Communication skills	3.86	3.98	3.69	3.76	0.747	0.526
2.5 Technology and database design knowledge and skills	4.00	3.92	3.62	3.19	2.207	0.090
2.6 Management skills	4.29	4.08	3.98	3.90	0.395	0.757

*Significant at level 0.05 (95% level of confidence)

5.3.4 Relationship between education level and attitude toward necessity and training needs.

Since education levels and opinion levels were nominal and interval scale respectively, and sample size was large (more than 30), z-test was suitable to analyze the data. However, since z-test and t-test are the same when the sample size is large and the SPSS program did not have z-test menu, the independent sample t-test was selected. As sample size was large, the data were assumed to have normal distribution [86]. The results are shown in table 4.30

Table 4.30 T-test of attitude toward necessity and training needs between bachelor and master graduated respondents

Attitude toward necessity and training needs	Education levels		t	Sig.
	Bachelor's Degree	Master's Degree		
1. Necessity	**3.80**	**3.80**	**-.033**	**0.974**
1.1 Computer skills	4.06	3.99	.665	0.506
1.2 Internet skills	4.01	3.94	.629	0.530
1.3 Information management skills	3.88	3.90	-.220	0.826
1.4 Communication skills	4.02	4.01	.107	0.915
1.5 Technology and database design knowledge and skills	3.18	3.21	-.226	0.821
1.6 Management skills	3.66	3.77	-1.001	0.317
2. Training needs	**3.76**	**3.49**	**3.010**	**0.003***
2.1 Computer skills	3.61	3.08	4.062	0.000*
2.2 Internet skills	3.47	2.96	3.934	0.000*
2.3 Information management skills	4.07	3.88	1.741	0.083
2.4 Communication skills	3.77	3.44	2.931	0.004*
2.5 Technology and database design knowledge and skills	3.68	3.70	-.178	0.859
2.6 Management skills	3.95	3.84	1.050	0.294

*Significant at level 0.05 (95% level of confidence)

From table 4.30, attitude toward necessity of respondents with bachelor and master degree is insignificantly different while training needs of respondents is significantly different. The result suggested that respondents with different education levels showed no significant different in all topics for attitude toward necessity to their work. However, for training needs, respondents with different education level showed significantly different in computer skills, Internet skills and communication skills while information management

skills, technology and database design knowledge and skills and management skills are insignificantly different between different education levels. Bachelor degree respondents tend to get higher score than master degree respondents thus also reflect age of respondents and confirmed that the younger respondents realize the important of informatics skills than the elders especially in computer skills, Internet skills and communication skills.

5.3.5 Relationship between time of practice and attitude toward necessity and training needs.

Since time of practice was divided into more than 2 groups, one-way ANOVA was used to analyze the data. As sample size was large, the data were assumed to have normal distribution and equal variance [86]. The results are shown in table 4.31

Table 4.31 One-way ANOVA of attitude toward necessity and training needs among respondents with different time of practice

Attitude toward necessity and training needs	Time of practice				F	Sig.
	Less than 5 years	5-10 years	11 - 20 years	More than 20 years		
1. Necessity	**3.96**	**3.64**	**3.76**	**3.70**	**4.119**	**0.007***
1.1 Computer skills	4.21	3.86	4.01	3.94	3.723	0.011*
1.2 Internet skills	4.19	3.83	3.93	3.79	4.920	0.002*
1.3 Information management skills	4.06	3.70	3.85	3.75	3.638	0.013*
1.4 Communication skills	4.21	3.90	3.95	3.71	5.307	0.001*
1.5 Technology and database design knowledge and skills	3.36	3.02	3.11	3.15	2.313	0.075
1.6 Management skills	3.74	3.53	3.69	3.84	1.359	0.254
2. Training needs	**3.81**	**3.78**	**3.66**	**3.17**	**8.293**	**0.000***
2.1 Computer skills	3.68	3.67	3.33	2.94	7.465	0.000*
2.2 Internet skills	3.49	3.48	3.26	2.88	4.111	0.007*
2.3 Information management skills	4.13	3.94	4.06	3.68	3.507	0.015*
2.4 Communication skills	3.86	3.72	3.66	3.06	8.717	0.000*
2.5 Technology and database design knowledge and skills	3.73	3.84	3.74	2.90	8.324	0.000*
2.6 Management skills	3.98	3.99	3.91	3.59	2.192	0.088

*Significant at level 0.05 (95% level of confidence)

From table 4.31, one-way ANOVA analysis shows that difference of both attitudes toward necessity training needs among respondents with different time of practice

are significant. Therefore, pharmacists who had different time of practice will have different attitude toward necessity and training needs.

When see in details, respondents who worked less than 5 year tends to get higher score than respondents who worked more. This result was similar to result from age. Thus confirm that respondent who were younger tend to realize the important of these skills than other groups.

5.4 Relationship between computer and Internet skills and attitude toward necessity and training needs.

5.4.1 Relationship between computer skills and attitude toward necessity and training needs.

Since skill levels and opinion levels were both in interval scale, correlation was used to analyze the data [86]. Results were shown in table 4.32.

Table 4.32 Correlation between computer skills and attitude toward necessity and training needs

Correlation between computer skills and attitude toward necessity and training needs	r	Sig.
1. Necessity	0.171	0.000*
2. Training need	0.007	0.847

*Significant at level 0.05 (95% level of confidence)

From table 4.32, correlation between computer skills and attitude toward necessity is significant, but correlation between computer skills and training needs is insignificant. Respondents who have high computer skills tend to have high attitude toward necessity to their works. However, the result showed very low relationship (r = 0.171) which mean their attitude toward necessity was slightly affected by their skills while their training needs were not affected by their computer skills.

5.4.2 Relationship between Internet skills and attitude toward necessity and training needs.

Since skill levels and opinion levels were both in interval scale, correlation was used to analyze the data [86]. Results are shown in table 4.33.

Table 4.33 Correlation between Internet skills and attitude toward necessity and training needs

Correlation between Internet skills and attitude toward necessity and training needs	r	Sig.
1. Necessity	0.205	0.000*
2. Training need	0.014	0.697

*Significant at level 0.05 (95% level of confidence)

From table 4.33, correlation between Internet skills and attitude toward necessity is significant, but correlation between Internet skills and training need is insignificant. Respondents who have high Internet skills tend to have high attitude toward necessity to their works. However, the result showed very low relationship (r = 0.205) which mean their attitude toward necessity was slightly affected by their skills while their training needs were not affected by their Internet skills.

5.5 Relationship between informatics knowledge and skills and attitude toward necessity and training needs

5.5.1 Relationship between information management skills and attitude toward necessity and training needs.

Since skill levels and opinion levels were interval scale, correlation was used to analyze the data [86]. The results were shown in table 4.34

Table 4.34 Correlation between information management skills and attitude toward necessity and training needs

Correlation between information management skills and attitude toward necessity and training needs	r	Sig.
1. Necessity	0.157	0.000*
2. Training need	0.024	0.503

*Significant at level 0.05 (95% level of confidence)

From table 4.34, correlation between information management skills and attitude toward necessity is significant but correlation between information management skills and training needs is insignificant. Respondents who have high information management skills tend to have high attitude toward necessity to their works. However, the result showed very low relationship (r = 0.157) which mean their attitude toward necessity was slightly

affected by their skills while there training needs were not affected by their information management skills.

5.5.2 Relationship between communication skills and attitude toward necessity and training needs.

Since skill levels and opinion levels were interval scale, correlation was used to analyze the data [86]. The results are shown in table 4.35

Table 4.35 Correlation between communication skills and attitude toward necessity and training needs

Correlation between communication skills and attitude toward necessity and training needs	r	Sig.
1. Necessity	0.199	0.000*
2. Training need	0.031	0.375

*Significant at level 0.05 (95% level of confidence)

From table 4.35, correlation between communication skills and attitude toward necessity is significant but correlation between communication skills and training needs is insignificant. Respondents who have high communication skills tend to have high attitude toward necessity to their works. However, the result showed very low relationship (r = 0.199) which mean their attitude toward necessity was slightly affected by their skills while there training needs were not affected by their communication skills.

5.5.3 Relationship between technology and database design knowledge and skills and attitude toward necessity and training needs.

Since skill levels and opinion levels were interval scale, correlation was used to analyze the data [86]. The results are shown in table 4.36

Table 4.36 Correlation between technology and database design knowledge and skills and attitude toward necessity and training needs

Correlation between technology and database design knowledge and skills and attitude toward necessity and training needs	r	Sig.
1. Necessity	0.103	0.003*
2. Training need	0.017	0.633

*Significant at level 0.05 (95% level of confidence)

From table 4.36, correlation between technology and database design knowledge and skills and attitude toward necessity is significant, but correlation between technology and database design knowledge and skills and training needs is insignificant. Respondents who have high technology and database design knowledge and skills tend to have high attitude toward necessity to their works. However, the result showed very low relationship (r = 0.103) which mean their attitude toward necessity was slightly affected by their skills while there training needs were not affected by their technology and database design knowledge and skills.

5.5.4 Relationship between management skills and attitude toward necessity and training needs.

Since skill levels and opinion levels were interval scale, correlation was used to analyze the data [86]. The results were shown in table 4.37

Table 4.37 Correlation between management skills and attitude toward necessity and training needs

Correlation between management skills and attitude toward necessity and training needs	r	Sig.
1. Necessity	0.161	0.000*
2. Training need	0.044	0.213

*Significant at level 0.05 (95% level of confidence)

From table 4.37, correlation between management skills and attitude toward necessity is significant while correlation between management skills and training needs is insignificant. Respondents who have high management skills tend to have high attitude toward necessity to their works. However, the result showed very low relationship (r = 0.161) which mean their attitude to necessity was slightly affected by their skills while there training needs were not affected by their management skills.

Discussion

According to international guidelines and informatics-related documents [13,16,53,54] a competent pharmacist should possess informatics skills and knowledge as described in table 4.38.

Table 4.38 Pharmacy informatics knowledge and skills

Skills			Knowledge
Basic computer and Internet	Informatics	Management	
Using basic computer component such as mouse, keyboard, and printer effectively Effective use of office application such as word processing, spreadsheet, presentation, easy-to-use database management software and also can install application. Skill in file and folder management and also can use help command to find their solution. Skill in using e-mail and webpage, searching online information, access and retrieve data related to patient care Skill in using social media	Skill in selection data source and assess data source reliability Skill in providing appropriate data service and choosing appropriate channel Skill in communication Skill in system analysis, system design and database management Skill in programming	Project management Change management Risk management	Pharmacy information system such as drug dispensing system, drug inventory system Pharmacy data, information and knowledge management such as data collection Health informatics standard such as HL7 Operating system Pharmacy information technology such as CPOE, E-prescribing, E-health record, Clinical decision support system Telepharmacy, Network and protocols

From the results, Thai hospital pharmacists were confident using computer and Internet which were common in this era. However, if we establish “Competent” as a proper level for pharmacists, there were some insufficient knowledge/skills such as “using help command” and “using database management application” that respondent averagely rated their skills just as advance beginner. Since these skills have been identified as recommended learning outcome for health professionals in IMIA [13], training courses on using help command and database management application should be included in pharmacy curricula. Respondents reflected their desire by rating computer and Internet skills as highly necessary to their works and highly required training.

For higher informatics skills, this survey divided them into four groups; information management, communication, technology and database design, and management

skills. The overall information management skills of respondents were as “competent”. However, important skills such as “standard drug code” and “informatics standard” were rated just “advance beginner” and “novice”, respectively. As these skills have been identified as recommended skills for health professional by IMIA [13] and also core competencies for entry-level doctor of pharmacy graduate in US [53]. Hence, they should be addressed in the future curricula. However, respondents did realize that these skills were necessary and needed more training as they rated the necessity and training needs as high. For communication skills, most respondents rated their ability to communicate with patients as “competent”. This was not surprising as a great deal of training of communication skills were present in all current pharmacy curricula.

