MEDICATION USE SITUATION AND THE DEVELOPMENT OF QUAILITY INDICATOR IN MEDICATION USE FOR ELDERLY IN THAILAND

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สถานการณ์การใช้ยาและการพัฒนาเครื่องชี้วัดคุณภาพการใช้ยาในผู้ป่วยสูงอายุในประเทศไทย

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วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรดุษฎีบัณฑิต
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การศึกษานี้มีวัตถุประสงค์เพื่อศึกษาสถานการณ์การใช้ยาในผู้ป่วยสูงอายุที่มารับการรักษาที่แผนกผู้ป่วยนอกของโรงพยาบาลระดับตติยภูมิ และเพื่อพัฒนาเครื่องชี้วัดคุณภาพการใช้ยาในผู้ป่วยสูงอายุในประเทศไทย สถานการณ์การใช้ยาศึกษาถึงรูปแบบของการสั่งใช้ยาและความเหมาะสมของการสั่งใช้ยาในผู้ป่วยสูงอายุตามเกณฑ์การใช้ยาที่มีความเสี่ยงสูงสำหรับผู้ป่วยสูงอายุ เป็นงานวิจัยเชิงพรรณนา และสำรวจแบบภาคตัดขวาง ทำการศึกษาในผู้ป่วยสูงอายุที่มีอายุมากกว่าหรือเท่ากับ 60 ปี โดยใช้ข้อมูลอิเล็กทรอนิคส์จากฐานข้อมูลเวชระเบียน ฐานข้อมูลการจ่ายยา และฐานข้อมูลการรักษา ของผู้ป่วยที่มารับบริการที่แผนกผู้ป่วยนอกในช่วงระยะเวลา 1 ปี (1ตุลาคม 2550 – 30 กันยายน 2551) เครื่องมือที่ใช้ในการเมินความเหมาะสมของการสั่งใช้ยา คือ รหัสยา ATC, 4th และเกณฑ์การใช้ยาที่มีความเสี่ยงสูงในผู้สูงอายุของวินิจและคณะ โดยใช้โปรแกรมไมโครซอฟต์แอคเซส 2003 ในการจัดการฐานข้อมูลจากโรงพยาบาลทั้ง 4 แห่ง และใช้โปรแกรม SPSS เวอร์ชั่น 17 ในการวิเคราะห์ข้อมูลทางสถิติ เทคนิคเดลฟายแบบปรับปรุงถูกนำมาใช้ในการพัฒนาตัวชี้วัดร่วมกับวิธี RAND appropriateness ขั้นตอนการพัฒนาตัวชี้วัดประกอบด้วย 4 ขั้นตอนหลัก 6 ขั้นตอนย่อย งานวิจัยนี้ใช้ตัวชี้วัดเชิงคุณภาพของ ACOVE และ STOPP ร่วมกับผลจากการศึกษาสถานการณ์การใช้ยา เป็นชุดตั้งต้นในการพัฒนา

ผลการศึกษามีผู้ป่วยสูงอายุทั้งหมด 115,047 ราย ร้อยละ 55.74 เป็นเพศหญิง อายุเฉลี่ยของผู้ป่วยเท่ากับ 70.26 ปี ผู้ป่วยส่วนใหญ่ (87%) ใช้สิทธิในระบบหลักประกันสุขภาพ และ 50% ของผู้ป่วยอยู่ในระบบหลักประกันสุขภาพถ้วนหน้า ค่าเฉลี่ยของการมาใช้บริการที่แผนกผู้ป่วยนอกเท่ากับ 3.5 ครั้งต่อคนต่อปี ผู้ป่วยส่วนใหญ่เป็นโรคความดันโลหิตสูงและร้อยละ 60 ของผู้ป่วยได้รับการวินิจฉัยว่ามีภาวะเจ็บป่วยมากกว่าหรือเท่ากับ 2 ร้อยละ 38 ของใบสั่งยาทั้งหมดจัดเป็นใบสั่งยาที่ได้รับยาหลายขนานร่วมกัน (มากกว่าหรือเท่ากับ 5 รายการยาต่อใบสั่งยา) จากการสั่งใช้ยาทั้งหมด พบการสั่งใช้ยาที่เป็นยาตามบัญชียาหลักแห่งชาติมากกว่าร้อยละ 70 ประมาณร้อยละ 50 ของการสั่งใช้ยา เป็นยาในกลุ่ม alimentary and metabolism และ cardiovascular ยาที่มีการสั่งใช้มากที่สุดคือซิมวาสทาทินพบการสั่งใช้ยาซ้ำซ้อนในกลุ่ม chemical subgroup จำนวน 117 กลุ่ม กลุ่มที่พบว่ามีการสั่งใช้ยาแบบซ้ำซ้อนมากที่สุดคือยาในกลุ่ม anti-vertigo การประเมินความเหมาะสมในการสั่งใช้ยาตามเกณฑ์ของวินิจพบว่าร้อยละ 14.68 ของใบสั่งยาทั้งหมดมีรายการยาที่ไม่เหมาะสมตามเกณฑ์ และพบการสั่งใช้ยาที่อาจเกิดปฏิกิริยาต่อกันระหว่างยาร้อยละ 1 การสั่งใช้ยาที่อยู่ในกลุ่มยาที่ควรหลีกเลี่ยงในผู้สูงอายุพบมากที่สุดคือ NSAIDs โดยที่พบมากที่สุดคือ diclofenac sodium และสำหรับการสั่งใช้ยาร่วมกันที่ไม่เหมาะสม พบการสั่งใช้ยา NSAIDs ร่วมกับ แอสไพรินมากที่สุด

ตัวชี้วัด PQIs-Thประกอบด้วยตัวชี้วัดสำหรับ 9 กลุ่มอาการ ประกอบด้วยตัวชี้วัด 301 ข้อ (จาก ACOVE 231 ข้อ, STOPP 65 ข้อและจากการศึกษา 5 ข้อ) ตัวชี้วัด 101 ข้อถูกเลือกในขั้นตอนการคัดเลือกขั้นที่ 1 และ เหลือ 86 ข้อในขั้นตอนที่ 2 เพื่อเตรียมชุดตัวชี้วัดให้ผู้เชี่ยวชาญในขั้นตอนของการให้คะแนน หลังจากผู้เชี่ยวชาญทำการประเมินครบ 2 รอบ ได้ตัวชี้วัดทั้งหมด 89 ข้อ และเหลือ 42 ข้อจากการประเมินตามเกณฑ์ของ RAND appropriateness

ที่ได้จากการศึกษานี้แสดงถึงภาพรวมของการสั่งใช้ยาในผู้สูงอายุที่เป็นผู้ป่วยนอก ข้อมูลการมารับบริการ เช่น ลักษณะของผู้ป่วย รายการยาต่อใบสั่งยา จากข้อมูลกลุ่มยา รายการยาที่มีการใช้มากและข้อมูลการสั่งใช้ยาซ้ำซ้อน ข้อมูลการสั่งใช้ยาที่ไม่เหมาะสม

เป็นข้อมูลที่มีคุณค่าในการแสดงถึงคุณภาพการสั่งใช้ยาในผู้ป่วยสูงอายุในประเทศไทยและตัวชี้วัดการสั่งใช้ยา PQI-Thได้ถูกพัฒนาขึ้นโดยใช้ตัวชี้วัดที่มีการใช้อย่างแพร่หลายร่วมกับปัญหาการใช้ยาที่พบมาเป็นตัวเริ่มต้น

ได้ชุดตัวชี้วัดเพื่อความเหมาะสมในการสั่งใช้ยาในผู้สูงอายุจำนวน 42 ข้อ

ภาควิชาเภสัชศาสตร์สังคมและบริหาร ลายมือชื่อนิสิต .....

สาขาวิชา เภสัชศาสตร์สังคมและบริหาร ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก .....

ปีการศึกษา 2556 ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์ร่วม .....

5377109233 : MAJOR SOCIAL AND ADMINISTRATIVE PHARMACY

KEYWORDS:MEDICATION USE SITUATION, ELDERLY, DUPLICATION MEDICATION, INAPPROPRIATE MEDICATION

DARANEECHIEWCHANTANAKIT: MEDICATION USE SITUATION AND THE DEVELOPMENT OF QUALITY INDICATOR FOR MEDICATION USE IN ELDERLY IN THAILAND. ADVISOR : ASSST. PROF.NIYADA KIATYING-ANGSULEE, Ph.D., CO-ADVISOR : ASST. PROF. YUPADEE SIRISINSUK, Ph.D., 151 pp.

The objectives of this study were to explore the situation of medication use in elderly in tertiary care hospital in Thailand, and to develop and assess the quality indicator for evaluating medication use for elderly in Thailand. The situation presented both the medication use patterns of the elderly and the appropriateness of medication use according to high-risk medication use criteria. The cross-sectional descriptive study was conducted by using the computerized databases of elderly patients who were more than 60 years old, from four tertiary hospitals, during 1st October 2007 to 30th September 2008. To evaluate the appropriateness of medication use, the ATC, 4th level code and the Winit-watjanahigh-risk medication use criteria were used. Microsoft access 2003 for window was used for database management and all statistical computing was performed using SPSS software version 17.0 (SPSS Co., Ltd, Bangkok, Thailand)..A modified Delphi technique was use for develop the prescribing quality indicators for Thai elderly (PQI-Th), and the RAND appropriateness method also used in this part. The process to develop the PQI-Th was composed of four processes; 6 steps, which are preparation process, selection process, rating process and adjustment process. ACOVE quality indicator and STOPP combine with result from situation study were used as a starting point for develop PQI-Th.

The total115, 047 elderly patients were included in the study. Female was 55.74 percent of the elderlyThe average age of the patients was 70.26 years. Most of the patients (87%) used some kinds of health insurances and 50% were in the Universal Coverage Scheme. The average number of visit was 3.5 times per person per year. Hypertensive disease was the majority of the underlying diseases, and 60% of the patients were diagnosed having two or more diseases. Thirty eight percent of the total prescription was counted as poly-pharmacy ($\geq$ 5 medications in a prescription). More than 70% of medication prescribed was the medication in the National List of Essential Medicines (NLEM). Approximately 50% of the medication was in alimentary and metabolism and in cardiovascular group, particularly simvastatin was the most common prescribed. Duplication medication found in 117 chemical subgroups. Most common duplication found was medication in anti-vertigo preparation. With the Winit-watjana criteria, 14.68% of all the prescriptions were recorded as inappropriate medication prescription (IMP) and 1% of total prescriptions reported drug-drug interactions. The most common medication should be avoided found was NSAIDs group, especially diclofenac sodium. Prescribing NSAIDs together with aspirin was the majority of drug-drug interactions.