For technology and database design skills that conventional pharmacist are not accustomed to, respondents unsurprisingly rated themselves as novice. Most of skills under this group were given low score, especially “skill in programming” which was widely rated as “do not know”. Respondents rated their knowledge/skills on electronic health record (EHR), e-prescribing, CPOE, and telepharmacy which are being implemented worldwide, as “advance beginner” at best. Knowledge/skills regarding database design and management were rated as novice. Understandably, under current working environment, respondents regarded technology and database design skills as moderately necessary to their work. However, respondents still eager to learn more about this topic as they rated training needs as high. For management skills, respondents averagely rated their management skills just as advance beginner. Around 10 percent of respondents did not know about risk management, project management or change management at all. As recommended by IMIA [13] and research document from American journal of health-system pharmacy [54] done on 2009, these topics must be included in further pharmacy curricula.

Above shown results suggested that many important knowledge and skills such as database management application, e-Rx, CPOE, standard drug code were ranked as just advance beginner or novice. This may because of current pharmacy curricula in Thailand scarcely focus on these topics. Most current curricula emphasize on other fields such as clinical pharmacy, industrial pharmacy, administration or PharmD. Additionally, technologies and competent persons to cope with are still shortage. The results thus reflected this kind of situation.

Comparing results between male and female using independent t-test, male respondents tended to be more competent on basic computer skills and informatics knowledge and skills than female as male showed higher mean result than female. Respondents with different age also gave significant different level basic computer skills, using one-way

ANOVA, the result from respondents under 30 year-old showed higher competency on basic computer skills than any other ages. However, for informatics knowledge and skills, the result was not significantly different as most respondent got low score on these skills. This was not surprising as informatics knowledge and skills were scarcely addressed in current pharmacy curriculum thus respondents showed the same understanding level at all ages.

The results regarding income and time of practice also demonstrated similarity to results regarding age since respondents who have lower income and less time of practice tend to have higher skills than others. The results regarding education level suggested that master-degree graduated respondents were more competent on these skills than bachelor-degree graduated respondents which were not surprising as master-degree graduated respondents had more experience on these skills and they had to use many informatics skills for their research.

The results from open-ended questions reflected that the most wanted training was on technology and database design knowledge and skills (4.84%) and the most other suggestion results was wish to be trained in these topics (1.12%). This result help confirmed the all above results.

Compare to other researches done on other professions in different countries [2,24,29] , the results done on Thai hospital pharmacists were shown to be in the same way. While respondents demonstrated highly competent in basic computer skills, they lacked advance informatics skills and needed more training. The result reflected international trend even if there were some differences among countries such as educational programs or technologies.

Overall, regarding to the IMIA recommendation and the ACPE standard, Thai hospital pharmacists had enough basic computer and Internet skills but still lack many important informatics skills, such as database management skills, standard drug code and informatics standard, pharmacy information technology. Management skills, such as project management, risk management or change management had also got low score. However, this is not surprising because current pharmacy curricula in Thailand barely address these topics, thus informatics competent personal are still scarce. Since these skills have been recommended for health professional by IMIA [13] and also specified as core competencies for entry-level doctor of pharmacy graduate in US [53], they should be addressed in the Pharmacy Council's core competency (Thailand) and present in forth coming pharmacy curricula. To develop these skills in Thai pharmacists, systematic problem solving must be implemented. Thai pharmacy informatics experts should gather together to standardize pharmacy informatics competencies and implement to all pharmacy curricula either

undergraduate or graduate programs in order to generate more informatics competent pharmacists to deal with current and upcoming technologies.

CHAPTER 5

CONCLUSIONS

Thai hospital pharmacists had high level on basic computer skills while their informatics knowledge and skills were somewhat low. However, they valued these skills as highly necessary to their works and eager to train more on informatics.

Informatics skill level of respondents related with gender, age, income, education level, and time of practice. Male exhibited higher competency in every skills than female. Respondents who were younger showed higher skill level than the elder except in management skills. Time of practice also related with informatics skills. Respondents who had shorter time of practice were more competent on many skills than the longer practitioners. In case of income, government hospital and private hospital were analyzed separately. The result suggested that respondents in government hospital with lower income were higher on skills than respondents with higher income except management skills, while the result of respondents from private hospitals exhibited insignificant relationship between income and skills. Income of pharmacists normally varies by time of practice and age in government hospitals, but not in private hospitals. Therefore, tendency of relationships between age, time of practice, and income with informatics skills is in the same way. For education levels, respondents with master degree were more competent in every skill than respondents with bachelor degree which was understandable because higher education usually required more informatics skills in coursework and research.

Attitude toward necessity and training needs also related with age, income, education levels and time of practice, but not gender. Younger respondents tend to realize the important of informatics skills and need training more than the elders. Respondents' skills level also related with their attitude to necessity toward their works.

Thai hospital pharmacists considered informatics necessary for their works. They also realized their limitation and needed more training on such knowledge and skills. As pharmacy curricula in Thailand had been changed to 6-year program in order to meet the international requirements, the curricula addressing pharmacy informatics and post-graduate training courses on pharmacy informatics were necessary and should be instantly developed in order to prepare Thai pharmacy students and pharmacists to be complied with international pharmacy standard.

Limitation of this study

Since a respondent can select more than one work scope, relationship between general information of respondents and the work scope cannot be analyzed.

REFERENCES

[1] Mantas, John. (1998). "Developing curriculum in nursing informatics in Europe." **International Journal of Medical Informatics**, 50 (June): 123-132.

[2] Devitt, Nicola, and Jeannette Murphy. (2004). "A survey of the information management and technology training needs of doctors in an acute NHS trust in the United Kingdom." **Health Information and Libraries Journal**, 21 (September): 164-172.

[3] Chang, Jieh, Mollie R. Poynton, Carole A. Gassert, and others. (2011). "Nursing informatics competencies required of nurse in Taiwan." **International Journal of Medical Informatics**, 80 (May): 332-340.

[4] Garde, Sebastian, David Harrison, and Evelyn Hovenga. (2005). "Skill needs for nurse in their role as health informatics professionals: A survey in the context of global health informatics education." **International Journal of Medical Informatics**, 74 (December): 899-907.

[5] Thrower, Margaret R. (2010). Computerized provider order entry. In **Building core competencies in pharmacy informatics,** 183-197. Edited by Fox, Brent I., Margaret R. Thrower, and Bill G. Felkey. Washington DC: American Pharmacist Association.

[6] Garg, Amit X., Neill K. Adhikari, Heather McDonald, and others. (2005). "Effects of computerized clinical decision support systems on practitioner performance and patient outcomes: a systematic review." **Journal of the American Medical Association**, 293, 10 (March): 1223-1238.

[7] Kawamoto, Kensaku, Caitlin A. Houlihan, E. Andrew Balas, and others. (2005). "Improving clinical practice using clinical decision support systems: a systematic review of trials to identify features critical to success." **British Medical Journal**, 330, 7494 (March): 765 [Epub].

[8] Classen, David C., Stanley L. Pestotnik, R Scott Evans, and others. (1997). "Adverse drug events in hospitalized patients. Excess length of stay, extra costs and attributable mortallity." **Journal of the American Medical Association**, 277, 4 (January): 301-306.

[9] Leape, L.L., D.W. Bates, D.J. Cullen, and others. (1995). "Systems-analysis of adverse drug events." **Journal of the American Medical Association**, 274, 1 (July): 35-43.

[10] Lokkerbol, J., D. Adema, P. Cuijpers, and others. (2014). "Improving the cost-effectiveness of a healthcare system for depressive disorders by implementing telemedicine: a health economic modeling study." **American Journal of Geriatric Psychiatry**, 22, 3 (March): 253-262.

[11] RAND Corporation. (2013). **Health Information Technology: Can HIT Lower Costs and Improve Quality?** Accessed January 23, Available from http://www.rand.org/pubs/research_briefs/RB9136/index1.html

[12] American Health Information Management Association. (2014). **Building the work force for health information transformation**. Accessed December 10, Available from http://www.amia.org/sites/amia.org/files/ Workforce_2006.pdf

[13] Mantas, John, E. Ammenwerth, G. Demiris, and others. (2010). "Recommendations of the International Medical Informatics Association (IMIA) on Education in Biomedical and Health Informatics." **Methods of Information in Medicine**, 49, 2 (January): 105-120.

[14] Institute of Medicine. (2001). **Crossing the quality chasm: A new health system for the 21st century.** Washington, DC: The National Academies Press.

[15] Greiner, Ann C., and Elisa Knebel. (2003). **Health professions education: A bridge to quality.** Washington DC: National Academy Press.

[16] Accreditation Council for Pharmacy Education. (2011). **Accreditation standards and guidelines for the professional program in pharmacy leading to the doctor of pharmacy degree (ACPE Standard 2007)**. Chicago, IL.

[17] Royal Pharmaceutical Society of Great Britain. (2003). **Competencies of the future pharmacy workforce**. London: Royal Pharmaceutical Society of Great Britain.

[18] Thai Medical Informatics Association. (2012). Accessed October 3 Available from http://www.tmi.or.th

[19] Fox, Brent I. (2010). Informatics and the medication use process. In **Building Core Competencies in Pharmacy Informatics,** 11-31. Edited by Fox, Brent I., Margaret R.Thrower, and Bill G. Felkey. Washington DC: American Pharmacist Association.

[20] National Library of Medicine. (2013). **Collection development manual: medical informatics**. Accessed January 21 Available from http://www.nlm.nih.gov/tsd/acquisitions/cdm/subjects58.html

[21] American Society of Health-System Pharmacists. (2007). "ASHP statement on the pharmacist's role in informatics." **American Journal of Pharmaceutical Education**, 64, 2 (January): 200-203.

[22] University of Illinois at Chicago. (2015). **A brief history of health informatics**. Accessed January 18, Available from http://healthinformatics.uic.edu/ resources/articles/a-brief-history-of-health-informatics/

[23] Vanderbilt University Department of Biomedical Informatics. (2013). **What is biomedical informatics?** Accessed January 25, Available from www.mc.vanderbilt.edu/dbmi/informatics.html

[24] Balen, Robert M., and Peter J. Jewesson. (2004). "Pharmacist computer skills and needs assessment survey." **Journal of Medical Internet Research**, 6, 1 (March): e11.

[25] Garde, Sebastian, David Harrison, Mohammed Huque, and others. (2006). "Building health informatics skills for health professionals: results from the Australian Health Informatics Skill Needs Survey." **Australian Health Review**, 30, 1 (Febuary): 34-45.

[26] Jasper, M.W.M., R.M. Gardner, L.C. Gatewood, and others. (2007). "An international summer school on health informatics: A collaborative effort of the Amsterdam Medical Informatics Program and IΦE - the International Partnership for Health Informatics Education." **International Journal of Medical Informatics**, 76 (July): 538-546.

[27] Vanderbush, Ross E., H. Glenn Anderson, William K. Fant, and others. (2007). "Implementing pharmacy informatics in college curricula: The AACP technology in pharmacy education and learning special interest group." **American Journal of Pharmaceutical Education**, 71, 6 (December): Article 117.

[28] Pedersen, Craig A., and Karl F. Gumpper. (2008). "ASHP national survey on informatics: Assessment of the adoption and use of pharmacy informatics in U.S. hospital - 2007." **American Journal of Health-System Pharmacy**, 65 (December): 2244-2264.

[29] Thomas, Peter, and Paul M. Ruttert. (2008). "A computer literacy skills profile of pharmacists residing in two countries of England." **Health Information and Libraries Journal**, 25 (December): 288-294.

[30] Fox, Brent I., R. B. Karcher, A. Flynn, and others. (2008). "Pharmacy informatics syllabi in doctor of pharmacy program in the US." **American Journal of Pharmaceutical Education**, 72, 4 (August): Article 89.

[31] Fox, Brent I., Allen J. Flynn, and Christopher R. Fortier. (2011). "Knowledge, skills and resources for pharmacy informatics education." **American Journal of Pharmaceutical Education**, 75, 5 (June): Article 93.

[32] International Medical Informatics Association. (2013). Accessed January 24, Available from http://www.imia-medinfo.org/new2/node/1

[33] International Medical Informatics Association. (2012). Accessed August 8, Available from http://www.imia-medinfo.org/new2/member_societies

[34] AMIA 10 x 10 Courses. (2013). Accessed January 26, Available from http://www.amia.org/education/10x10-courses

[35] Knaup, P., W. Frey, R. Haux, and others. (2003). "Medical informatics specialists: what are their job profiles? Results of a study on the first 1024 medical informatics graduates of the Universities of Heidelberg and Heilbronn." **Methods of Information in Medicine**, 42 (Febuary): 578-587.