The PQIs classified into 9 categories according to system of disease. After two round rating, 301 statement of QIs (231 QI from ACOVE, 65 QI from STOPP and 5 QIs from phase 1 analysis), 101 statements and 86 statements were selected in first step and in the second step, respectively. Five PQIs were edited by expert during first round and 3 PQIs were added in this process. After adjusted the PQI with criteria, 42 practice statements were accepted with high priority appropriate both importance and feasibility of implement PQIs.

The finding from this study showed the overall picture of medication prescribing for elderly, at ambulatory care clinic. The information, i.e. patient characteristics, number of medication per prescription, type of medications in the prescription, duplication therapy and the level of appropriateness were valuable for presenting the quality of medication use among the elderly in Thailand. The PQI-Thwas developed base on well-known indicators and problem of medication use in real practice. Forty two items of indicators were established.

Department : Social and Administrative Pharmacy Student's Signature .....

Field of Study : Social and Administrative Pharmacy Advisor's Signature .....

Academic Year : 2013 ..... Co-advisor's Signature .....

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ACOVE	Assessing Care of Vulnerable Elders
ADE	Adverse drug events
ADR	adverse drug reactions
ATC	the Anatomical Therapeutic Chemical
CSMBS	Civil Servant Medical Benefit Scheme
DALY	Disability Adjusted Life Year
DUR	Drug use review
ED	Essential drug according to the national list of essential medicines
IP	Inappropriate prescribing
IPET	the Improving Prescribing in the Elderly Tool
NED	non essential drug
NHSS	National Health Security Scheme
NLEM	National List of Essential Medicines
NSO	the National Statistical Office
PIM	potentially inappropriate medication
PIP	potentially inappropriate medication prescriptions
RAM	RAND appropriateness method
SSS	Social Security Scheme
STOPP	Screening tool of older persons' potentially inappropriate prescriptions
UC	Universal Coverage

CHAPTER I

INTRODUCTION

Rationale and Statement of the problems

The situation of population ageing are a big issued throughout the world, because of aging population is occurring at a fast rate.(WHO 1995). The meaning of 'population ageing' is an increase in the elderly share of the totalpopulation. These increases are associated with several factors such as a decline infertility rate, significant reductions in adult mortality and increased life expectancy (Lloyd-Sherlock 2000; Jun, Raven et al. 2007).

In Asia and the Pacific region including Thailand, the older people are expected to rise dramatically. In Thailand, the elderly population increased from 1.21 million in 1960 to 4.02 in 1990 and will reach 10.78 million in 2020 (Jitapunkul and Bunnag 1999). Impact from population ageing situation in term of socio-economic, employment, human resource allocation in long term is just beginning whereas those developed country already began (Jitapunkul and Bunnag 1999; Jitapunkul, Na Songkhla et al. 1999).In 2003, data about percentage of population divided by aged group from Thai elderly situation by Ministry of social development and human security. They showed the increasing percentage of population in aged group more than 60 that are 4.9, 5.5, 7.4, 9.5, 12.6 and 17.8 in 1970, 1980, 1990, 2000, 2010 and 2020, respectively.

Changing demographic patterns that are elderly population and patients with chronic disease increased are leading to increase medication prescribing and pharmaceutical expenditures. The increasing number of older people around the world has been focused especially by health care policy makers and workers in view of more cost and work load which has to be increased due to the fact that older people tend to suffer from multiple co-morbidities and various degenerative disorders. Disease and disability that caused by degenerative disorder mostly found in 4 systems that are neurological system, cardiovascular

system, respiratory system and genito-urinary system. Diseases that commonly occurred in elderly and strongly associated with later life are hypertension, stroke, hyperlipidemia, cancer, diabetes mellitus, psychiatric disorder, neurological disorder, gastrointestinal disorder and sensory disorder (Praditsuwan 2007). These require long-term cares which are often expensive. The previous study reported that there has been an overall increase in the hospitalization rates amongst the elderly 8.7% and 12.4% in 1993 and 2003, respectively (Jun, Raven et al. 2007).

Health problem in Thailand when presented by Disability Adjusted Life Year (DALY) showed non-communicable disease is a majority for DALY 85.2%. Data from the National Statistical Office (NSO) of Thailand, in 1991 and 2002, reported that pain and joint pain and insomnia are mostly found in elderly, however they trend to decline in 2002 while dementia are increased (NSO 2545).

Increasing age come with the increasing of chronic disease that require multiple medications for treatment. Therefore, older populations is utilized more drugs than younger populations. There are some evidence suggests that the use of medications in elderly patient often inappropriate because of the complexities of prescribing as well as other patient, provider, and health-system factors. For many reason that elderly faced include the general changes that occur with age, multiple chronic diseases that require multiple physicians as followed by multiple medications, furthermore, lack of geriatrics expertise and clinical pharmacist are contributing to place elderly individuals at increase risk of developing adverse drug reactions (ADR), drug-interaction, and failed therapeutic regimens in these patient (Monane and Cataldi 2000).

Suboptimal prescribing in elderly includes inappropriate prescribing, over-prescribing and under-prescribing. Inappropriate prescribing (IP) can cause substantial morbidity, and represents a clinical and economic burden to patients and society. The one of common problem are polypharmacy. Elderly people take an average of 4.5-8 medications per day

(Ferrini AF and Ferrini RL 1993). Patients 65 years and older are at significant risk of potentially inappropriate medication prescriptions (PIP), because ofpolypharmacy for multiple conditions and of resulting adverse drug events ranging from minor symptoms to serious adverse effects (Lau, Kasper et al. 2005). Two thirds of older people received regular medication and this commonly includes cardiovascular agents, antihypertensives, analgesic and anti-inflammatories, sedatives and gastrointestinal medication while hospitalized patient tend to receive laxatives, analgesic, major tranquilizers and benzodiazepines.

Potentially inappropriate are associated with adverse drug events and causing hospitalization. Therefore, there have been associated with increased healthcare costs and may be a marker for poor-quality care. A positive relationship between potentially inappropriate prescription and increased cost of pharmaceutical serviceswere found, but not between potentially inappropriate prescription and mortality. An effective drug benefit would greatly reduce or eliminate cost-relate compromise in the use of prescribed medications. Studies have suggested that the effectiveness of drug benefits varies with the extent of coverage (Safran, Neuman et al. 2002). Data from the National Health Account, in 1991, Americans spent $36 billion on prescription drugs of the $36 billion, the elderly account for about $12.7-$14.3 billion or $425-$475 per person. One study in Canada reported at least 30% of health care cost may be due to suboptimal practice (Naugler, Brymer et al. 2000).

Adverse drug events (ADE) are commonly occurred in elderly people, cause clinically significant morbidity and mortality and are associated with large economic costs (Budnitz, Shehab et al. 2007). Multiple disorders and severity of each disease also may contribute to the increased likelihood for ADEs in the elderly. The incidence of ADEs in the community dwelling elderly varies widely from 5% to 35%. The number of serious adverse drug reactions reports to the Committee on Safety of Medication is more than twice that in patients under 40 years old (Hudson and Boyter 1997; Cresswell, Fernando et al. 2007) .The detection of adverse effects

is the elderly is complicated by both the co-morbidity and the polypharmacy that are prevalent in geriatric medicine.

There are several study confirmed that prescribing medication for the elderly are inappropriate. In 1994, Wilcox et al, studied about suboptimal prescribing in elderly patient, reported that approximately one fourth of all elderly people living in the community were prescribed an inappropriate medication according to Beers criteria. Concordance with result from a study by Golden et al in 1997, were found 40% of homebound elderly individuals were prescribed an inappropriate drug according to the Beers criteria.

The evaluation and assessment of health care quality are required more attention by many countries around the world. There are several methods for evaluation and assessment health care that are quality indicator, standard treatment guideline, and the explicit and implicit criteria. The normal methods for assessing appropriate or inappropriate prescribing are explicit criteria and implicit professional judgment. Clinical guidelines focus on disease management, not patient management, and so may neglect interactions between treatment regimes in patients with two or more chronic conditions

A number of prescribing tools have been developed to monitor the appropriateness of prescribing. Theyare used to improve prescribing for the individual patient and for institutional audit. There have been various different methods that have been advocated for monitoring the appropriateness of prescriptions in hospital and community settings (Cantrill, Sibbald et al. 1998).

The Beers criteria is the most commonly used for evaluating appropriate drug utilization in the elderly. The another familiar tool is the Improving Prescribing in the Elderly Tool (the IPET) was developed by Naugler et al for used to screen potentially inappropriate prescriptions in the elderly in Canada (Naugler, Brymer et al. 2000).

Even through, Beers criteria is worldwide but it does not suitablein some countries. Because of the Beers criteria are only applicable to American medication. Additionally, the lists of drug in each country are different and this criteria has not been up to date, in terms of new drugs that launch to the market. For example, a study about inappropriate prescription in Finland by using Beers criteria found a small number of inappropriate prescriptions that causing by many of drugs in Beers criteria list are not even available in Finland (Pitkala, Strandberg et al. 2002; van der Hooft, Sturkenboom et al. 2006).

There are variations in prescribing between countries. Data from many countries include the Netherlands, the UK and southern European countries reported that percentages of drug prescribed by general practitioners (GPs) vary between 60-90%. There are a number of reasons for its variation, in terms of the choice of drug and the quantities prescribed, that are demographic difference in population, differences in morbidity, differences in the prescribing behavior and the quality of prescribing. Because of variation of prescribing from professional culture and clinical practice between countries, the guidelines and prescribing indicators may be differences. The consequently is the transferring of prescribing indicator or practice guideline have to validated and tested before applying.

There are the studies from the United States, the United Kingdom and also from Canada, described consensus development of quality indicators for drug use for the elderly patient, including drugs to avoid, maximum daily dose, drug duplication, limits on duration of use, drug-drug and drug-disease interactions, need for drug monitoring, underuse of necessary drugs to treat or prevent common problems and inappropriate drug-administration technique (Hanlon JT, Lindblad CI et al. 2003). Any published prescribing quality indicators have focused on the American health care system, Canada, the United Kingdom, and other countries. Existing guidelines in the United Kingdom largely focus on specific condition or drugs, and do not consider the overall quality or appropriateness of individual patients' drug regimen.

In 1997, Thailand started a hospital accreditation project designed primarily to ensure quality of care. The project was implemented worldwide by both public and private hospitals. The main focus of the accreditation project is to improve quality of care through the use of multidisciplinary approaches to patient care. Even though the quality indicator for prescribing has been become important for improving quality of health care, the quality indicator focusing prescribes medication for elderly patient has not been established in Thailand. They only have indicators that applying in hospital for hospital accreditation for the purpose of patient safety for example “Hospital Drug System Performance Indicator”.

For assess appropriateness, the combining explicit criteria with expert review to allow implicit judgments should be done. According to the Donabedian’s framework of quality, there are three types of indicators that are structure, process and outcome indicators.

In order to assessment, evaluation and improvement the quality of medication use, the quality indicator for medication use will be developed base on concept of process indicator.

From those weak points of published indicators and variation between countries, this research will develop a new quality indicator for medication use which based on the most population criteria and indicator that are Beers criteria, ACOVE indicator, MAI, and the IPET for evaluating medication prescription and that suitable for the context in Thailand. This research is designed for study about quality of drug utilization in hospitalized elderly patients by developed the optimal quality indicator of medication use for Thai elderly.

Research questions

1. What are the situations of medication use in Thai elderly in tertiary care hospital?

2. What is the optimal quality indicator for assessing quality of medication use in Thai elderly?

Purposes of study:

1. To explore the situation of medication use in elderly in tertiary care hospital in Thailand.

2. To develop and assess the quality indicator for evaluating medication use for elderly in Thailand.

Expected Benefits:

1. The result of this study will provide the current situation of medication use in elderly in Thailand.
2. Health care providers can use the quality indicator (QI) as a screening tool to detect potential inappropriate medication use.
3. The QI will be used to identify the targeted step that need to be improve in medication use process.
4. The developed tool can be used by national policymaker such as payers or quality auditors to evaluate the hospital performance as a part of system to evaluate hospital performance.

Operational definitions

Older people/ elderly defined as persons who 60 years of age and older.

Inappropriate medication use defined as the use of medicines that introduce a significant risk of an adverse drug event or the use of medication that should be avoided base on the explicit criteria.

Adverse drug reaction defined as a undesired and unintended response to medication.

Polypharmacy is defined as the use of multiple drugs in a single prescription; the use of multiple drugs to treat multiple concurrent disorders in the same patient; especially the indiscriminate prescription of many drugs to elderly patients.

Duplication therapy is defined as the use of two or more medication in same ATC 4th level for the same condition.

Indicators are explicitly defined and measurable items which act as building blocks in the assessment of care.

Quality indicator defined as a tool for measuring and monitoring medication use for ensure the quality of medication use.

Process indicator defined as a process of prescribing and dispensing medication.

Prescribing

Drug use evaluation (DUE) is structural and authorized process for review of prescribing by physician, dispensing by pharmacist, and administering medication by nurse and patient themselves. DUE involves a comprehensive review of patients' prescription and medication data before, during, and after dispensing to ensure appropriate medication decision making or to determine the drug therapy concordance with approved criteria, and positive patient outcomes"

Scope of the study

1. This study will be conducted out inpatient at tertiary care hospital, by using database.
2. The quality indicator for medication use will be developed for use in elderly patient in tertiary care hospital.

Conceptual framework

DonabedianA. proposed a model for assessing health care quality based on three dimensions which was structures, processes and outcomes. This framework was commonly use in healthcare system research. Structure defined as the environment in which health care is provided, process defined as the method by which health care is provided, and outcome defined as the consequence of the health care provided. Adapted from Donabedian's framework, the quality indicator for medication prescription in this study will involve only in a block of process in term of a process indicator. The reason for using process indicator are: 1) processes are a more efficient measure of quality, 2) for the most conditions there are insufficient information in the medical record and 3) process of care are amendable to direct action by providers. (RAND, Corporation et al.).

Conceptual framework for this study was show in Figure 1. The developed prescribing quality indicator contain 4 parts that is prescribing indicated medications, avoiding inappropriate medications, education, continuity, and documentation, and medication monitoring (Shrank, Asch et al. 2006) by using the information of medication prescribing in Thai elderly, and the particulat list of quality indicators form ACOVE and STOPP. Quality indicator for medication prescribing will provide information for decision making to improve the process of prescribing and dispensing. The consequence of medication use follow the developed quality indicator may improve output or outcome of pharmacotherapy.

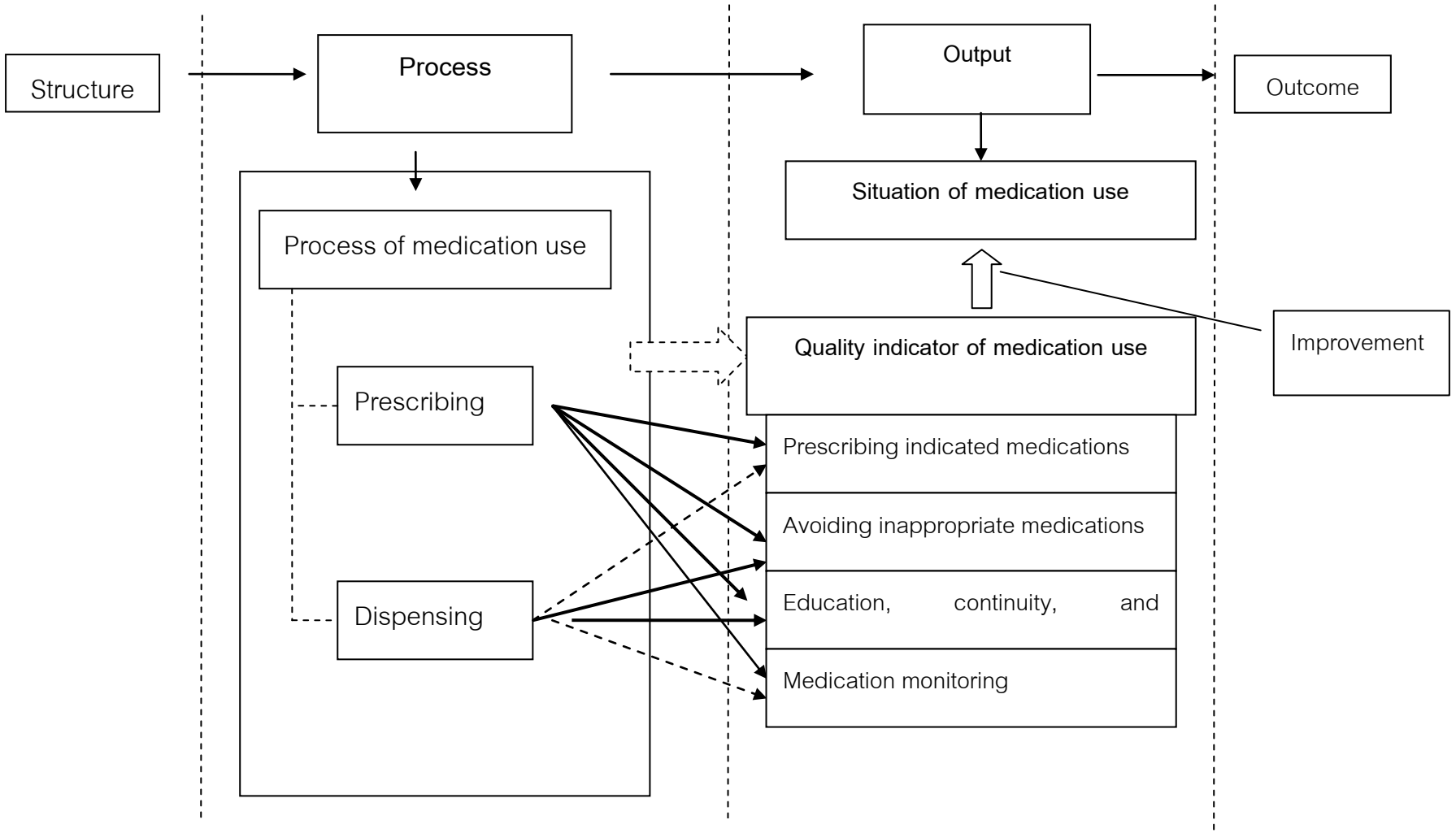


Figure 1. Conceptual framework for developing prescribing quality indicator for Thai elderly

CHAPTER II

LITERATURE REVIEW

To study about quality indicator of medication use in elderly, this chapter composed of 3 main parts that are elderly population, situation of medication use in elderly and tool for measuring medication use and quality indicators.

Part 1: Elderly population

The world's population has been growing at an annual rate of 1.7% during the period 1990-1995, and the population aged over 65 is increasing by some 2.7% annually. Of a world total of 355 million people over 65 in 1993, more than 200 million are in the developing world, where they make up 4.6% of the population, with more than 150 million in developed countries, where the proportion is 12.6%. Similarly, the elderly population in Asia and the Pacific region including Thailand is expected to rise dramatically. In Thailand, the elderly population increased from 1.21 million; in 1960 to 4.02 million; in 1990 and will reach 10.78 million in 2020. However, the situation which is seriously considered is population ageing. Population ageing means an increase in the elderly share of the total population. In 1960 only 4.6 percent of the whole population was elderly aged 60 and over. In 1990 the elderly population share was 7.36 percent of the total population. They will represent 15.28 percent by 2020 (Jitapunkul and Bunnag 1999).

Population ageing presents a range of challenges to governments throughout the world. This situation created an economic problem as the taxation base decrease and the support needs of an older population increase. The challenge for all countries is to develop health strategies that result in older people remaining healthier for longer. Success will not only contain the costs of health care but will improve the quality of life of an increasing proportion of the population. The challenge of an ageing population is particularly pressing in

developing countries. Elderly populations are rapidly increasing in the developing world – at a much faster rate than has occurred in the developed world (Lloyd-Sherlock 2000).

In 2003, data about percentage of population divided by aged group from Thai elderly situation by Ministry of social development and human security as showed in table below. They showed the increasing percentage of population in aged group more than 60 that are 4.9, 5.5, 7.4, 9.5, 12.6 and 17.8 in 1970, 1980, 1990, 2000, 2010 and 2020, respectively.

Table 1. Percentage of population divided by aged group

Year / Aged group	1970	1980	1990	2000	2010	2020
0-14	45.1%	38.3%	29.2%	24.4%	20.3%	18.4%
15-59	50.0%	56.2%	63.4%	66.1%	67.1%	63.8%
More than 60	**4.9%**	**5.5%**	**7.4%**	**9.5%**	**12.6%**	**17.8%**

The increasing number of older people around the world has been focused especially by health care policy makers and workers in view of more budget and work load. The pattern of health and disease is consistently related to demographic, social and economic conditions. A degree of socio-economic development resulting in improved health intervention and greater use of medical technology permits infectious diseases to be brought under control. This results in lower infant and adult mortality rates. Communicable diseases particularly acute infectious diseases among children are declining while degenerative diseases, mental illnesses and accidental injuries are increasing. The diseases, which are increasing in frequency, are definitely diseases of the elderly. Age-specific mortality rates of diseases which effect Thai elderly include coronary heart disease, stroke, malignant neoplasm, and accident and trauma (The national commission on the elderly ; Jitapunkul and Bunnag 1999; Kubo, Nakayama et al. 2005).