[36] European Federation for Medical Informatics. (2013). Accessed January 26, Available from www.efmi.org

[37] Hasman, A. (1998). "Education and training in health informatics: the IT-EDUCTRA project." **International Journal of Medical Informatics**, 50, 1-3 (June): 179-185.

[38] European Commission. (1995). "NIGHTINGALE Project: HC1109 DGXIII Contract and technical annex." December.

[39] Health Informatics World Wide. (2012). Accessed 3 October, Available from http://www.hiww.org

[40] Mantas, John. **Health Informatics curriculum efforts in Europe**, Available from http://www.worldofhealthit.org/sessionhandouts/documents/PS11-3-Mantas.pdf

[41] Lun, K.C. (1999). "Health Informatics in the Asia Pacific Region." **International Journal of Medical Informatics**, 55 (July): 3-7.

[42] Asia Pacific Association for Medical Informatics. (2013). Accessed January 27, Available from http://www.apami.org/membership.htm

[43] Bates, D.W., L.L. Leape, D.J. Cullen, and others. (1998). "Effect of computerized physician order entry and a team intervention on prevention of serious medication errors." **The Journal of the American Medical Association**, 280, 15 (October): 1311-1316.

[44] Kaushal, R., K.G. Shojania, and D.W. Bates. (2003). "Effects of computerized physician order entry and clinical decision support systems on medication safety: a systematic review." **Archives of Internal Medicine**, 163, 12 (June): 1409-1416.

[45] Marvin, Kevin. (2010). Electronic prescribing. In **Building corec ompetencies in pharmacy informatics,** 199-217. Edited by Fox, Brent I, Margaret R Thrower, and Bill G Felkey. Washington DC: American Pharmacist Association.

[46] Johnston, D. (2004). **E-Health initiative. Electronic prescribing: Toward maximum value and rapid adoption.** Charlestown. MA: Center for Information Technology Leadership.

[47] Musen, M.A., Y. Shahar, and E.H. Shortlife. (2001). Clinical decision-support systems. In **Medical Informatics,** 2nd ed., 573-609. Edited by Shortlife, E.H. and Perreault L. E. New York: Springer-Verlag.

[48] Johnston, M.E., K.B. Langton, R.B. Haynes, and others. (1994). "Effects of computer-based clinical decision support systems on clinician performance and patient outcome. A critical appraisal of research." **Annals of Internal Medicine**, 120, 2 (January): 135-142.

[49] Phansalkar, Shobha. (2010). Clinical decision support systems at prescribing. In **Building core competencies in pharmacy informatics,** 219-235. Edited by Fox, Brent I., Margaret R. Thrower, and Bill G. Felkey. Washington DC: American Pharmacist Association.

[50] Shea, S., W.DuMouchel, and L.Bahamonde. (1996). "A meta-analysis of 16 randomized controlled trials to evaluate computer-based clinical reminder systems for preventive care in the ambulatory setting." **Journal of the American Medical Informatics Association**, 3, 6 (November): 399-409.

[51] Minnesota e-Health Initiative Advisory Committee and the Minnesota Department of Health Glossary of selected terms and acronyms. (2015). Accessed Febuary 2, Available from http://www.health.state.mn.us/ divs/orhpc/hit/terms.pdf

[52] Hillestad, Richard, James Bigelow, Anthony Bower, and others. (2005). "Can electronic medical record systems transform health care? Potential health benefits, savings, and costs." **Health Affairs**, 24, 5 (September): 1103-1117.

[53] Seaton, Terry L. (2010). Setting the stage: Consensus-based development of pharmacy informatics competencies. In **Building core competencies in pharmacy informatics,** 1-7. Edited by Fox, Brent I., Margaret R. Thrower, and Bill G. Felkey. Washington DC: American Pharmacist Association.

[54] Tribble, Dennis A., John Poikonen, Jerry Blair, and others. (2009). "Whither pharmacy informatics." **American Journal of Health-System Pharmacy**, 66 (May): 813-815.

[55] Otero, Paula D., Caroline Perrin, Antoine Geissbuhler, and others. (2014). Informatics education in low resource settings. In **Informatics education in healthcare: lessons learned,** 197-222. Edited by Berner, Eta S. London: Springer.

[56] The Pharmacy Council of Thailand. (2014). **The Pharmacy Council of Thailand's notice no.18/2555: Thai pharmacy core competencies**. Accessed November 11, Available from http://www.pharmacycouncil.org/ share/file/file_195.pdf

[57] Chulalongkorn University. Faculty of Pharmaceutical Sciences. (2014). "Doctor of Pharmacy Program." Revised curriculum adademic year 2014.

[58] Prince of Songkla University. Faculty of Pharmaceutical Sciences. (2014). "Doctor of Pharmacy Program." Revised curriculum adademic year 2014.

[59] Khonkaen University. Faculty of Pharmaceutical Sciences. (2013). "Doctor of Pharmacy Program." Revised curriculum adademic year 2013.

[60] Huachiew Chalermprakiet University. Faculty of Pharmaceutical Sciences. (2012). "Doctor of Pharmacy Program." Revised curriculum adademic year 2012.

[61] Ubon Ratchathani University. Faculty of Pharmaceutical Sciences. (2012). "Doctor of Pharmacy Program." Revised curriculum adademic year 2012.

[62] Naresuan University. Faculty of Pharmaceutical Scineces. (2012). "Doctor of Pharmacy Program." Revised curriculum adademic year 2012.

[63] Srinakharinwirot University. Faculty of Pharmacy. (2009). "Doctor of Pharmacy Program." Revised curriculum adademic year 2009.

[64] Mahasarakham University. Faculty of Pharmacy. (2011). "Doctor of Pharmacy Program." Revised curriculum adademic year 2011.

[65] Payap University. Faculty of Pharmacy. (2010). "Doctor of Pharmacy Program." Revised curriculum adademic year 2010.

[66] Burapha University. Faculty of Pharmaceutical Sciences. (2010). "Doctor of Pharmacy Program." Revised curriculum adademic year 2010.

[67] Thammasat University. Faculty of Pharmacy. (2013). "Doctor of Pharmacy Program." Curriculum adademic year 2013.

[68] Walailak University. School of Pharmacy. (2011). "Doctor of Pharmacy Program." Revised curriculum adademic year 2011 (Draft).

[69] Eastern Asia University. School of Pharmacy. (2010). "Doctor of Pharmacy Program." Revised curriculum adademic year 2010.

[70] University of Phayao. School of Pharmaceutical Sciences. (2012). "Doctor of Pharmacy Program." Curriculum adademic year 2012.

[71] Mahidol University. Faculty of Pharmacy. (2009). "Doctor of Pharmacy Program." Curriculum adademic year 2009.

[72] Silpakorn University. Faculty of Pharmacy. (2012). "Doctor of Pharmacy Program." Revised curriculum adademic year 2012.

[73] Chiang Mai University. Faculty of Pharmacy. (2010). "Structure and education plan of Pharmacy curriculum." Revised curriculum adademic year 2010.

[74] Chanakit, Teeraporn, Dayin Kumpalum, Nonglek Kunwaradisai, and others. (2009). "Characteristics of drug information service in Thailand." **Thai Journal of Pharmaceutical Sciences**, 4, 4 (December): 490-499.

[75] Donsamak, Sisira, and Somchai Suriyakrai. (2012). "A knowledge management in drug information service at hospital in Ubon Ratchathani." **Isan Journal of Pharmaceutical Sciences**, 8, 3 (September): 48-63.

[76] Garde, Sebastian, David Harrison, and Evelyn Hovenga. (2005). **Australian skill needs analysis of health informatics professionals**: Central Queensland University.

[77] Benner, P. (1984). **From novice to expert, excellence and power in clinical nursing practice.** Menlo Park, CA: Addison-Wesley publishing company.

[78] Rovinelli, R.J, and R.K. Hambleton. (1977). "On the use of content specialists in the assessment of criterion referred test item validity." **Dutch Journal of Education Research**, 2 (March): 49-60.

[79] Jump, N. (1978). **Psychometric Theory.** 2nd ed. New York: McGraw Hill.

[80] Yamane, Taro. (1973). **Statistic: An introductory analysis.** 3rd ed. New York: Harper and Row Publication.

[81] Human Resources for Health Research and Development Office. (2011). **Human Resources: Past, Present and Future.** 1st ed. Bangkok: Print@me.

[82] Wikipedia. (2013). **Hospital in Thailand**. Accessed August 20, Available from http://th.wikipedia.org/wiki/โรงพยาบาลในประเทศไทย

[83] National Statistical Office of Thailand. (2013). **Private hospitals survey in Thailand 2012**. Accessed August 20, Available from http://service.nso.go.th/nso/nsopublish/themes/files/hostpitalExec55.pdf

[84] Burns, Nancy, and Susan K. Grove. (2001). **The practice of nursing research: Conduct, critique, & utilization.** 4th ed. Philadelphia: W.B. Saunders.

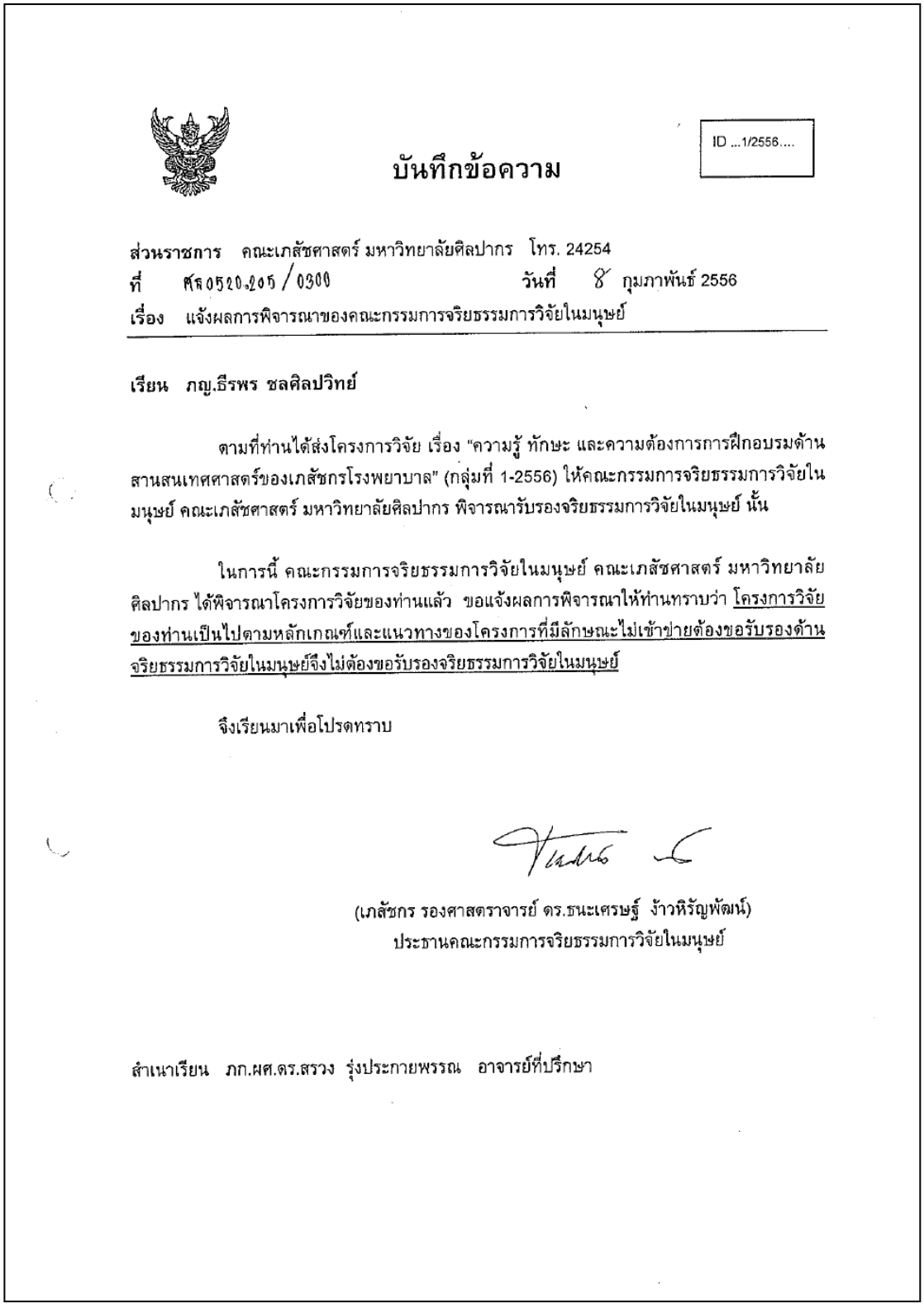
[85] Bhisalbutra, Sorachai, Saowaros Yaisawarng, and Preecha Asavadachanukorn. (2010). **Questionnaire development and data processing.** 4th ed. Bangkok: Wittayapat.