The older people suffer from various degenerative disorders and most older patients have multiple comorbidities. Disease and disability that caused by degenerative disorders found in 4 systems that are neurological system, cardiovascular system, respiratory system and genito-urinary system. Diseases that commonly occurred in elderly are hypertension, stroke, hyperlipidemia, cancer, diabetes mellitus, psychiatric disorder, neurological disorder, gastrointestinal disorder and sensory disorder (Assantachai, Chongsuphajaisiddhi et al. 1998; Maranatre 2006; Praditsuwan 2007)

Thailand had a policy for supporting the situation of population ageing by drawn the first version of the Long-term Plan for the Elderly in Thailand in 1986. This first plan was a plan for year 1986 to 2001. The National Committee for the Elderly was use this plan as the framework and guidelines for the autorized and associated organizations. In 1992., the National Long-term Plan of Action for Elderly (1992-2011) was prepared to support the implementation of government policies on the care of older persons. The objectives of the plan are to provide the elderly with general knowledge on changing age and environmental adjustments including health care, to provide the elderly with protection and caring of families and community in other welfare services as deemed necessary, to support roles of the elderly in participation of family and other activities, and to emphasized the responsibility of the society for the elderly .

Although Thailand has national policy for older persons, it does not have a policy for preparation people for old age. Preparation for old age should be a lifetime process starting from youth and covering all critical aspects of life:- health, education, financial security, for example and should be pursued at the national, community, family and individual levels (Jitapunkul and Bunnag 1999).

Future trends of state actions for ageing population should include providing welfare of all aspects, particularly a pension for every Thai elderly. Social security and promotion of private pension insurance are unavoidable strategies in the future, strengthen family values

and sustain family support for the elderly, strengthen community participation in both social and health care sectors, providing welfare and support-schemes for care-giver of dependent elderly and disables, providing community care in both health and social sectors especially at the primary health care level, strengthen informal care which is also an essential domain of care for Thai elderly, providing continuous programs for both formal and informal education for the elderly and younger people nation-wide, providing education and training for both health and social personnel. Finally,this service should be improved ability of self care among the elderly and this should cover not only health promotion and prevention but also simple curative care and rehabilitation. Alternative medicine is also invaluable.

Part 2: Situation of medication use in elderly and tool for measuring medication use

2.1 Situation of medication use in elderly

2.1.1 Inappropriate use of medication in elderly

It is clearly established that older people suffer a high rate of disease related to medication. Probably the major reason for this is that older patients are prescribed more drugs than younger people and the rate of prescribing appears to be increasing all the time (Thompson S and Crome P 2002). It seems likely that prescribed medicines will continue to increase across all age groups and in both developed and developing countries. By themselves, the elderly have tendency to adverse drug reaction because of altered pharmacokinetics and pharmacodynamic. Moreover, polypharmacy and non adherence to drug regimen are contributed to adverse drug event (Hanlon JT, Schmader IE et al. 1997; Cresswell, Fernando et al. 2007). Reducing polypharmacy was felt to be the best way to lower the risk of adverse drug reactions in older people (Rajska-Neumann A and Wieczorowska-Tobis K 2007).

The multiple concomitant diseases and multiple prescriptions often comewith the older people. Prescribing for older people is challenging as any new medication must be considered in the context of altered pharmacokinetics which was drug absorption, distribution,

metabolism and excretion; altered pharmacodynamics which was physiological effects of the drug; and age-related changes in physiology and body composition. In elderly people, a decrease in lean body mass and total body water affect a relative increase in total body fat.Such changes lead to a decreased volume of distribution for hydrophilic drugs such as lithium, ethanol and digoxin where unadjusted dosing can result in higher plasma concentrations, thus increasing the potential for adverse effects. Conversely, lipid soluble drugs such as long-acting benzodiazepines have an increased volume of distribution, thereby delaying their maximal effects and resulting in accumulation with continued use (Patricia M.L.A, van den Bemt et al. 2000).

With ageing, there is a reduction in hepatic mass and blood flow. Some group of medications such as beta-blockers, nitrates and tricyclic anti-depressants which have a first pass effect in the liver may have a higher bioavailability in older people and thus be effective at lower doses. Moreover, cytochrome P450 oxidation declines with ageing and drug–drug interactions involving these enzymes are important to recognize. Excretion is altered as a result of age-related changes in renal structure. Larger drug storage reservoirs and decreased clearance prolong drug half-lives and lead to increased plasma drug concentrations in older people. If serum albumin is decreased there will be an increase in the active unbound drug concentration for highly protein-bound drugs such as phenytoin, theophylline, warfarin and digoxin.

Ageing is also associated with changes in the end-organ responsiveness to drugs at receptor or post-receptor level. There is decreased sensitivity to beta-receptors along with a possible decreased clinical response to beta-blockers and beta-agonists. Increased sensitivity to drugs such as opiates and warfarin is common. Changes in patient medical status over time can cause medications that have been used chronically to become unsafe or ineffective. Particular care must be taken in determining drug dosages when prescribing for older adults.

2.1.2 Types of inappropriate prescribing

In clinical practice,there found3types of potentially inappropriate prescribing (PIP) (Gallagher P, Barry P et al. 2007). First type of PIP is medication should be avoided because there is the use of medication known to have a high incidence of adverse effects in the elderly patient. The second type of inappropriate prescribing is polypharmacy, which may result in multiple drug interactions and the last one is under-prescribing of drugs for which there is clear evidence of efficacy.

Hasting and colleague classified the inappropriate prescription into 4 categories. (Hastings, Sloane et al. 2007). The definition of four category of inappropriate prescription are;

1. Drug-to-avoid criteria: discharge medication is one that should be avoided in elderly patients followed Beers list.

2. Drug-drug interactions: discharge medicat6ion has potential to interact with one of patients' other medications.

3. Drug-disease interactions: discharge medication has potential to exacerbate one of patients' underlying medical conditions.

4. Failure to satisfy an explicit quality indicator: discharge medication does not satisfy a QI for optimal prescribing or care subsequent to emergency department discharge does not satisfy a QI for medication monitoring.

2.1.3 Methods of measuring appropriate prescribing

There were many different methods that were used for monitoring the appropriateness of prescriptions in hospital and community settings (Thompson S and Crome P 2002).

1. Beers criteria: Beers *et al*. developed criteria to determine PIM in nursing homes. (Fick, Cooper et al. 2003; van der Hooft, W.'t Jong et al. 2005)

2. Prescribing quality indicator for vulnerable elderly: A newer set of quality indicators for appropriate prescribing in the elderly was developed as part of the Assessing Care of Vulnerable Elders (ACOVE) project. These criteria were developed by methods similar to Beers, but the process also included a comprehensive literature review prior to submitting statements to an expert panel for consideration. The outcome was 12 quality indicators with supporting evidence. They are suggested to measure prescribing practice in older people (RAND, Corporation et al. ; Chow and MacLean 2001; Knight and Avon 2001; Leape, Hilborne et al. 2001; Wenger and Shekelle 2001).

3. UK also developed quality indicators for appropriate prescribing as same as United States of America. Oborne*et al.* developed fourteen prescribing indicators of appropriateness specifically for an elderly inpatient population(Oborne, Batty et al. 1997).

4. Cantrill*et al.* purpose nine criteria to be applied in primary (community) care to assess medication regimes (Cantrill, Sibbald et al. 1998).

5. The IPET Tool (Improving Prescribing in the Elderly) published in Canada returns to the format adopted by Beers in suggesting specific drugs to be avoided in older people. The advantage of the IPET tool is easy to apply but it is limited in only assessing specific areas of inappropriate prescribing (Naugler, Brymer et al. 2000).

6. A tool for monitoring medication use in community-dwelling older people.was developed by Hanlon and colleaguesThey studied for 4 years with using explicit criteria developed and validated by the consensus of an expert panel. Eight categories of medication were defined in terms of dosage, drug interaction, duplication and duration, as a potential risk to older patients. These were digoxin, calcium channel-blockers, non-steroidal anti-inflammatory drugs (NSAIDs), angiotensinconverting enzyme (ACE) inhibitors, H2 receptor

antagonists, benzodiazepines, anti-psychotics and antidepressants (Hanlon J T, Schmader et al. 2001; Hanlon JT, Lindblad CI et al. 2003; Spinewine, Schmader et al. 2007).

7. The Medication Appropriateness Index (MAI)used for measures the appropriateness of prescribing for elderly patients. It used 10 criteria for each medication prescribed. For this criteria, the evaluator rates whether the medication is appropriate, marginally appropriate, or inappropriate. The MAI has been used in observational and interventional studies. Its feasibility, content validity, predictive validity, and reliability have been demonstrated in ambulatory settings (Hanlon, Artz et al. 2004).

2.2 Study about inappropriate medication use

People over the age of 65 years have a higher prevalence of chronic illness, disability and dependency than those <65 years. They are more likely to be on medication than younger people. They are often taking several drugs at once to treat concomitant disease processes. A survey of 2590 non-institutionalized older adults in the United States showed an increased usage of all medications with advancing age, the highest prevalence of drug use being in women 65 years of age and older with 12% taking 10 or more medications and 23% taking at least five prescribed drug therapies. Everitt and Avorn found that elderly women took, on average, 5·7 prescription drugs and 3·2 non-prescription drugs concurrently. In most industrialized nations older people consume three times as many prescription medications as younger people and purchase 70% of non-prescription medications.

In the United States, Ireland and Europe, there is some study report the percentage of elderly population and percentage of medication consumed. In the United States, 12·5% of the population is over 65 years of age but consume 32% of all prescription medications and account for 25% of drug expenditure and 30% of total national healthcare expenditure. In Ireland, people over the age of 65 years comprise 11·13% of the population but consumes 47% of all prescription medications. In Europe, people over 65 years of age consume on average 2·3 times the amount of health care than do those <65 years of age. These figures

indicate that older people are the greatest consumers of medications and healthcare resources in developed countries

Potentially inappropriate prescribing in Europe (Fialová, Topinková et al. 2005; Gallagher, Barry et al. 2007)

Beers' criteria and McLeod's criteria were developed in the United States and Canada respectively, on the basis of those countries' national drug formularies. European-specific criteria for potentially inappropriate medication use have not yet been developed, primarily because of significant differences in national drug formularies. However, a number of European studies have adopted Beers and McLeod criteria to investigate the prevalence of potentially inappropriate medication use by older people in Europe and to determine the risk factors for receiving such prescriptions. A population-based survey in Finland estimated the prevalence rate of inappropriate prescribing at 12·5%. A study of hospitalized elderly people in Italy found the prevalence rate of potentially inappropriate medication to be 14·6% using Beers 1997 criteria. In this Italian study, age and cognitive impairment were associated with less inappropriate drug use, whereas a direct relationship was observed for a number of drugs used during hospital stay and Charlson co-morbidity index. These studies showed a somewhat lower prevalence of inappropriate medication use in Europe than in the United States. However, because of different study populations, time horizons and methodologies these studies have little comparability.

Van Der Hooft*et al.* studied the computer-based records of a group of 150 general practitioners in the Netherlands from 1997 to 2001. Using Beers' 1997 and 2002 criteria this study found that the most frequently prescribed inappropriate drugs were nitrofurantoin, long-acting benzodiazepines, amitriptyline, promethazine and cimetidine. Conventional NSAIDs in persons with a history of gastric/duodenal ulcer were the most frequently prescribed contra-indicated drugs. The 1-year risk of receiving at least one inappropriate drug prescription for older people living in the Netherlands ranged between 16·8% and 18·5% according to the 1997 criteria and between 19·1% and 20% according to the updated 2002 criteria.

A large, retrospective, cross-sectional study combined Beers' 1997 and 2002 criteria and McLeod's 1997 criteria to determine the prevalence of potentially inappropriate medication use in 2707 patients receiving home-care in 8 European countries. Using all three sets of prescribing criteria in combination, 19·8% of these patients received at least one inappropriate medication. There were significant differences in the prevalence rates of inappropriate medication use between countries in Eastern Europe (41·1% Czech republic) and Western Europe (mean 15·8%, ranging from 5·8% in Denmark to 26·5% in Italy). Potentially inappropriate medication use was associated with polypharmacy, anxiolytic drug use, depression and poor economic situation. The odds of potentially inappropriate medication use were significantly increased with the number of associated factors. Those aged 85 years and older, and those living alone, were less likely to receive a potentially inappropriate prescription. The research group also applied Beers 1997 criteria in isolation to the data and found that the prevalence of potentially inappropriate medication use was generally <11%.

In 2002, Daniela Fialová et al study about the prevalence and associated factors of potentially inappropriate medication use among elderly home care patients in European countries include Czech Republic, Denmark, Finland, Iceland, Italy, the Netherlands, Norway, and the United Kingdom A retrospective cross-sectional study was conducted of 2707 elderly patients receiving home care This study combining all 3 sets of criteria, they found that 19.8% of patients in the total sample used at least 1 inappropriate medication; using older 1997 criteria it was 9.8% to 10.9%. Substantial differences were documented between Eastern Europe (41.1% in the Czech Republic) and Western Europe (mean 15.8%, ranging from 5.8% in Denmark to 26.5% in Italy). Potentially inappropriate medication use was associated with patient's poor economic situation (adjusted relative risk [RR], 1.96; 95% confidence interval [CI], 1.58-2.36), polypharmacy (RR, 1.91; 95% CI, 1.62- 2.22), anxiolytic drug use (RR, 1.82; 95% CI, 1.51-2.15), and depression (RR, 1.29; 95% CI, 1.06-1.55). Negatively associated factors were age 85 years and older (RR, 0.78; 95% CI, 0.65- 0.92) and living alone (RR, 0.76; 95% CI, 0.64-0.89). The odds of potentially inappropriate medication use significantly

increased with the number of associated factors (*P*_.001).(Daniela Fialová, Eva Topinková et al. 2005)

2.3 Drug utilization review (DUR)

Drug utilization review (DUR) is a process that used to assess the appropriateness of medication therapy by engaging in the evaluation of data on drug use in a given health care environment against predetermined criteria and standards. If therapy is determined to be inappropriate, interventions may be needed with specific patients or providers to optimize drug therapy (Fulda, Lyles et al. 2004). DUR has been undertaken for as long as pharmacists have been practicing their profession. Pharmacy education has traditionally stressed the importance of the 3 Rs (right drug, right dose, right time). Several factors are different today, such as an immense and rapidly growing body of knowledge, the incorporation of some of this knowledge into criteria for appropriate and inappropriate drug use, and the potential application of support technologies. DUR promised to reduce or eliminate serious preventable drug-related morbidity. (Fulda, Lyles et al. 2004). Thus, DUR is a process both to improve the quality of care and to reduce avoidable expenses.

There are 3 approaches to DUR generally recognized. There is a prospective DUR (pDUR) or concurrent DUR (cDUR)and retrospective DUR (rDUR). It can be performed either prospectively or retrospectively. By the way, the focus of each approach is quite different.

1. Prospective DUR involves reviewing each prescription for an individual patient before it is dispensed. Reviews are typically conducted electronically during the claims adjudication process before the product is dispensed. This review is designed to identify potential problems such as drug-drug interactions (DDIs) or drug-disease contraindications (when disease information is available or using surrogate indicators), therapeutic duplication, inappropriate dosage, duration of therapy or other potential adverse drug events. (Lyles, Sleath et al. 2001). When the pharmacist is alerted to one or more of these potential problems,

he or she is expected to use professional judgment to determine an appropriate intervention, which may include counseling the patient or alerting the prescriber. Interventions may result in the prescription being dispensed as written, changed, or not filled.

2. Concurrent DUR is ongoing process of DUR. It performed during the course of treatment and involves the ongoing monitoring of drug therapy to ensure positive patient outcomes. It is the opportunity of pharmacists to alert prescribers of potential inappropriate medication and to intervene in areas such as drug-drug interactions, duplicate therapy, over or underutilization, and excessive or insufficient dosing. This type of DUR allows therapy for a patient to be altered if necessary.

3. Retrospective DUR occurs after the prescriptions have been dispensed and “uses practice pattern analysis to identify the use of high-cost drugs, to compare particular classes of drug use by different facilities or providers, or to monitor adherence to pharmacotherapy recommendations from practice pattern guidelines for the treatment of particular diseases”(Lyles, Sleath et al. 2001). RDUR examines drug use after the drug has been dispensed and often occurs after the drug has been consumed. The aim of rDUR is to discern patterns of inappropriate or suboptimal drug use, which may result in PDRM, and engage in interventions with providers to prevent future unfavorable or undesirable outcomes. Because of its retrospective nature, this form of DUR is less well-suited to alert practitioners to prevent potentially avoidable problems in currentpatients. While rDUR interventions can be used to influence the use of drugs in current patients, the majority of the value of rDUR lies in identification of patterns of prescribing or drug use that may lead to future preventable drug-related morbidity.

Table 2. Summary an inappropriate study applied the 1997 Beer criteria

References	Setting	Design	Data source	Sample size	Prevalence (%)	Year
Chin et al (1999)	Emergency department	Prospective	Hospital database	898	10.6 at time entry 3.6 in ED 5.6 at discharge	1995-1996
Golden et al (1999)	Nursing home	Retrospective, cross sectional	Medicaid	2253	39.7	1997
Hanlon et al (2000)	Community dwelling elderly	Retrospective, cross sectional	Duke data	3314 in wave 2, 2551 in wave 3	27 in wave 2 22.6 in wave 3	Wave2: 1989-90 Wave 3:1992-3
Mort and Aparasu(2000)	Ambulatory visit	Retrospective, cross sectional	National amburatorymedicare survey, national hospital amburatorymedicare survey	1373 involving psychotropic	Psychotropic medication 27.2	1996
Mott and Meek (2000)	Community pharmacist	Retrospective, cross sectional	Random survey of community pharmacies	1530	14.3	1996

Table 2. Summary an inappropriate study applied the 1997 Beer criteria (Cont.)

References	Setting	Design	Data source	Sample size	Prevalence (%)	Year
Piecoro et al (2000)	Elderly with Medicaid	Retrospective, cross sectional	Medicaid claim data	64832	27	1996
Fick et al (2001)	Medicare managed care elderly	Retrospective, cross sectional	HMO claim data	2336	24.2	1998
Meredith et al (2001)	Home healthcare elderly	Retrospective, cross sectional	Claim data	8058	17	1996-8
Spiker et al (2001)	Indigent and homeless elderly	Retrospective, cross sectional	Medical profile	146	35.6	1999-2000
Zhan et al (2001)	Community dwelling elderly	Retrospective, cross sectional	Medical expenditure panel survey	2455	21.3	1996
Hanlon el al (2002)	Community dwelling elderly	Retrospective, cross sectional	Duke data	3234+2451	28	1898-1993
S. Nicole Hastings et al (2007)	the emergency department (ED) or urgent care clinic	Retrospective, cohort study	Hospital database	421	31.8	2005

The quality of DUR depends on the quality of the criteria used to determine if a problem exists. These criteria can be implicit (based on an individual's expert judgment, clinical experience, and knowledge of the literature), or they can be explicit (based on compendia, texts, and literature). A mixed strategy that combines both explicit and implicit criteria may be an optimal approach in developing standardized criteria (2001).

The goals of DUR embrace the concepts of both quality control and quality assurance to enhance the use of pharmaceuticals. Quality control relates to process-oriented criteria that measure factors such as appropriateness of dose or duration of therapy. Quality assurance relates to measuring outcomes of therapy with drugs. Because clinical judgment is based on personal opinion and the interpretation of available data, it is important to reach a consensus among the scientific community both about the need for criteria for the particular aspect of care being reviewed and about what those criteria should be (Sjöqvist and Birkett 2003).

Drug use evaluation (DUE) is an ongoing, systematic, criteria-based program of drug evaluations that will help ensure that appropriate drug use is provided. If therapy is determined to be inappropriate, interventions with providers or patients will be necessary to optimized drug therapy. This terminology is similar to drug utilization review (DUR) (2001).

At one time, a distinction was drawn between DUE and DUR based on the notion that the former was prospective and the latter retrospective. However, most experts agree that there is little difference between the two and favor use of the term DUE.

DUE are conducted for a various purpose such as ensuring that the drug therapy meets current standards of care, creating guidelines for appropriate drug utilization and preventing medication-related problems(2001)

To be study about DUR, understanding of drug utilization research is necessary. Drug utilization research and pharmacoepidemiology may provide insights into the following aspects of drug use and drug prescribing (Sjöqvist and Birkett 2003):

Pattern of use: extent and profiles of drug use and trends in drug use and costs over time.

Quality of use: audits comparing actual use to national and regional prescription guidelines or local drug formularies. Quality indices of drug use may include the choice of drug (compliance to recommended assortment), drug cost (compliance to budgetary recommendations), drug dosage (awareness of inter-individual variations in dose requirements and age dependence), drug interaction awareness, ADR awareness, proportion of patients being aware of/unaware of the cost/benefit of the treatment, etc.