[86] Vanichbuncha, Kanlaya. (2008). **Statistic analysis.** 11th ed. Bangkok: Chulalongkorn University.

APPENDIX

APPENDIX A

Figure Appendix A.1 Ethic permission



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บันทึกข้อความ

ส่วนราชการ คณะเภสัชศาสตร์ มหาวิทยาลัยศิลปากร โทร. 24254
ที่ ศธ 0520.205 / 0300 **วันที่** 8 กุมภาพันธ์ 2556
เรื่อง แจ้งผลการพิจารณาของคณะกรรมการจริยธรรมการวิจัยในมนุษย์

เรียน ภญ.ธีรพร ชลศิลปวิทย์

ตามที่ท่านได้ส่งโครงการวิจัย เรื่อง "ความรู้ ทักษะ และความต้องการการฝึกอบรมด้านสานสนเทศศาสตร์ของเภสัชกรโรงพยาบาล" (กลุ่มที่ 1-2556) ให้คณะกรรมการจริยธรรมการวิจัยในมนุษย์ คณะเภสัชศาสตร์ มหาวิทยาลัยศิลปากร พิจารณารับรองจริยธรรมการวิจัยในมนุษย์ นั้น

ในการนี้ คณะกรรมการจริยธรรมการวิจัยในมนุษย์ คณะเภสัชศาสตร์ มหาวิทยาลัยศิลปากร ได้พิจารณาโครงการวิจัยของท่านแล้ว ขอแจ้งผลการพิจารณาให้ท่านทราบว่า โครงการวิจัยของท่านเป็นไปตามหลักเกณฑ์และแนวทางของโครงการที่มีลักษณะไม่เข้าข่ายต้องขอรับรองด้านจริยธรรมการวิจัยในมนุษย์จึงไม่ต้องขอรับรองจริยธรรมการวิจัยในมนุษย์

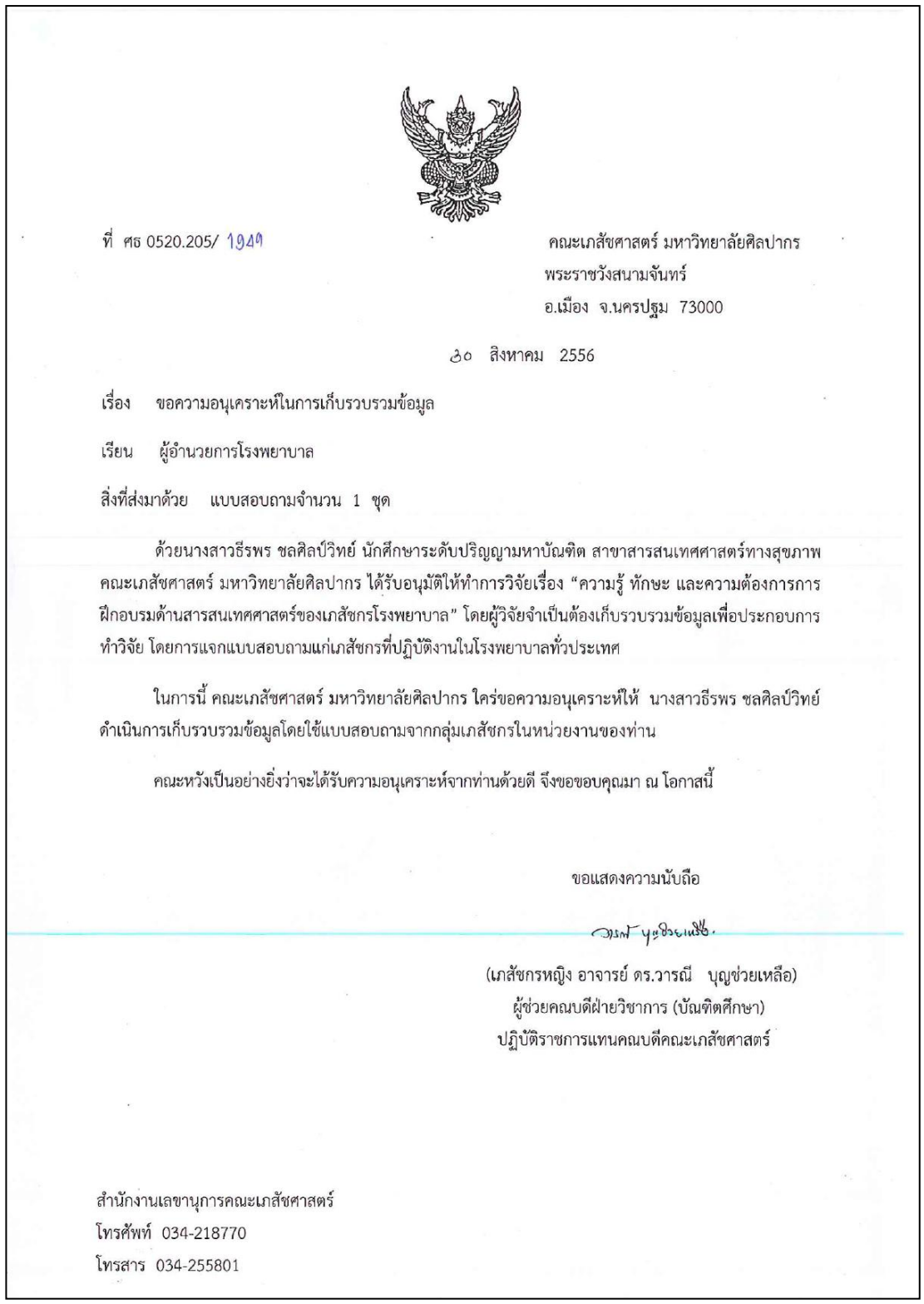
จึงเรียนมาเพื่อโปรดทราบ

(เภสัชกร รองศาสตราจารย์ ดร.ธนะเศรษฐ์ ง้าวหิรัญพัฒน์)
ประธานคณะกรรมการจริยธรรมการวิจัยในมนุษย์

สำเนาเรียน ภก.ผศ.ดร.สรวง รุ่งประกายพรรณ อาจารย์ที่ปรึกษา

APPENDIX B

Figure Appendix B.1 Data collection permission



ที่ ศธ 0520.205/ 1949

คณะเภสัชศาสตร์ มหาวิทยาลัยศิลปากร
พระราชวังสนามจันทร์
อ.เมือง จ.นครปฐม 73000

๓๐ สิงหาคม 2556

เรื่อง ขอความอนุเคราะห์ในการเก็บรวบรวมข้อมูล

เรียน ผู้อำนวยการโรงพยาบาล

สิ่งที่ส่งมาด้วย แบบสอบถามจำนวน 1 ชุด

ด้วยนางสาวธีรพร ชลศิลป์วิทย์ นักศึกษาระดับปริญญามหาบัณฑิต สาขาสารสนเทศศาสตร์ทางสุขภาพ คณะเภสัชศาสตร์ มหาวิทยาลัยศิลปากร ได้รับอนุมัติให้ทำการวิจัยเรื่อง "ความรู้ ทักษะ และความต้องการการฝึกอบรมด้านสารสนเทศศาสตร์ของเภสัชกรโรงพยาบาล" โดยผู้วิจัยจำเป็นต้องเก็บรวบรวมข้อมูลเพื่อประกอบการทำวิจัย โดยการแจกแบบสอบถามแก่เภสัชกรที่ปฏิบัติงานในโรงพยาบาลทั่วประเทศ

ในการนี้ คณะเภสัชศาสตร์ มหาวิทยาลัยศิลปากร ใคร่ขอความอนุเคราะห์ให้ นางสาวธีรพร ชลศิลป์วิทย์ ดำเนินการเก็บรวบรวมข้อมูลโดยใช้แบบสอบถามจากกลุ่มเภสัชกรในหน่วยงานของท่าน

คณะหวังเป็นอย่างยิ่งว่าจะได้รับความอนุเคราะห์จากท่านด้วยดี จึงขอขอบคุณมา ณ โอกาสนี้

ขอแสดงความนับถือ

(เภสัชกรหญิง อาจารย์ ดร.วารณี บุญช่วยเหลือ)
ผู้ช่วยคณบดีฝ่ายวิชาการ (บัณฑิตศึกษา)
ปฏิบัติราชการแทนคณบดีคณะเภสัชศาสตร์

สำนักงานเลขานุการคณะเภสัชศาสตร์
โทรศัพท์ 034-218770
โทรสาร 034-255801

APPENDIX C

Figure Appendix C.1 Content validity form

แบบฟอร์มประเมินความเที่ยงตรงด้านเนื้อหา (Content validity) ของแบบสอบถามเรื่อง

ความรู้ ทักษะ และความต้องการการฝึกอบรมด้านสารสนเทศศาสตร์ของเภสัชกรโรงพยาบาล

คำชี้แจง แบบฟอร์มนี้ใช้เพื่อประเมินความถูกต้องของเนื้อหาในแบบสอบถาม เรื่อง ความรู้ ทักษะ และความต้องการการฝึกอบรมด้านสารสนเทศศาสตร์ของเภสัชกรโรงพยาบาล จำนวน 69 ข้อ ซึ่งเป็นหัวข้อวิทยานิพนธ์ในระดับบัณฑิตศึกษา สาขาสารสนเทศศาสตร์ทางสุขภาพ คณะเภสัชศาสตร์ มหาวิทยาลัยศิลปากร แบบสอบถามดังกล่าวมีวัตถุประสงค์ดังนี้

1. เพื่อประเมินทักษะด้านคอมพิวเตอร์และอินเตอร์เนตของเภสัชกรโรงพยาบาล
2. เพื่อประเมินทักษะด้านสารสนเทศศาสตร์ของเภสัชกรโรงพยาบาล
3. เพื่อประเมินความต้องการการฝึกอบรมในหลักสูตรสารสนเทศศาสตร์ของเภสัชกรโรงพยาบาล
4. เพื่อศึกษาความสัมพันธ์ระหว่างข้อมูลทั่วไปของเภสัชกรกับระดับความคิดเห็นในเรื่องการประเมินทักษะทางคอมพิวเตอร์และอินเตอร์เนต
5. เพื่อศึกษาความสัมพันธ์ระหว่างข้อมูลทั่วไปของเภสัชกับระดับความคิดเห็นในเรื่องการประเมินทักษะด้านสารสนเทศศาสตร์
6. เพื่อศึกษาความสัมพันธ์ระหว่างข้อมูลทั่วไปของเภสัชกรกับระดับความคิดเห็นในเรื่องการประเมินความต้องการการฝึกอบรมในหลักสูตรสารสนเทศศาสตร์
7. เพื่อศึกษาความสัมพันธ์ระหว่างระดับความคิดเห็นในเรื่องการประเมินทักษะคอมพิวเตอร์และอินเตอร์เนตกับระดับความคิดเห็นในเรื่องการประเมินความต้องการการฝึกอบรมในหลักสูตรสารสนเทศศาสตร์
8. เพื่อศึกษาความสัมพันธ์ระหว่างระดับความคิดเห็นในเรื่องการประเมินทักษะด้านสารสนเทศศาสตร์กับระดับความคิดเห็นในเรื่องการประเมินความต้องการการฝึกอบรมในหลักสูตรสารสนเทศศาสตร์

ผู้ประเมินพิจารณาเนื้อหาในแบบสอบถามและทำการประเมินความถูกต้องของเนื้อหาโดยแบ่งการประเมินเป็น 3 ระดับคือ