Determinants of use: user characteristics (e.g. socio-demographic parameters, attitude towards drugs), prescriber characteristics (e.g. specialty, education and factors influencing therapeutic decisions), and drug characteristics (e.g. therapeutic properties, affordability)

Outcomes of use: health outcomes (benefits and adverse effects) and economic consequences.

2.4 The study of drug utilization review (DUR) in Thailand

This study was a systematic review through electronic search of several databasesby using keyword: 'older AND drug', 'older AND medication', 'elderly AND drug', 'elderly AND medication', 'Geriatric AND drug', and 'Geriatric AND medication'. Moreover, the search term 'Thailand' was added within search results

For electronic search, a several database both international and Thailand are using.

1. Scientific database: Sciencedirect(www.sciencedirect.com), Cochrane library (www.thecochranelibrary.com) and Pubmed(www.ncbi.nlm.nih.gov/pubmed)

2. University website: Khonkaen university (www.kku.ac.th), Chiang Mai university (www.cmu.ac.th), Prince of Songkla university (www.psu.ac.th), Silpakorn university (www.su.ac.th), Naresuan university (www.nu.ac.th),UbonRajathaneeuniversity (www.ubu.ac.th), Chulalongkorn university (www.chula.ac.th), Mahidol university (www.mahidol.ac.th), SukhothaiThammathirat open university (www.stou.ac.th), Mahasarakham university (www.msu.ac.th), SrinakharinWirot university (www.swu.ac.th) and Union of library of Thai university (www://dems.or.th/dcms/basic.php)

3. Journal online: Thai research (www.thesis.tiac.ac.th), research supporting by Health system research instated (http://www.hsri.or.th/)

4. Supporting research: Internal health policy program, Thailand (www.ihpp.thaigov.net) and The Thailand Research Fund (http://www.trf.or.th/)

For the result from an intensive search, a few studied about medication use in Thai elderly was found. Majority of research in elderly are about general health, elderly health behavior, and study of disease often occurred in elderly. Others research are study in the social aspect and behavioral aspect.

There are a few study about medication use in elderly was conducted in Thailand. In 1999, Boonchoo was study about medication prescribing in elderly outpatients at BuddhachinnarajPhitsanulok(Boonchoo 2001). In this study, the Beer's criteria were used to identify inappropriate medication prescribing. Finding from the study, medication prescribing with risk of adverse drug event at least 1 drug/visit was 29.9%. The most frequently prescribed drug was diazepam (26.7%), the other were amitryptyline, chlorxazone, chlorpheniramine and cyproheptadine.

There are a study of drug used by outpatients of geriatrics clinic at Pramongkutklao Hospital was conducted for 2 month, by using a retrospective study. The result from the study

found 350 elderly patients visit at geriatric clinic during study period. Medication was prescribed for 2002 items. The Average 5.71 items/prescription (1-16) and top 3 medication prescribed are vitamin and mineral (antioxidant vitamin), CVS (Hypertension), musculoskeletal (NSAIDs)(Meechana, Daram et al. 2000)

In 2003, the recently study of medication use in elderly in Thailand was conducted in elderly dental patients (Jainkittivong A, Aneksuk V et al. 2004). The finding from the study was elderly patients tended to have more chromic health problem and consume more medication than other age group. Focus in medication use, sixty-five percent of this elderly population reported taking medications, with an average of 1.5 drug group/ person. The maximum number of drugs use was four. The number of drug used was 1.3 drug group/ person in the 60-64 year group, 1.5 drug groups / person in the 65-69 , and 1.6 drug groups/person in the 70 year and older group. The distribution of various medications used among the elderly in relation to sex. Overall, the four most prevalent drugs were cardiovasculat medications (3.2%), endocrinologic drugs (14.5%), nutritional therapeutics (12.9%) and drug acting on the musculoskeletal system (11.4%)

From intensive search, there are a few study of drug use in elderly in Thailand, moreover, the study are conducted in a small population. The result from those studies can not show the overall figure of medication use in elderly in Thailand. From this reason, the study of medication use in elderly in Thailand should be conducted for present the pattern of medication use in Thai elderly.

Part 3. Quality indicators (QIs)

Nowadays, there are increased concern of quality of medical care, pharmacotherapy and prescribing. Quality assessment and improvement in health care is a major issue in many countries. Information on health care is being demanded by policy makers, health-care professionals and the general public. With the majority of doctor-patient encounters in general

practice resulting in a prescription for drug treatment, the quality of prescribing in general practice is an important issue. Also prescribing has a major influence on well being and accounts for a substantial part of health care expenditure (Pont, Denig et al. 2004).

Prescribing quality can be defined in several ways. The WHO definition of rational drug use is taken as the starting-point. According to this definition, rational drug use means each patient receiving medication appropriate for his/her clinical needs, in doses meeting the related requirements, for an adequate period of time and at the lowest costs to them and to the community. Based on this, prescribing quality can be considered as an aggregation of effectiveness, safety, appropriateness and costs (Holden and Wilson 1996)

There are several methods for evaluation and assessment health care that are quality indicator, standard treatment guideline, and the explicit and implicit criteria. The commonest methods for assessing appropriate or inappropriate prescribing are explicit criteria and implicit professional judgment.

To be able to measure prescribing quality, prescribing indicators have been developed. A prescribing quality indicator can be defined as an explicitly defined measurable item of prescribing giving a possible indication of the level of prescribing quality (Campbell, Braspenning et al. 2002). Using a slight modification of an existing well-established definition, a prescribing quality indicator is *a measurable element of prescribing for which there is evidence or consensus that it can be used to assess quality, and hence change in the quality, of treatment provided* (Lawrence and Olesen 1997).

Prescribing quality indicators are divided in three axis that are process and outcome indicators axis, the second is drug-, disease-, and patient axis. In a third separate axis, indicators can be included that describe documentation requirements, such as documentation of drug allergy on the medical chart (Haaijer-Ruskamp FM, Hoven JL et al. 2004).

Indicators can be classified on different dimensions. One dimension, according to Donabedian, distinguishes structure indicators, process indicators and outcome indicators. Depending on which aspect of care is assessed. Prescribing is a health care process, so prescribing indicators should focus on the prescribing process. Since improvement of patient outcomes is the aim of all treatment, outcome indicators, where patient outcome is linked to drug therapy are very important. Sometimes the term 'performance indicators' is used, but the definition of performance indicators is not always clear. Campbell et al define performance indicators as statistical devices for monitoring performance without any necessary inference about quality (Campbell, Braspenning et al. 2002).

Indicators can be constructed in all these areas. This also applies to prescribing indicators.

Structural indicators are aspects of the health system, organization of care and available resources. In the area of prescribing it may be access to necessary drugs, availability of industry-independent drug information, an updated formulary or prescribing guidelines.

Process indicators cover the actual performance, the decisions and actions of the physician, for example prescribing the appropriate treatment or choosing a drug according to recommendations.

Outcome indicators relate to the benefit or harm to the patient, equivalent to what is measured in clinical trials, but here assessed as consequences of prescribing in a non-experimental setting. Thus, outcome indicators cover all types of drug effects: risk of death or hospitalization, measures of disease severity or activity, functional impairment, and impact on patients' wellbeing and quality of life. Prescribing quality indicators are most often process indicators.

Indicators are used for a number of different purposes, covering quality management in a broad sense. At the professional level, indicators are used by physicians for quality development and educational activities, assisting learning processes. Researchers use indicators for evaluating interventions, for example in experimental randomized studies testing new methods for changing prescribing behavior. Finally, administrators of the health system are also used indicators for monitoring quality, screening for quality problems, benchmarking and providing feedback to physicians. There are sometimes conflicts between the professional, health administrative and political perspectives of indicators.(Andersen 2006)

3.1 Characteristic of Quality indicator

An ideal indicator would have the following key characteristics: indicator is based on agreed definitions, and described exhaustively and exclusively; indicator is highly or optimally specific and sensitive, i.e. it detects few false positives and false negatives; indicator is valid and reliable; indicator discriminates well; indicator relates to clearly identifiable events for the user (e.g. if meant for clinical providers, it is relevant to clinical practice); indicator permits useful comparisons; and indicator is evidence-based (Campbell, Braspenning et al. 2003; Haaijer-Ruskamp, Hoven et al. 2004).

Validity is an important attribute of any indicator of prescribing quality. A quality indicator is valid when meeting the indicator is considered better quality and when the measure is a good translation of the clinical situation; one might call this external validity, to differentiate it from the internal validity. Where internal validity deals with accuracy of data, external validity deals with remaining issues as interpretability, context, representatively etc. Depending on the level of evidence, four kinds of validity can be defined that are face validity, content validity, concurrent validity and construct validity. However, this should be a minimum prerequisite for any quality measure and subsequent developmental work is required to provide empirical

evidence, as far as possible, of acceptability, feasibility, reliability, sensitivity to change, and predictive validity

Principle of development quality indicator

Three issues should be considered when developing quality indicators recommended by Campbellet al(Campbell, Braspenning et al. 2003) are

1. Which aspects of care to assess: structure (staff, equipment, appointment systems, etc.), processes such as prescribing, investigations, interaction between professionals and patients) and outcome (such as mortality, morbidity, or patient satisfactions)
2. Which stake holder's perspectives are the indicators intended to reflect? Stakeholders have different perspectives about quality of care. It cannot be presumed that one's steak holder's views represent another group views.
3. Supporting information or evidence. This can be derived by systematic or non-systematic method.

3.2 Methodology for developing quality indicators(Campbell, Braspenning et al. 2002)

The methodologies for developing quality indicators are depend on the available information. It is divided in to 2 systems that are non-systematic and systematic method.

Non-systematic

Non- systematic approaches are not evidence based, but indicators developed in this way can also be useful because they are quick and easy to create. An example includes a quality improvement project based on one case study such as a termination of pregnancy in a 13 year old girl. Examination of her medical records showed two occasions when contraception could have been discussed, and this led to the development of a quality indicator relating to contraceptive counseling.

Systematic

1. Evidence based methods

Indicators should be based on scientific evidence such as rigorously conducted (trial based) empirical studies. The better the evidence, the stronger the benefits of applying the indicators in terms of reduced morbidity and mortality.

2. Systematic methods combining evidence and expert opinion

Many areas of health care have a limited or methodologically weak evidence base, especially within primary care. Quality indicators have to be developed by using other evidence alongside expert opinion. However, many experts often disagree on the interpretation of evidence, rigorous methods are needed to incorporate their opinion. Consensus methods are structured facilitation techniques that explore consensus among a group of experts by synthesizing opinions (Fink, Kosecoff et al. 1984). Consensus method is designed for enhance decision making, develop policies, and estimate unknown parameters, facilitate the development of quality indicators or review criteria where evidence alone is insufficient, synthesizes accumulated expert opinion/professional norms, identify, quantify, and subsequently measure areas where there is uncertainty, controversy, or incomplete evidence

Group judgments are preferable to individual judgments, which are prone to personal bias. Several consensus techniques exist, including consensus development conferences, the Delphi technique, the nominal group technique, the RAND appropriateness method, and iterated consensus rating procedures.

Table 3. Characteristics of informal and formal methods for developing consensus.

Method	Mailed questionnaires	Private decisions elicited	Formal feedback of group choices	Face to face contact	Interaction structured	Aggregation method
Consensus development ıference	No	No	No	Yes	no	Implicit
Delphi technique	Yes	Yes	Yes	No	yes	Explicit
Nominal group technique	No	Yes	Yes	Yes	yes	Explicit
RAND appropriateness method	Yes	Yes	Yes	Yes	yes	Explicit
Iterated consensus rating procedure	Yes	Yes	Yes	Yes	yes	Explicit

Table 4 Review related article in Quality indicator between year 2000 and 2010

Author/year	Title	Objective	Method	Result	Recommendation
Chang CB and Chan DC (Chang, 2010)	Comparison of Published Explicit Criteriafor Potentially Inappropriate Medications in Older Adults	to summarize and compare existing criteria to enable more informedchoices about their use	seven examples of criteria published between 1991 and 2009 were included in the review their individual characteristics are presented. Common medications listed in the majority of these criteria are also summarized.	Compare 6 set of explicit criteria	

Table 4 Review related article in Quality indicator between year 2000 and 2010 (cont.)

Author/year	Title	Objective	Method	Result	Recommendation
Rognstad S, Brekke M, Fetveit A, Spigset O,WyllerTB,and StraandJ Scand J Prim Health Care. 2009; 27(3): 153–159.	The Norwegian General Practice (NORGEP) criteria for assessing potentially inappropriate prescription to elderly patients. A modified Delphi study	To established a clinical relevant list with explicit criteria for pharmacologically inappropriate prescriptions in general practice for elderly people	A 3 round Delphi 37 criteria, 140 physicians, visual analogue scale 0-100. Inappropriate : use median score. Agreement: the inter-quartile range was calculated.	57 out of 140 were respond the questionnaire in the first round, 50 in the second and 47 complete all in the third round. 36 of 37 criteria were clinically relevant for general practice.	
Basger BJ, Chen TF, and Moles RJ (Basger BJ, 2008)	Inappropriate medication use and prescribing indicators in Elderly Australians. Development of a prescribing indicators tool	To develop a list of prescribing indicators for elderly (aged >65 years)		48 prescribing indicators were identified	

Table 4 Review related article in Quality indicator between year 2000 and 2010 (cont.)

Author/year	Title	Objective	Method	Result	Recommendation
der Ploeg E, Depla MFIA, Shekelle P, Rigter H, Mackenbach JP. QualSaf Health Care 2008;17:291-5	Developing quality indicators for general practice care for vulnerable elders; transfer from US to The Netherlands	To develop a set of quality indicators based on the ACOVE quality in The Netherlands based on the ACOVE quality indicators	A modified version of the RAND/UCLA appropriateness method was used. 9 clinical experts (5 GPs, 2 nursing home practitioners, 2 clinical geriatricians. Use the same cut-off points as the US set (validity score ≥7) without disagreement within the panel	From 108 original US indicators for the eight conditions, 32 indicators (30%) were discarded and five new indicators were added. 76 indicators were included in the Dutch set with 4 changed indicators.	The ACOVE-3 indicators were a good starting-point to develop a set of quality indicator. The current study shows that the transferability between countries of quality indicators is possible but should be done with caution.

Table 4 Review related article in Quality indicator between year 2000 and 2010 (cont.)

Author/year	Title	Objective	Method	Result	Recommendation
Laroche ML, Charmes JP, Merle L Eur J ClinPharmacol; 2007:63: 725-731	Potentially inappropriate medications in the elderly: a French consensus panel list	To evaluate drug-related problems in the elderly, various lists of potentially inappropriate medications have been published in North America. To establish a list of IMs for the French elderly population using the Delphi method and to propose safer, effective alternatives.	A two-round Delphi the responses from the first round were collected and analysed; a revised questionnaire based on the results of this analysis was submitted to the same experts to converge to an agreement from the average responses. 15 experts were invited to participate.	The first round: 37 criteria were submitted to the panel of experts. 30 were considered as inappropriate 1 was not selected And 6 were no consensus. 3 criteria were purpose. The second round: among 39 criteria, 5 were eliminated by the panel. The final list contained 34 criteria	The criteria were identified from conditions with 1) an unfavorable benefit to risk ratio, 2) a questionable efficacy or 3) an unfavorable benefit-to-risk ratio together with a questionable efficacy.A list of criteria is a guide for assessing the PIMs.

Table 4 Review related article in Quality indicator between year 2000 and 2010 (cont.)

Author/year	Title	Objective	Method	Result	Recommendation
Winit-Watjana W (Winit-watjana, Sakulrat, & Kespichayawattana, 2008)	Criteria for high-risk medication use in Thai older patients	To develop explicit criteria for determining high-risk medication use in Thai older patients	A delphi technique, three round, 16 experts in geriatric medicine	77 practice statements. 23 statement categorize as Groups 1-3 54 were unclassified.	to evaluate the criteria in terms of prescribing and monitoring medication use in older patients in a further study
Steinman MA, Landerfeld CS, Rosenthal GE, Berthenthal D, Sen S, Kaboli PJ J Am GeriatrSoc 2006;54:1516-1523	Polypharmacy and prescribing quality in older people	To evaluate the relationship between inappropriate prescribing, medication underuse, and the total number of medications used by patients	Cross-sectional study 196 out-patient taking five or more medication at Veterans affairs medical center Beers criteria and MAI were use for identified inappropriate.		

Table 4 Review related article in Quality indicator between year 2000 and 2010 (cont.)

Author/year	Title	Objective	Method	Result	Recommendation
Steel N, Melzer D, Shekelle PG, Wegner NS, Forsyth D, McWilliams BC. QualSaf Health Care 2004;13:260-264	Developing quality indicators for older adults: transfer from the USA to the UK is feasible	Describe the adaptation of a set of USA quality indicators for use in patient interview surveys in England To measure the extent to which older patients receive a broad range of effective healthcare interventions in both primary and secondary care.	A modified version of the RAND/UCLA appropriateness method was used. 10 clinical experts in England were review 119 quality indicator based on ACOVE quality indicators.	102 from 119 were accepted by expert (86%) in 16 clinical areas. 14% were rejected ad invalid 79 from 93 ACOVE were approved with no changed, 23 of 26 new indicators were approved.	There are two main advantages. 1. QI is desirable for developed indicators to be shared internationally in different countries. 2.use of the same indicators will allow international comparisons of the quality of healthcare processes.

Table 4 Review related article in Quality indicator between year 2000 and 2010 (cont.)

Author/year	Title	Objective	Method	Result	Recommendation
Askari M, Wierenga PC, Eslami S, Medlock S, De Rooij SE, Abu-Hanna A. PLoS ONE 6(12): E28631	Assessing quality of care of elderly patients using the ACOVE quality indicator set: a systematic review	To summarize studies that assess the quality of care using QIs from or based on ACOVE, in order to evaluate the state of quality of care for the reported conditions	Systematically searched MEDLINE, EMBASE and CINAHL for English-language studies indexed by February 2010. Article were include if they used any ACOVE QIs or adaptation	17 studies were included with 278 QIs.	
Fick DM, Cooper JW, Wade WE, Waller JL, Maclean JR, Beers MH Arch intern med 2003 ; 163:2716-2724	Updating the Beers Criteria for potentially inappropriate medication use in older adults. Results of a US consensus panel of experts.	To revise and update the Beers criteria for potentially inappropriate medication use in adults 65 years and older in the US	Modified Delphi method	48 individual medications / classes of medications to avoid in older adults and their potential concerns and 20 disease/conditions and medications to be avoided in older adults with these conditions.	

3.3 Quality indicator in Thailand

For Thailand, we have the 2007 Thai Health Report. It includes 14 indicators measuring the mental, physical, social health and spiritual health of Thai. Fourteen indicators include: dementia: an epidemic on the horizon, occupational health, mental illness, happiness, risk factors for cardiovascular disease, risks from secondhand smoke, hazardous waste, food supplements, consumer protection, income, savings, debt, the sufficiency economy, Thai young people gambling to get rich quick, Thai young people in the cyber age, educational inequalities. From 14 indicators that mentioned above, there is not an indicator for medication use.

In 1997, Thailand started a hospital accreditation project designed primarily to ensure quality of care. The project was implemented nationwide and includes both public and private hospitals. The main focus of the accreditation project is to improve quality of care through the use of multidisciplinary approaches to patient care. Even though the quality indicator for prescribing has been become important for improving quality of health care, the quality indicator focusing prescribes medication for elderly patient has not been established in Thailand. They only have indicators that applying in hospital for hospital accreditation for the purpose of patient safety for example “Hospital Drug System Performance Indicator”.

For the criteria of drug use in elderly, in Thailand, I found two studies about this issue. The first is conducted by PanuwitSrisena in 2005(Srisena 2005). This research wasdevelop DUR criteria by using a modified Delphi method base on Beer criteria. The second study is conducted by WinitWinit-watjana(Winit Winit-watjana, Parinya Sakulrat et al. 2008). The study uses the same methodology with the former. This study aimed to develop explicit criteria for determining high-risk medication use in Thai older patients.

CHAPTER III

METHODOLOGY

This study consists of two main research questions. The methods used for a particular research question was described separately.

Part 1: The medication use situation in the elderly

The purpose of this part was to explore the situation of the medication use in Thai elderly people in tertiary care hospitals. The patterns of medication prescribing and the occurrence of inappropriate medication prescription were described. The scope of the situation of medication use in elderly is covered as follows:

1. **The pattern of medication prescription.**

1.1 The quantity and types of the medication prescribed. The percentage of the medication use was presented. The ranking of high frequency prescription items were presented. The average number of medication use per elderly patient, minimum and maximum numbers of drug items were also shown in this part.

1.2 The categories of medication prescribed according to The National List of Essential Medicines (NLEM), B.E. 2555 (A.D. 2012). Since the NLEM is the official list of essential medicines recommended for all levels of hospital drug list, the latest version of NLEM was used to identify types of the medication used in the hospitals whether they are essential or not.