1. เหมาะสม หมายถึง เนื้อหาในข้อนั้นมีความถูกต้องเหมาะสม สามารถเข้าใจได้ชัดเจน สอดคล้องกับวัตถุประสงค์ของงานวิจัย
2. ไม่แน่ใจ หมายถึง ไม่แน่ใจว่าเนื้อหาในข้อนั้นมีความเหมาะสมและสอดคล้องกับวัตถุประสงค์หรือไม่ จำเป็นต้องมีการปรับปรุงแก้ไขให้เหมาะสม หรือน่าจะตัดออกจากแบบสอบถาม
3. ไม่เหมาะสม หมายถึง เนื้อหาในข้อนั้นไม่เหมาะสม ไม่สอดคล้องกับวัตถุประสงค์ ควรตัดออกจากแบบสอบถาม

ผู้ประเมินสามารถเพิ่มข้อคิดเห็นหรือข้อเสนอแนะในแต่ละข้อได้ โดยเฉพาะอย่างยิ่งหากผู้ประเมินทำการประเมินในระดับ “ไม่แน่ใจ” หรือ “ไม่เหมาะสม” กรุณาเพิ่มเติมข้อเสนอแนะเพื่อเป็นแนวทางในการแก้ไขแบบสอบถามให้แก่ผู้วิจัย

หากผู้ประเมินมีข้อเสนอแนะเพิ่มเติมอื่นๆนอกเหนือจากคำถามที่ปรากฏในแบบสอบถาม สามารถเพิ่มเติมได้ในส่วนท้ายของแบบฟอร์มนี้

ผู้วิจัยขอขอบคุณในความร่วมมือของท่านมา ณ ที่นี้

ติดต่อผู้วิจัย: ธีรพร ชลศิลปวิทย์

E-mail: teeraporn@yahoo.com

Tel: 087-357-5545

Figure Appendix C.1Content validity form (Continued)

ข้อที่	เหมาะสม	ไม่แน่ใจ	ไม่เหมาะสม	ข้อคิดเห็น/ ข้อเสนอแนะ
ข้อมูลทั่วไป				
1.	☐	☐	☐	
2.	☐	☐	☐	
3.	☐	☐	☐	
4.	☐	☐	☐	
5.	☐	☐	☐	
6.	☐	☐	☐	
7.	☐	☐	☐	
ทักษะทางคอมพิวเตอร์				
8.	☐	☐	☐	
9.	☐	☐	☐	
10.	☐	☐	☐	
11.	☐	☐	☐	
12.	☐	☐	☐	
13.	☐	☐	☐	
14.	☐	☐	☐	
15.	☐	☐	☐	
16.	☐	☐	☐	
17.	☐	☐	☐	
ทักษะทางอินเทอร์เน็ต				
18.	☐	☐	☐	
19.	☐	☐	☐	
20.	☐	☐	☐	
21.	☐	☐	☐	
22.	☐	☐	☐	
23.	☐	☐	☐	
24.	☐	☐	☐	
25.	☐	☐	☐	
26.	☐	☐	☐	

Figure Appendix C.1Content validity form (Continued)

ความรู้และทักษะด้านการจัดการข้อมูลและการสื่อสาร				
27.	☐	☐	☐	
28.	☐	☐	☐	
29.	☐	☐	☐	
30.	☐	☐	☐	
31.	☐	☐	☐	
32.	☐	☐	☐	
33.	☐	☐	☐	
34.	☐	☐	☐	
35.	☐	☐	☐	
36.	☐	☐	☐	
37.	☐	☐	☐	
38.	☐	☐	☐	
ความรู้และทักษะด้านเทคโนโลยีและการออกแบบฐานข้อมูล				
39.	☐	☐	☐	
40.	☐	☐	☐	
41.	☐	☐	☐	
42.	☐	☐	☐	
43.	☐	☐	☐	
44.	☐	☐	☐	
45.	☐	☐	☐	
46.	☐	☐	☐	
47.	☐	☐	☐	
48.	☐	☐	☐	
49.	☐	☐	☐	
50.	☐	☐	☐	
51.	☐	☐	☐	
52.	☐	☐	☐	
53.	☐	☐	☐	

Figure Appendix C.1Content validity form (Continued)

ทักษะด้านการจัดการระบบ				
54.	☐	☐	☐	
55.	☐	☐	☐	
56.	☐	☐	☐	
57.	☐	☐	☐	
58.	☐	☐	☐	
59.	☐	☐	☐	
ความจำเป็นต่องาน				
60.	☐	☐	☐	
61.	☐	☐	☐	
62.	☐	☐	☐	
63.	☐	☐	☐	
64.	☐	☐	☐	
ความต้องการการฝึกอบรม				
65.	☐	☐	☐	
66.	☐	☐	☐	
67.	☐	☐	☐	
68.	☐	☐	☐	
69.	☐	☐	☐	

ข้อเสนอแนะอื่นๆ

Figure Appendix C.2 Questionnaire for testing content validity

แบบสอบถามเพื่อประเมินความรู้ ทักษะและความต้องการการฝึกอบรมด้านสารสนเทศศาสตร์ของเภสัชกรโรงพยาบาล

คำชี้แจง แบบสอบถามนี้จัดทำขึ้นเพื่อประเมินความรู้ ทักษะและสำรวจความต้องการการฝึกอบรมด้านสารสนเทศศาสตร์ของเภสัชกรโรงพยาบาล สำหรับเป็นแนวทางในการพัฒนาการเรียนการสอนสารสนเทศศาสตร์ของหลักสูตรเภสัชศาสตรบัณฑิตในประเทศไทย
กรุณาทำเครื่องหมาย ✓ ลงในช่อง O ที่ตรงกับความเป็นจริงของท่านมากที่สุด

ส่วนที่ 1 ข้อมูลทั่วไป

1. เพศ
   O ชาย O หญิง
2. อายุ
   O ต่ำกว่า 30 ปี O 51-60 ปี
   O 30-40 ปี O มากกว่า 60 ปี
   O 41-50 ปี
3. รายได้ต่อเดือน
   O 10,000-20,000 บาท O 30,001-40,000 บาท
   O 20,001-30,000 บาท O มากกว่า 40,000 บาท
4. การศึกษาสูงสุด
   O ปริญญาตรี
   O ปริญญาโท สาขา_____
   O ปริญญาเอก สาขา_____
5. ฝ่ายที่ปฏิบัติงาน (ตอบได้มากกว่า 1 ข้อ)
   O งานบริการผู้ป่วยนอก O งานผลิต
   O งานบริการผู้ป่วยใน O อื่นๆ (ระบุ)_____
   O งานบริหารเวชภัณฑ์
6.ประเภทโรงพยาบาล
   O โรงพยาบาลชุมชน O โรงพยาบาลเอกชน
   O โรงพยาบาลทั่วไป O อื่นๆ (ระบุ)_____
   O โรงพยาบาลศูนย์
7. ระยะเวลาในการปฏิบัติงานเภสัชกรโรงพยาบาล
   O น้อยกว่า 5 ปี O 21-30 ปี
   O 5-10 ปี O มากกว่า 30 ปี
   O 11-20 ปี

ส่วนที่ 2 ประเมินทักษะทางคอมพิวเตอร์และอินเตอร์เน็ต

ประเมินตนเองว่ามีความรู้/ ความเข้าใจ/ ความเชี่ยวชาญ ในหัวข้อต่อไปนี้อยู่ในระดับใด โดยให้ระดับคะแนนดังนี้

5 = สามารถใช้ได้อย่างเชี่ยวชาญ/ เข้าใจอย่างแตกฉาน
4 = สามารถใช้ได้ดีมาก/ มีความเข้าใจดีมาก
3 = สามารถใช้ได้ดี/ มีความเข้าใจเป็นอย่างดี
2 = พอใช้ได้/ พอเข้าใจ
1 = ใช้ได้เพียงเล็กน้อย/ เข้าใจเพียงเล็กน้อย
0 = ไม่สามารถใช้ได้เลย/ ไม่เข้าใจ/ ไม่รู้จัก

ทักษะทางคอมพิวเตอร์

	5	4	3	2	1	0
8. ทักษะในการใช้อุปกรณ์พื้นฐาน เช่น เมาส์ แป้นพิมพ์ เครื่องพิมพ์	O	O	O	O	O	O
9. ทักษะในการใช้โปรแกรมประมวลผลคำ เช่น Microsoft Word	O	O	O	O	O	O
10. ทักษะในการใช้โปรแกรมตารางทำการ เช่น Microsoft Excel	O	O	O	O	O	O
11. ทักษะในการใช้โปรแกรมนำเสนอ เช่น Microsoft PowerPoint	O	O	O	O	O	O
12. ทักษะในการใช้โปรแกรมจัดการฐานข้อมูล เช่น Microsoft Access	O	O	O	O	O	O
13. ทักษะในการจัดการไฟล์และแฟ้มข้อมูล เช่น สร้าง เปลี่ยนชื่อ คัดลอก เคลื่อนย้าย ลบไฟล์และแฟ้มข้อมูล	O	O	O	O	O	O
14. ทักษะในการติดตั้งโปรแกรม	O	O	O	O	O	O
15. ทักษะในการใช้คำสั่งช่วยเหลือ (Help)	O	O	O	O	O	O
16. ทักษะในการค้นหาไฟล์ที่ต้องการในคอมพิวเตอร์	O	O	O	O	O	O
17. ประเมินทักษะทางคอมพิวเตอร์ของท่านโดยรวม	O	O	O	O	O	O

ทักษะทางอินเตอร์เน็ต

	5	4	3	2	1	0
18. ทักษะในการติดต่อโดยใช้จดหมายอิเล็กทรอนิกส์	O	O	O	O	O	O
19. ทักษะในการแนบไฟล์/ เปิดไฟล์แนบ/ สร้างกลุ่มติดต่อในจดหมายอิเล็กทรอนิกส์	O	O	O	O	O	O
20. ทักษะในการค้นหาข้อมูลในอินเตอร์เน็ตโดยใช้ search engine เช่น google, yahoo	O	O	O	O	O	O
21. ทักษะในการบันทึกหน้าเว็บเพจ	O	O	O	O	O	O
22. ทักษะในการดาวน์โหลดไฟล์จากอินเตอร์เน็ต	O	O	O	O	O	O
23. ทักษะในการเพิ่มหน้าเว็บเพจในรายการโปรด	O	O	O	O	O	O
24. ทักษะในการค้นหาข้อมูลทางสุขภาพโดยใช้ฐานข้อมูลออนไลน์ เช่น Pubmed, Science direct	O	O	O	O	O	O
25. ทักษะในการใช้สื่อสังคม เช่น Facebook, Twitter	O	O	O	O	O	O
26. ประเมินทักษะทางอินเตอร์เนตของท่านโดยรวม	O	O	O	O	O	O

Figure Appendix C.2 Questionnaire for testing content validity (Continued)

ส่วนที่ 3 ประเมินความรู้และทักษะทางสารสนเทศศาสตร์

(ประเมินตนเองโดยใช้ระดับคะแนนเช่นเดียวกับส่วนที่ 2)

<u>ความรู้และทักษะด้านการจัดการข้อมูลและการสื่อสาร</u>

	5	4	3	2	1	0
27. ความรู้เรื่องการจัดการระบบสารสนเทศทางเภสัชกรรม	O	O	O	O	O	O
28. ความรู้เรื่องการจัดการข้อมูล สารสนเทศและองค์ความรู้ทางเภสัชกรรม	O	O	O	O	O	O
29. ความรู้เรื่องรหัสยามาตรฐาน เช่น ICD DRG	O	O	O	O	O	O
30. ความรู้เรื่องมาตรฐานทางสารสนเทศศาสตร์ทางสุขภาพ เช่น HL7	O	O	O	O	O	O
31. ทักษะในการเลือกแหล่งข้อมูลทางยาและประเมินความน่าเชื่อถือของแหล่งข้อมูล	O	O	O	O	O	O
32. ทักษะในการคัดเลือกแหล่งข้อมูลให้สอดคล้องกับความต้องการของผู้รับบริการ	O	O	O	O	O	O
33. ทักษะในการให้ข้อมูลและเลือกแนวทางการให้บริการได้อย่างเหมาะสม	O	O	O	O	O	O
34. ทักษะในการตอบคำถามด้านยาแก่ผู้รับบริการได้อย่างถูกต้องเหมาะสม	O	O	O	O	O	O
35. ทักษะในการเลือกช่องทางการเผยแพร่สื่อและการให้ข้อมูลได้อย่างเหมาะสมสำหรับข้อมูลแต่ละประเภท	O	O	O	O	O	O
36. ความรู้เรื่องหลักการสื่อสารเพื่อเพิ่มประสิทธิภาพในการดูแลผู้รับบริการ	O	O	O	O	O	O
37. ความรู้ความเข้าใจเรื่องอุปสรรคในการสื่อสารกับผู้รับบริการ	O	O	O	O	O	O
38. ประเมินความรู้และทักษะด้านการจัดการข้อมูลและการสื่อสารของท่านโดยรวม	O	O	O	O	O	O

<u>ความรู้และทักษะด้านเทคโนโลยีและการออกแบบฐานข้อมูล</u>

	5	4	3	2	1	0
39. ความรู้เรื่องระบบปฏิบัติการแบบต่างๆ สามารถบอกชนิดและหน้าที่ของระบบปฏิบัติการได้	O	O	O	O	O	O
40. ทักษะในการวิเคราะห์ระบบงาน/ การวิเคราะห์ความต้องการของผู้ใช้	O	O	O	O	O	O
41. ทักษะในการออกแบบระบบ/ ข้อกำหนดเฉพาะทางเทคนิค	O	O	O	O	O	O
42. ความรู้เรื่องระบบสั่งการรักษาทางคอมพิวเตอร์ (Computerized provider order entry; CPOE)	O	O	O	O	O	O
43. ความรู้เรื่องใบสั่งยาอิเล็กทรอนิกส์ (E-prescribing)	O	O	O	O	O	O
44. ความรู้เรื่องระบบช่วยสนับสนุนการตัดสินใจทางคลินิก (Clinical decision support system)	O	O	O	O	O	O
45. ความรู้เรื่องบริการเภสัชทางไกล (Telepharmacy)	O	O	O	O	O	O
46. ความรู้เรื่องระเบียนประวัติผู้ป่วยอิเล็กทรอนิกส์ (Electronic patient record/ Electronic health record)	O	O	O	O	O	O
47. ทักษะในการจัดการฐานข้อมูล	O	O	O	O	O	O
48. ทักษะในการออกแบบฐานข้อมูล	O	O	O	O	O	O
49. ทักษะในการเรียกดูข้อมูลจากฐานข้อมูล	O	O	O	O	O	O
50. ทักษะในการออกแบบส่วนติดต่อผู้ใช้งานฐานข้อมูล	O	O	O	O	O	O
51. ความรู้เรื่องระบบเครือข่าย (Network and protocols)	O	O	O	O	O	O
52. ทักษะในการเขียนโปรแกรม	O	O	O	O	O	O
53. ประเมินความรู้และทักษะด้านเทคโนโลยีและการออกแบบฐานข้อมูลของท่านโดยรวม	O	O	O	O	O	O

<u>ทักษะด้านการจัดการระบบ</u>

	5	4	3	2	1	0
54. ทักษะในการจัดการโครงการ (เกี่ยวกับระบบ)	O	O	O	O	O	O
55. ทักษะในการจัดการความเปลี่ยนแปลง	O	O	O	O	O	O
56. ทักษะในการจัดการคุณภาพและความปลอดภัย	O	O	O	O	O	O
57. ทักษะในการวิเคราะห์ความเสี่ยงในระบบ	O	O	O	O	O	O
58. ทักษะการวิเคราะห์จุดวิกฤตในระบบ	O	O	O	O	O	O
59. ประเมินทักษะด้านการจัดการระบบของท่านโดยรวม	O	O	O	O	O	O

ส่วนที่ 4 ประเมินความจำเป็นต่องานและความต้องการการฝึกอบรม

ความรู้และทักษะต่อไปนี้มีความจำเป็นต่องานปัจจุบันของท่านในระดับใด

(5=จำเป็นมากที่สุด 1=จำเป็นน้อยที่สุด 0=ไม่จำเป็น)	5	4	3	2	1	0
60. ทักษะทางคอมพิวเตอร์	O	O	O	O	O	O
61. ทักษะทางอินเตอร์เนต	O	O	O	O	O	O
62. ความรู้และทักษะด้านการจัดการข้อมูลและการสื่อสาร	O	O	O	O	O	O
63. ความรู้และทักษะด้านเทคโนโลยีและการออกแบบฐานข้อมูล	O	O	O	O	O	O
64. ทักษะด้านการจัดการระบบ	O	O	O	O	O	O

ประเมินความต้องการในการฝึกอบรมเพิ่มเติม

(5=ต้องการมากที่สุด 1=ต้องการน้อยที่สุด 0=ไม่ต้องการ)

	5	4	3	2	1	0
65. ทักษะทางคอมพิวเตอร์	O	O	O	O	O	O
66. ทักษะทางอินเตอร์เนต	O	O	O	O	O	O
67. ความรู้และทักษะด้านการจัดการข้อมูลและการสื่อสาร	O	O	O	O	O	O
68. ความรู้และทักษะด้านเทคโนโลยีและการออกแบบฐานข้อมูล	O	O	O	O	O	O
69. ทักษะด้านการจัดการระบบ	O	O	O	O	O	O

Figure Appendix C.2 Questionnaire for testing content validity (Continued)

ส่วนที่ 5 ข้อเสนอแนะ

หัวข้อใดที่ท่านต้องการฝึกอบรมเพิ่มเติมเป็นพิเศษ

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ข้อเสนอแนะเพิ่มเติมอื่นๆ

_____
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_____
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_____

Table Appendix C.1 Content validity results (IOC results)

Question No.	Expert					Total	IOC	Question No.	Expert					Total	IOC
	1	2	3	4	5				1	2	3	4	5		
1	1	1	1	1	1	5	1	36	1	0	-1	0	1	1	0.2
2	1	1	1	1	0	4	0.8	37	1	0	1	0	1	3	0.6
3	1	1	1	1	0	4	0.8	38	1	0	1	0	1	3	0.6
4	1	1	1	1	0	4	0.8	39	1	1	1	0	1	4	0.8
5	1	-1	0	0	0	0	0	40	1	1	1	0	1	4	0.8
6	-1	1	1	1	1	3	0.6	41	1	1	1	0	0	3	0.6
7	1	1	1	1	1	5	1	42	0	1	1	0	1	3	0.6
8	1	1	1	0	1	4	0.8	43	1	1	1	0	1	4	0.8
9	1	1	1	1	1	5	1	44	1	1	1	0	1	4	0.8
10	1	1	1	1	1	5	1	45	1	1	1	0	1	4	0.8
11	1	1	1	1	1	5	1	46	1	1	1	0	1	4	0.8
12	1	1	1	1	1	5	1	47	1	1	1	0	1	4	0.8
13	1	1	1	1	0	4	0.8	48	1	1	1	0	1	4	0.8
14	1	0	1	1	1	4	0.8	49	1	1	1	0	1	4	0.8
15	1	1	1	1	1	5	1	50	1	0	1	0	1	3	0.6
16	1	1	1	1	1	5	1	51	1	1	1	0	1	4	0.8
17	1	0	1	1	1	4	0.8	52	1	0	1	0	1	3	0.6
18	1	1	0	0	1	3	0.6	53	1	0	1	0	1	3	0.6
19	1	-1	1	0	1	2	0.4	54	1	1	1	0	1	4	0.8
20	1	1	1	0	1	4	0.8	55	1	1	1	0	1	4	0.8
21	0	1	1	0	1	3	0.6	56	1	1	1	0	1	4	0.8
22	1	1	1	0	1	4	0.8	57	1	1	1	0	1	4	0.8
23	-1	1	1	0	1	2	0.4	58	1	1	1	0	1	4	0.8
24	1	0	1	1	1	4	0.8	59	1	1	1	0	1	4	0.8
25	1	1	1	1	1	5	1	60	1	1	1	0	1	4	0.8
26	1	1	1	1	1	5	1	61	1	1	1	0	1	4	0.8
27	1	0	0	0	0	1	0.2	62	1	1	1	0	1	4	0.8
28	1	1	0	0	1	3	0.6	63	1	1	1	0	1	4	0.8
29	1	-1	0	0	0	0	0	64	1	1	1	0	1	4	0.8
30	1	1	1	0	1	4	0.8	65	1	1	1	0	1	4	0.8
31	1	1	1	0	1	4	0.8	66	1	1	1	0	1	4	0.8
32	1	1	-1	0	1	2	0.4	67	1	1	1	0	1	4	0.8
33	1	1	1	0	1	4	0.8	68	1	1	1	0	1	4	0.8
34	1	1	1	0	1	4	0.8	69	1	1	1	0	1	4	0.8
35	1	1	1	0	1	4	0.8								

APPENDIX D

Figure Appendix D.1 Final version questionnaire

แบบสอบถามการวิจัย

เรื่อง

ความรู้ ทักษะและความต้องการการฝึกอบรมด้านสารสนเทศศาสตร์ของเภสัชกรโรงพยาบาล

คำชี้แจง

1. แบบสอบถามนี้ผู้วิจัยจัดทำขึ้นโดยมีวัตถุประสงค์เพื่อประเมินความรู้ ทักษะและสำรวจความต้องการการฝึกอบรมด้านสารสนเทศศาสตร์ของเภสัชกรโรงพยาบาลสำหรับเป็นแนวทางในการพัฒนาการเรียนการสอนสารสนเทศศาสตร์ของหลักสูตรเภสัชศาสตรบัณฑิตในประเทศไทย
2. ผู้ตอบแบบสอบถามนี้ได้แก่เภสัชกรที่ปฏิบัติงานอยู่ภายในโรงพยาบาลทุกสังกัด
3. แบบสอบถามนี้ประกอบด้วยคำถาม 73 ข้อ แบ่งเป็น 5 ส่วน คือ

    ส่วนที่ 1 ข้อมูลทั่วไป (ข้อที่ 1-9)

    ส่วนที่ 2 ประเมินทักษะการใช้งานคอมพิวเตอร์และอินเทอร์เน็ต (ข้อที่ 10-30)

    ส่วนที่ 3 ประเมินความรู้และทักษะทางสารสนเทศศาสตร์ (ข้อที่ 31-61)

    ส่วนที่ 4 ประเมินความจำเป็นต่องานและสำรวจความต้องการการฝึกอบรม (ข้อที่ 62-73)

    ส่วนที่ 5 ข้อเสนอแนะ

ผู้วิจัยขอความกรุณาจากท่านช่วยตอบแบบสอบถามฉบับนี้ตามความเป็นจริง และตอบให้ครบทุกข้อ โดยไม่ต้องระบุชื่อ ทั้งนี้ ผู้วิจัยจะเก็บข้อมูลจากแบบสอบถามของท่านเป็นความลับ จะนำข้อมูลมาใช้ในการวิจัยเท่านั้น และเสนอผลการวิจัยในลักษณะภาพรวมไม่ได้เสนอเป็นรายบุคคล

เมื่อท่านตอบแบบสอบถามฉบับนี้เสร็จเรียบร้อยแล้ว ขอความกรุณาส่งแบบสอบถามกลับมายังผู้วิจัย โดยนำแบบสอบถามพับครึ่งพร้อมทั้งเย็บด้วยที่เย็บกระดาษและส่งไปรษณีย์กลับมายังผู้วิจัย ซึ่งผู้วิจัยได้ระบุที่อยู่ส่งกลับพร้อมทั้งติดแสตมป์ไว้ที่แบบสอบถามแล้ว และโปรดส่งคืนภายในวันที่ 31 ตุลาคม พ.ศ. 2556

ขอแสดงความนับถือ

ภญ.ธีรพร ชลศิลปวิทย์

นักศึกษาปริญญาโท สาขาสารสนเทศศาสตร์ทางสุขภาพ

คณะเภสัชศาสตร์ มหาวิทยาลัยศิลปากร

Figure Appendix D.1 Final version questionnaire (Continued)

แบบสอบถามเพื่อประเมินความรู้ ทักษะและความต้องการการฝึกอบรมด้านสารสนเทศศาสตร์ของเภสัชกรโรงพยาบาล

กรุณาทำเครื่องหมาย ✓ ลงในช่อง O ที่ตรงกับความเป็นจริงของท่านมากที่สุด

ส่วนที่ 1 ข้อมูลทั่วไป

1. เพศ

O ชาย O หญิง

2. อายุ

O ต่ำกว่า 30 ปี O 30-40 ปี O 41-50 ปี

O 51-60 ปี O มากกว่า 60 ปี

3. รายได้ต่อเดือน (รวมรายรับทุกประเภทจากงานเภสัชกรโรงพยาบาล)

O 10,000-20,000 บาท O 20,001-30,000 บาท

O 30,001-40,000 บาท O มากกว่า 40,000 บาท

4. การศึกษาสูงสุด

O ปริญญาตรี

O ปริญญาโทวุฒิ_____ สาขา_____

O ปริญญาเอกวุฒิ_____ สาขา_____

5. ลักษณะงานที่ปฏิบัติ (ตอบได้มากกว่า 1 ข้อ)

O งานบริการผู้ป่วยนอก O งานผลิต

O งานบริการผู้ป่วยใน O งานเภสัชสนเทศ

O งาน Primary care unit O งานบริหาร (หัวหน้างาน/ หัวหน้ากลุ่มงาน)

O งานบริหารเวชภัณฑ์ O อื่นๆ (ระบุ)_____

6. ประเภทโรงพยาบาล

O โรงพยาบาลสังกัดกระทรวงสาธารณสุข

O โรงพยาบาลสังกัดกรุงเทพมหานคร

O โรงพยาบาลมหาวิทยาลัย

O โรงพยาบาลเอกชน O อื่นๆ (ระบุ)_____

7. จำนวนเตียง

O น้อยกว่า 10 – 120 เตียง O มากกว่า 120 – 500 เตียง O มากกว่า 500 เตียง

8. ที่ตั้งโรงพยาบาล

O ภาคเหนือ O ภาคตะวันออกเฉียงเหนือ O ภาคตะวันออก

O ภาคใต้ O ภาคกลาง (ไม่รวมกรุงเทพและปริมณฑล)

O กรุงเทพและปริมณฑล

9. ระยะเวลาในการปฏิบัติงานเภสัชกรโรงพยาบาล

O น้อยกว่า 5 ปี O 5-10 ปี O มากกว่า 10 ปี - 20 ปี

O มากกว่า 20 ปี - 30 ปี O มากกว่า 30 ปี

ส่วนที่ 2 ประเมินทักษะการใช้งานคอมพิวเตอร์และอินเทอร์เน็ต

ประเมินตนเองว่ามีความรู้/ ความเข้าใจ/ ความเชี่ยวชาญ ในหัวข้อต่อไปนี้อยู่ในระดับใด โดยให้ระดับคะแนนดังนี้

5 = สามารถใช้ได้อย่างเชี่ยวชาญ/ เข้าใจอย่างแตกฉาน

4 = สามารถใช้ได้ดีมาก/ มีความเข้าใจดีมาก

3 = สามารถใช้ได้ดี/ มีความเข้าใจเป็นอย่างดี

2 = พอใช้ได้/ พอเข้าใจ

1 = ใช้ได้เพียงเล็กน้อย/ เข้าใจเพียงเล็กน้อย

0 = ไม่สามารถใช้ได้เลย/ ไม่เข้าใจ/ ไม่รู้จัก

ทักษะการใช้งานคอมพิวเตอร์

	5	4	3	2	1	0
10. ทักษะในการใช้อุปกรณ์พื้นฐาน เช่น เมาส์ แป้นพิมพ์ เครื่องพิมพ์	O	O	O	O	O	O
11. ทักษะในการใช้โปรแกรมประมวลผลคำ เช่น Microsoft Word	O	O	O	O	O	O
12. ทักษะในการใช้โปรแกรมตารางทำการ เช่น Microsoft Excel	O	O	O	O	O	O
13. ทักษะในการใช้โปรแกรมนำเสนอ เช่น Microsoft PowerPoint	O	O	O	O	O	O
14. ทักษะในการใช้โปรแกรมจัดการฐานข้อมูล เช่น Microsoft Access	O	O	O	O	O	O
15. ทักษะในการจัดการไฟล์ (file) และแฟ้มข้อมูล (folder) เช่น สร้าง เปลี่ยนชื่อ คัดลอก เคลื่อนย้าย ลบไฟล์และแฟ้มข้อมูล	O	O	O	O	O	O
16. ทักษะในการติดตั้งโปรแกรมสำเร็จรูป	O	O	O	O	O	O
17. ทักษะในการใช้คำสั่งช่วยเหลือ (help)	O	O	O	O	O	O
18. ทักษะในการค้นหาไฟล์ที่ต้องการในคอมพิวเตอร์	O	O	O	O	O	O
19. ประเมินทักษะการใช้งานคอมพิวเตอร์ของท่านโดยรวม	O	O	O	O	O	O

ทักษะการใช้งานอินเทอร์เน็ต

	5	4	3	2	1	0
20. ทักษะในการติดต่อโดยใช้ e-mail	O	O	O	O	O	O
21. ทักษะในการแนบไฟล์/ เปิดไฟล์แนบใน e-mail	O	O	O	O	O	O
22. ทักษะในการสร้างกลุ่มติดต่อใน e-mail	O	O	O	O	O	O
23. ทักษะในการค้นหาข้อมูลในอินเทอร์เน็ตโดยใช้ search engine เช่น google, yahoo	O	O	O	O	O	O
24. ทักษะในการใช้คำสั่งบันทึก (save) หน้าเว็บเพจ	O	O	O	O	O	O
25. ทักษะในการดาวน์โหลดไฟล์จากอินเทอร์เน็ต	O	O	O	O	O	O
26. ทักษะในการเพิ่มหน้าเว็บเพจในรายการโปรด (favorite หรือ bookmark)	O	O	O	O	O	O
27. ทักษะในการสืบค้นข้อมูลทางสุขภาพโดยใช้ฐานข้อมูลออนไลน์ เช่น Pubmed, Science direct (สามารถสืบค้นเจอเอกสารที่ต้องการได้)	O	O	O	O	O	O
28. ทักษะในการเข้าถึงข้อมูลในฐานข้อมูลออนไลน์ เช่น Pubmed, Science direct (เมื่อสืบค้นเจอเอกสารที่ต้องการแล้ว สามารถนำเอกสารฉบับเต็มออกมาใช้ได้)	O	O	O	O	O	O
29. ทักษะในการใช้สื่อสังคม เช่น Facebook, Twitter	O	O	O	O	O	O
30. ประเมินทักษะการใช้งานอินเทอร์เน็ตของท่านโดยรวม	O	O	O	O	O	O

Figure Appendix D.1 Final version questionnaire (Continued)

ส่วนที่ 3 ประเมินความรู้และทักษะทางสารสนเทศศาสตร์

(ประเมินตนเองโดยใช้ระดับคะแนนเช่นเดียวกับส่วนที่ 2)

<u>ความรู้และทักษะด้านการจัดการข้อมูล</u>

	5	4	3	2	1	0
31. ความรู้เรื่องระบบสารสนเทศทางเภสัชกรรม (เช่น ระบบสารสนเทศในการจ่ายยา ระบบสารสนเทศเพื่อบริหารคลังยาและเวชภัณฑ์ ระบบสารสนเทศสำหรับให้คำปรึกษาด้านยา)	O	O	O	O	O	O
32. ความรู้เรื่องการจัดการข้อมูล สารสนเทศและองค์ความรู้ทางเภสัชกรรม (เช่นการรวบรวมและตรวจสอบข้อมูล, การประมวลผลข้อมูล, การดูแลรักษาข้อมูล)	O	O	O	O	O	O
33. ความรู้เรื่องรหัสมาตรฐาน เช่น ICD, DRG, รหัสยา มาตรฐาน 24 หลัก	O	O	O	O	O	O
34. ความรู้เรื่องมาตรฐานทางสารสนเทศศาสตร์ทางสุขภาพ เช่น HL7	O	O	O	O	O	O
35. ทักษะในการคัดเลือกแหล่งข้อมูลให้สอดคล้องกับความต้องการของผู้รับบริการ (เช่น เลือกจากหนังสือ เว็บไซต์ ฐานข้อมูลทางยาต่างๆ)	O	O	O	O	O	O
36. ทักษะในการประเมินความน่าเชื่อถือของแหล่งข้อมูล (รู้ว่าต้องสังเกตอะไรบ้างเพื่อประเมินว่าแหล่งข้อมูลมีความน่าเชื่อถือ เช่น วัตถุประสงค์ในการเผยแพร่ข้อมูล มีการระบุชื่อผู้เขียนหรือผู้ให้ข้อมูล มีการให้ที่อยู่ผู้ติดต่อ การนำเสนอเนื้อหาตรงตามวัตถุประสงค์ มีการอ้างอิงหรือระบุแหล่งที่มาของข้อมูล มีการระบุวันเวลาในการเผยแพร่และปรับปรุงข้อมูล เป็นต้น)	O	O	O	O	O	O
37. ประเมินความรู้และทักษะด้านการจัดการข้อมูลของท่านโดยรวม	O	O	O	O	O	O

<u>ทักษะด้านการสื่อสาร</u>

	5	4	3	2	1	0
38. ทักษะในการให้ข้อมูลและเลือกแนวทางการให้บริการแก่ผู้รับบริการได้อย่างเหมาะสม	O	O	O	O	O	O
39. ทักษะในการเลือกช่องทางการเผยแพร่สื่อและการให้ข้อมูลได้อย่างเหมาะสมสำหรับข้อมูลแต่ละประเภท (เช่น การทำเว็บไซต์ แผ่นพับ)	O	O	O	O	O	O
40. ทักษะด้านการสื่อสารเพื่อเพิ่มประสิทธิภาพในการดูแลผู้รับบริการ (เช่น ตระหนักและเข้าใจความหมายทางวาจาและท่าทางของผู้รับสาร ใช้ศัพท์ที่จำเพาะ ชัดเจนและเหมาะสมกับผู้รับบริการ ตอบคำถามด้วยความชัดเจนและสมบูณ์)	O	O	O	O	O	O
41. ทักษะในการจัดการอุปสรรคในการสื่อสารกับผู้รับบริการ ทั้งอุปสรรคที่เกิดจากผู้ส่งสาร (เช่น ขาดความรู้ความเข้าใจเกี่ยวกับสาร วิธีในการถ่ายทอดและนำเสนอไม่เหมาะสม) อุปสรรคที่เกิดจากสาร (เช่น ภาษาที่ใช้คลุมเครือ ขาดความชัดเจน สารยากต่อความเข้าใจ สารขาดการจัดลำดับที่ดี สารไม่เหมาะสมกับผู้รับสาร) และอุปสรรคที่เกิดจากผู้รับสาร (เช่น ผู้รับสารขาดความรู้ ขาดความพร้อม มีทัศนคติที่ไม่ดีต่อสารหรือผู้ส่งสาร)	O	O	O	O	O	O
42. ประเมินทักษะด้านการสื่อสารของท่านโดยรวม	O	O	O	O	O	O

<u>ความรู้และทักษะด้านเทคโนโลยีและการออกแบบฐานข้อมูล</u>

	5	4	3	2	1	0
43. ความรู้เรื่องระบบปฏิบัติการแบบต่างๆ สามารถบอกชนิดและหน้าที่ของระบบปฏิบัติการได้	O	O	O	O	O	O
44. ความรู้เรื่องระบบสั่งการรักษาทางคอมพิวเตอร์ (Computerized provider order entry; CPOE)	O	O	O	O	O	O
45. ความรู้เรื่องใบสั่งยาอิเล็กทรอนิกส์ (E-prescribing)	O	O	O	O	O	O
46. ความรู้เรื่องระเบียนประวัติผู้ป่วยอิเล็กทรอนิกส์ (Electronic patient record/ Electronic health record)	O	O	O	O	O	O
47. ความรู้เรื่องระบบช่วยสนับสนุนการตัดสินใจทางคลินิก (Clinical decision support system)	O	O	O	O	O	O
48. ความรู้เรื่องบริการเภสัชทางไกล (Telepharmacy)	O	O	O	O	O	O
49 ความรู้เรื่องระบบเครือข่าย (Network and protocols)	O	O	O	O	O	O
50. ทักษะในการวิเคราะห์ระบบงาน/ การวิเคราะห์ความต้องการของผู้ใช้	O	O	O	O	O	O
51. ทักษะในการออกแบบระบบและกำหนดคุณลักษณะเฉพาะของระบบสารสนเทศ (เช่น ระบบสามารถทำอะไรได้บ้าง รองรับงานในลักษณะใดบ้าง)	O	O	O	O	O	O
52. ทักษะในการจัดการฐานข้อมูล	O	O	O	O	O	O
53. ทักษะในการออกแบบฐานข้อมูล	O	O	O	O	O	O
54. ทักษะในการเรียกดูข้อมูลจากฐานข้อมูล	O	O	O	O	O	O
55. ทักษะในการออกแบบส่วนติดต่อผู้ใช้งานฐานข้อมูล (user interface)	O	O	O	O	O	O
56. ทักษะในการเขียนโปรแกรม	O	O	O	O	O	O
57. ประเมินความรู้และทักษะด้านเทคโนโลยีและการออกแบบฐานข้อมูลของท่านโดยรวม	O	O	O	O	O	O

Figure Appendix D.1 Final version questionnaire (Continued)

ทักษะด้านการบริหารจัดการ

	5	4	3	2	1	0
58. ทักษะในการจัดการโครงการ (การวางแผน จัดระเบียบ จัดการ และควบคุมทรัพยากรต่างๆ เพื่อให้โครงการบรรลุเป้าประสงค์ โดยมีหัวใจสำคัญคือการจัดการความสัมพันธ์ระหว่างเวลา ราคา และคุณภาพในทรัพยากรที่กำหนดเพื่อให้ได้เป้าหมายตามต้องการ)	O	O	O	O	O	O
59. ทักษะในการจัดการความเปลี่ยนแปลง (กำหนดสิ่งที่ต้องการเปลี่ยนแปลง ประเมินผลกระทบที่จะเกิดขึ้นจากการเปลี่ยนแปลง ดำเนินการเปลี่ยนแปลงตามแผนที่วางไว้ สรุปผลการเปลี่ยนแปลง และเฝ้าระวังผลกระทบที่เกิดขึ้นจากการเปลี่ยนแปลง) (การเปลี่ยนแปลงในที่นี้หมายรวมถึงการเปลี่ยนแปลงทั้งที่เกิดจากโครงสร้างภายใน เช่นการเปลี่ยนแปลงกระบวนการจ่ายยาเพื่อเพิ่มความพึงพอใจของผู้รับบริการ และการเปลี่ยนแปลงอันเนื่องมาจากปัจจัยภายนอก เช่นการเปลี่ยนแปลงจากการบังคับใช้กฎหมาย)	O	O	O	O	O	O
60. ทักษะในการบริหารความเสี่ยง (กำหนดขอบเขตการบริหารความเสี่ยงของโครงการ วิเคราะห์จุดมุ่งหมายของโครงการ ระบุความเสี่ยงของโครงการ วิเคราะห์ความเสี่ยงที่อาจเกิดขึ้น วางแผนควบคุมความเสี่ยง ดำเนินการควบคุมความเสี่ยงตามแผน ตรวจติดตามความเสี่ยง)	O	O	O	O	O	O
61. ประเมินทักษะด้านการบริหารจัดการของท่านโดยรวม	O	O	O	O	O	O

ส่วนที่ 4 ประเมินความจำเป็นต่องานและสำรวจความต้องการฝึกอบรม

ความจำเป็นต่องาน

ความรู้และทักษะในหัวข้อดังกล่าวข้างต้นมีความจำเป็นต่องานปัจจุบันของท่านในระดับใด
(5=จำเป็นมากที่สุด 1=จำเป็นน้อยที่สุด 0=ไม่จำเป็น)

	5	4	3	2	1	0
62. ทักษะการใช้งานคอมพิวเตอร์	O	O	O	O	O	O
63. ทักษะการใช้งานอินเทอร์เน็ต	O	O	O	O	O	O
64. ความรู้และทักษะด้านการจัดการข้อมูล	O	O	O	O	O	O
65. ทักษะด้านการสื่อสาร	O	O	O	O	O	O
66. ความรู้และทักษะด้านเทคโนโลยีและการออกแบบฐานข้อมูล	O	O	O	O	O	O
67. ทักษะด้านการบริหารจัดการ	O	O	O	O	O	O

ความต้องการการฝึกอบรม

ท่านมีความต้องการการฝึกอบรมเพิ่มเติมในหัวข้อดังกล่าวข้างต้นในระดับใด
(5=ต้องการมากที่สุด 1=ต้องการน้อยที่สุด 0=ไม่ต้องการ)

	5	4	3	2	1	0
68. ทักษะการใช้งานคอมพิวเตอร์	O	O	O	O	O	O
69. ทักษะการใช้งานอินเทอร์เน็ต	O	O	O	O	O	O
70. ความรู้และทักษะด้านการจัดการข้อมูล	O	O	O	O	O	O
71. ทักษะด้านการสื่อสาร	O	O	O	O	O	O
72. ความรู้และทักษะด้านเทคโนโลยีและการออกแบบฐานข้อมูล	O	O	O	O	O	O
73. ทักษะด้านการบริหารจัดการ	O	O	O	O	O	O

ส่วนที่ 5 ข้อเสนอแนะ

หัวข้อใดที่ท่านต้องการฝึกอบรมเพิ่มเติมเป็นพิเศษ (สามารถระบุหัวข้อย่อยในแบบสอบถาม หรือหัวข้ออื่นๆที่ไม่มีอยู่ในแบบสอบถามได้)

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ข้อเสนอแนะเพิ่มเติมอื่นๆ

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เมื่อท่านตอบแบบสอบถามฉบับนี้เรียบร้อยแล้ว ขอความกรุณาส่งแบบสอบถามกลับมายังผู้วิจัย โดยนำแบบสอบถามพับครึ่งพร้อมทั้งเย็บด้วยที่เย็บกระดาษและส่งไปรษณีย์กลับมายังผู้วิจัย ซึ่งผู้วิจัยได้ระบุที่อยู่ส่งกลับพร้อมทั้งติดแสตมป์ไว้ที่แบบสอบถามแล้ว และโปรดส่งคืนภายในวันที่ 31 ตุลาคม พ.ศ. 2556

ผู้วิจัยขอขอบพระคุณท่านเป็นอย่างสูงมา ณ โอกาสนี้ ที่ได้ในความกรุณาในการตอบแบบสอบถาม

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APPENDIX E

Open-ended question results

Table Appendix E.1 Frequency and percent of the most wanted training topics/ other training topics

Most wanted training topics/ Other training topics	Frequency	Percent
1. Computer skills		
1) Computer skills	9	1.12
2) Skills in using computer applications	10	1.24
3) Computer programs installation	1	0.12
4) Microsoft Access	15	1.86
5) SPSS or other statistic applications	8	0.99
6) Operating system used in hospital	1	0.12
2. Internet skills		
1) Internet skills	7	0.87
2) Skill in searching and accessing information in online database	19	2.36
3) Create a website	3	0.37
3. Information management skill		
1) Information management skill	20	2.48
2) Skill in selecting data source	3	0.37
3) Skill in assessment of data source reliability	6	0.75
4) Health informatics standard (ex HL7)	2	0.25
4. Communication skills		
1) Communication skills	20	2.48
2) Appropriate response to questions	1	0.12
3) DIS case study	1	0.12
5. Technology and database design knowledge and skills		
1) Technology and database design knowledge and skills	39	4.84
2) Database design	3	0.37
3) Database management	25	3.11
4) Programming	17	2.11
5) System analysis	3	0.37
6) Network and protocol	1	0.12
7) Telepharmacy	3	0.37
8) Clinical decision support system	2	0.25
6. Management skills		
1) Management skills	17	2.11
2) project management	3	0.37
3) Change management	2	0.25
4) Risk management	3	0.37
5) Knowledge management	1	0.12
6) SWOT analysis	1	0.12
7. Miscellaneous		
1) Apply information technology (ex. using smart phone, tablet) to routine work	6	0.75
2) R2R research	2	0.25
Total	**254**	**31.55**

Table Appendix E.2 Frequency and percent of field of master degree

Field of Master Degree	Frequency	Percent
1. Master of Pharmacy		
1) Clinical pharmacy	50	6.21
2) Consumer protection	2	0.25
3) Community pharmacy	20	2.48
4) Pharmaceutical chemistry	2	0.25
5) Pharmacy administration	9	1.12
6) Pharmacognocy	3	0.37
7) Pharmaceutical product development	2	0.25
8) Pharmaceutical technology	1	0.12
9) Health informatics	1	0.12
10) Phytochemistry	1	0.12
11) Pharmacology	5	0.62
12) Pharmacy management	4	0.50
13) Hospital pharmacy	1	0.12
14) Social and administrative pharmacy	10	1.24
15) Food chemistry	1	0.12
16) Pharmaceutical botany	2	0.25
17) Pharmaceutics	5	0.62
18) Industrial pharmacy	3	0.37
19) Pharmaceutical care	5	0.62
20) Not specified	1	0.12
2. Master of Science		
1) Biostatistics	1	0.12
2) Health product management	3	0.37
3) Information technology and management	2	0.25
4) Consumer protection in public health	1	0.12
5) Aesthetic sciences and health	1	0.12
6) Not specified	1	0.12
3. Master of Public Health	18	2.24
4. Master of Public Administration	2	0.25
5. Master of Public Administration Program in Public and Private Management	2	0.25
6. Master of Arts in Social Development and Administration	1	0.12
7. Master of Business Administration	18	2.24
Total	**178**	**22.11**

Table Appendix E.3 Frequency and percent of other types of hospital

Other Types of Hospital	Frequency	Percent
1. Ministry of Defense	30	3.73
2. Ministry of Interior	1	0.12
3. Ministry of Justice	2	0.25
4. Ministry of Transport and Communications	1	0.12
5. Department of Medical Services, Ministry of Public Health	3	0.37
6. Royal Thai Police Headquarters	1	0.12
7. The Thai Red Cross Society	6	0.75
8. The Church of Christ	1	0.12
Total	**45**	**5.59**

Table Appendix E.4 Frequency and percent of other work scopes

Other work scopes	Frequency	Percent
1. Clinical pharmacy	11	1.37
2. Pharmaceutical care	23	2.86
3. Adverse Drug Reaction	11	1.37
4. Consumer protection	10	1.24
5. Community pharmacy	5	0.62
6. Ambulatory care	3	0.37
7. General Administration	2	0.25
8. Chemotherapy	1	0.12
9. Quality development	10	1.24
10. Thai Traditional Medicine Program	2	0.25
Total	**78**	**9.69**

Table Appendix E.5 Frequency and percent of other suggestions

Other suggestions	Frequency	Percent
1. Wish to be trained in these topics/ consider these topics are useful	9	1.12
2. Some of confusing questions occur	6	0.75
3. Wish to have program or database management that can help doing routine work better	4	0.50
4. Too much questions	3	0.37
5. Font is too small	1	0.12
6. Uncertain in self-assessment	1	0.12
7. Should assess base skill before training	1	0.12
8. Informatics topics should be added in pharmacy curriculum	1	0.12
9. Wish to have feedback of this questionnaire	1	0.12
10. Held proactive activities to convince leader to accept the importance of informatics knowledge	1	0.12
11. Wish to know how to choose and use optional freeware	1	0.12
Total	**29**	**3.60**

BIOGRAPHY

Name Teeraporn Chonsilapawit, Miss

Date of Birth November 25, 1980

Place of Birth Bangkok, Thailand

Workplace

2003-2005	Quality control section, National Blood Centre, Thai Red Cross Society
2005-present	Blood product production section, National Blood Centre, Thai Red Cross Society

Institution Attended

1998-2002	Chulalongkorn University Bachelor of Pharmaceutical Sciences
2011-2015	Silpakorn University Master of Pharmacy (Health Informatics)

Presentation

1. Teeraporn Chonsilapawit, Suang Rungpragayphan"Informatics knowledge, skills and training needs of hospital pharmacists in Thailand" The 5thAsia Pacific Pharmacy Education Workshop "Innovation in Pharmacy Education" 27-29 August 2014; Faculty of Pharmaceutical Sciences, Chulalongkorn University, Thailand.

2. Teeraporn Chonsilapawit, Suang Rungpragayphan "Relationship of age, education level, and gender with informatics knowledge and skills of hospital pharmacists" The 9thSilpakorn University International Conference on Academic Research and Creative Arts: Integration of Art and Science 11-21 February 2016; Silpakorn University, Sanam Chandra Palace, Nakhon Pathom, Thailand.