1.3 The pattern of medication prescribed in three major health insurance schemes. As generally known that the payments for the three major health insurance schemes including Civil Servant Medical Benefit Scheme (CSMBS.), Social Security Scheme (SSS.) and National Health Security Scheme (NHSS.) are different, the number and types of medication prescribed in elderly across health insurance schemes were compared.

2. **Suboptimal medication prescription**. In the study has defined the term of suboptimal medication prescription as polypharmacy, duplication prescription; and potentially inappropriate medication prescription (PIP). The details of the definition of each condition are explained as follows:

2.1 Poly-pharmacy: The number of medication in each prescription was counted and the specific prescription was identified as poly-pharmacy, if the number of medication items was equal to five or more than five. (Bjerrum L, Rosholm JU et al. 1997; Viktil, Blix et al. 2006).

2.2 Duplication prescription: Duplication medication was defined as at least two medications in the same prescription have the similar code of the 4^{th} level of chemical subgroup of the Anatomical Therapeutic Chemical (ATC). (WHO 2010)(Oborne, Batty et al. 1997; Steinman, Seth Landefeld et al. 2006).

2.3 Potentially inappropriate medication prescription (PIP): PIP is defined as using dangerous medication for elderly or using medication should be avoided or using medication that has contraindication for elderly.(Fialová, Topinková et al. 2005) In this study, to determine the use of PIP, the criteria for high risk medication for Thai elderly (Winit-watjana, Sakulrat et al. 2008) was used as reference.

Study design

A retrospective cross-sectional study design using an electronic database from 4 tertiary care hospitals from 4 regions in Thailand was employed.

Data collection

1. **Recruiting the hospitals**

According to the objective of this study, in order to explore the patterns of drug use in tertiary care hospitals, the study was conducted in four tertiary care hospitals allocated in four regions of Thailand which are sampling from the total twenty five tertiary care hospitals. The inclusion criteria for selecting the tertiary care hospitals are as follows:

1. Allocated in four regions as each for one region.

2. Having the computerized database system in the hospital.

3. The hospital was voluntary to participate and provide the data for analysis.

2. Source of data.

Two main computerized databases were needed as sources of the medication data in the study. There are the dispensing database and the ICD-10 database. These two databases are available in most of regional hospitals including the four sampled hospitals. However, before conducting the study, it is necessary to check the availability of the related necessary data in these data sources.

From the dispensing database, this research requires particular data according to objectives. The necessary data that should be available are patient's information including hospital identification number (HN), age, gender, types of health insurance scheme; service utilization data including visiting number (VN), date of visit; medication data including medication name, strength, category classified by ATC code and NLEM if data available). These data was used to describe patterns of medication prescribed and the suboptimal medication prescription including poly-pharmacy, duplication prescription and PIP.

Form the ICD-10 database, the necessary data included patient's HN, date of visits, department of visit, and diagnosis code both principle diagnosis and co-morbidity must be available.

3. The targeted patients

The data of the targeted patients who were sixty and older, visited to outpatient department at selected hospitals in the study period were extracted from the database for analysis. The study period was between October 1st, 2007 to September 31st, 2008. Moreover, complete patient and medication information in the hospital electronic database were required.

Data analysis

The data retrieved from the four hospitals were processed to reflect the patterns of medication prescribed and the situation of suboptimal medication prescription. The database management process including data cleansing and merging the three databases that are medical recode database, dispensing database and ICD-10 database.

Within the information from database, patients are divided in five groups of information. Group I information is the patient who registers for visit, gets diagnosis from physician, receives medications, and has the receipt information. Group II information is the patient who registers for visit, gets diagnosis from physician, receives medications, but do not has the receipt information. Group III information is patient who has registration number for visit and diagnosis information. The medication data and receive data were not found in this group. For group IV information, patient has only registration number and medication information, does not has diagnosis information and receive information in the database. And in group V information, it has only registration number for visit. There are the reasons for explanation this phenomenon such as patient come to hospital at out-patient department for follow up the laboratory test; patients visit his physician for receive any counseling and it is not necessary of medication; some patients do not have a time for waiting, they come to hospital

in another day for receive medication. Only subject who complete information as group I was employed to the study.

For data analysis, demographic data of the targeted patients were described. All prescribed medications were classified according to the Anatomical Therapeutic Chemical Classification (ATC) system (4^{th} level, chemical subgroup).

The pattern of medication use was presented by the frequency of use. An average number, minimum and maximum numbers of medication use per prescription were presented. Additionally, patterns of medication use among health insurance schemes were compared. The prescriptions with poly-pharmacy were identified according to the appropriate cut of point of five items or more medications in one prescription. The prescription was counted as duplication medication if there were at least two or more medications having the same 4^{th} level ATC codes. For PIP, the eligible prescription was considered as PIP exposure if it was found that the name of the medication was in the list of inappropriate medication.

Statistical analysis

The descriptive statistics was employed to present the patterns of medication prescribed and the situation of suboptimal medication. The baseline patient characteristics and demographic data (aged, gender, disease, and health insurance scheme) was presented as percentage and mean with standard deviation.

The number of medication per prescription was calculated. The primary analysis calculated the number of poly-pharmacy, duplication prescription and PIP. The average number of any events was showed.

All statistical computing was performed using SPSS software version 13 (SPSS Inc, Chicago). The difference of number of disease diagnosis, number of medication prescription between hospitals was compare by using Kruskal Wallis test.

Part 2: Developing the prescribing quality indicators for Thai elderly (PQI-Th).

Study Design and data collection

This part of the study was a qualitative research. The prescribing quality indicators for Thai elderlywere developed by using a modified Delphi technique based on the RAND appropriateness method. The process to develop the PQI-Th was composed of three steps as shown in figure 2.

1. Preparation process

Step 0: Propose the candidate prescribing quality indicators

The researcher performed the systematic literature reviews. The literatures review included the statement of quality indicator from a set of PQI from ACOVE and STOPP. Moreover, from the results in part 1, five interested PQI which reflected the inappropriate prescribing found in the real practice in the sampled hospitals were also identified as the important PQI. This step resulted in the first draft of candidate prescribing quality indicators.

2. Selection process

The first draft of the candidate PQI from Step 0 was used as the input for the selection process which comprised two steps which were step 1 and step 2.

Step 1: Screening the set of prescribing quality indicators by researcher.

The researcher selected the relevant PQI which were the medication associated indicators from ACOVE because ACOVE was a set of QI for healthcare so there were some indicators not relevant to the medication aspect. This step resulted in the statement that involved only medication treatment.

Step 2: Validating the screening PQI by clinical pharmacists.

The PQI from Step 1 was sent to three experts in clinical pharmacy. The clinical pharmacists were selected from the pharmacists who have worked in the university hospital and a lecturer in geriatric medication use in the university. They were asked to check the validity of the statement of QIs and the availability in Thailand market of the medications in the PQI.

3. Rating process

A two-round modified Delphi method, Step 3 and Step 4, was used to find the consensus between eleven experts in clinical practice (6 physicians in medicine, 3 clinical pharmacists and 2 academic pharmacists).

Step 4: First round rating

The questionnaires were sent to all experts by mail. All experts were asked to return within four weeks. The process of rating was directly described to each expert by verbal communication and by the instruction at the front page of the questionnaire.

After the researcher sent each panelist the proposed quality indicators and the criteria for selecting, the experts were asked to judge based on such criteria. The two criteria were the importance and the feasibility of implementation the PQI in Thai situation.

Characteristics of the criteria

1. Importance of PQI

The medication use process according to any statement will significantly affect the quality of medication use implemented. There are 2 issues for rating consideration which are prevalence of the condition addressed and expected magnitude of benefit.

Scale 0-3 = Not important for evaluating care quality

Scale 4-6 = Uncertain or equivocal importance for quality

Scale 7-9 = Clearly important for evaluating or providing quality care

2. Feasibility of implementation

This feasibility defined as the process can be implementing to the tertiary care hospital. A feasibility study will be conducted in both two round rating. For each potential QI, expert will be rated base on their experience with and knowledge of the resources and records available in an electronic database and medical record.

There are 3 issues for rating consideration of the individual QI that are (1) staffing resources to implement, (2) physician resources to implement, and (3) all other costs of implementation

Scale 0-3 = Not feasible to perform the process in any tertiary care hospital

Scale 4-6 = Considerable variability such that only some tertiary care can implement

Scale 7-9 = Clearly feasible in any tertiary care hospital.

The study also followed the protocol recommend by RAND/UCLA for rating the scores. In this method, each panelist had the equal weight in determining the final ratings. The rating scale based on the RAND appropriateness method (RAM) was used in this process. Rating score ranged from 1 to 9 (from strongly disagree to strongly agree). Moreover, the

experts were asked to comment, edit the statement of the PQI and suggest the new PQI based on their experience in clinical practices.

In this step, researcher analyzed rating score from all experts in each PQI item. Frequency of rating in each score level and the median score from group were calculated and noted for the next step.

Step 4: Second round rating

In the second round, the results from the first round rating were sent to the same experts for re-rating the PQI. In this step, in order to find the consensus, the experts received the questionnaire with their own scores from the first round, the frequency of rating scores from all experts in each statement and the median scores of all the experts for enabling the experts to compare their opinion with other experts. Similarly with the first round, questionnaire was sent to experts by mail and follow up within four weeks.

After two rounds rating, researcher analyzed the PQIs according to the RAND appropriateness method, and the list of quality indicator for prescribing were established.

4. Adjustment process

Step 5: Adjusting the quality indicators

After two rounds rating, the indicators were re- prioritized by the criteria of appropriateness selected by the two criteria including the level of appropriateness and the level of agreement.

The PQIs were classified into three levels of appropriateness, that are 'Appropriate', 'Uncertain' and 'Inappropriate', using the following definitions:

Appropriate (A) indicator is the indicator has a median score between7 and 9 without disagreement

Uncertain(U) indicator is the indicator has a median score between 4 and 6 or any median with disagreement

Inappropriate (I) indicator is the indicator has a median score between 1 and 3 without disagreement

For 'Appropriate' indicators, there are 2 level of appropriate – priority and high priority. Median ratings of 7 to 9 without disagreement (30% or more ratings of 1 to 3 and 30% or more ratings of 7 to 9) were accepted as 'priority', with median ratings of 8 or 9 defined as 'high priority'. (Dreischute, Grant et al. 2012)

The level of agreement was used for discriminate the disagreement items. The definitions of the terms are as follows:

Agreement: No more than one third panelists rate the indication outside the 3-point region (1-3; 4-6; 7-9) containing the median.

Disagreement: At least one third panelists rate the indication in the 1-3 region, and at least one third panelists rate it in the 7-9 region.

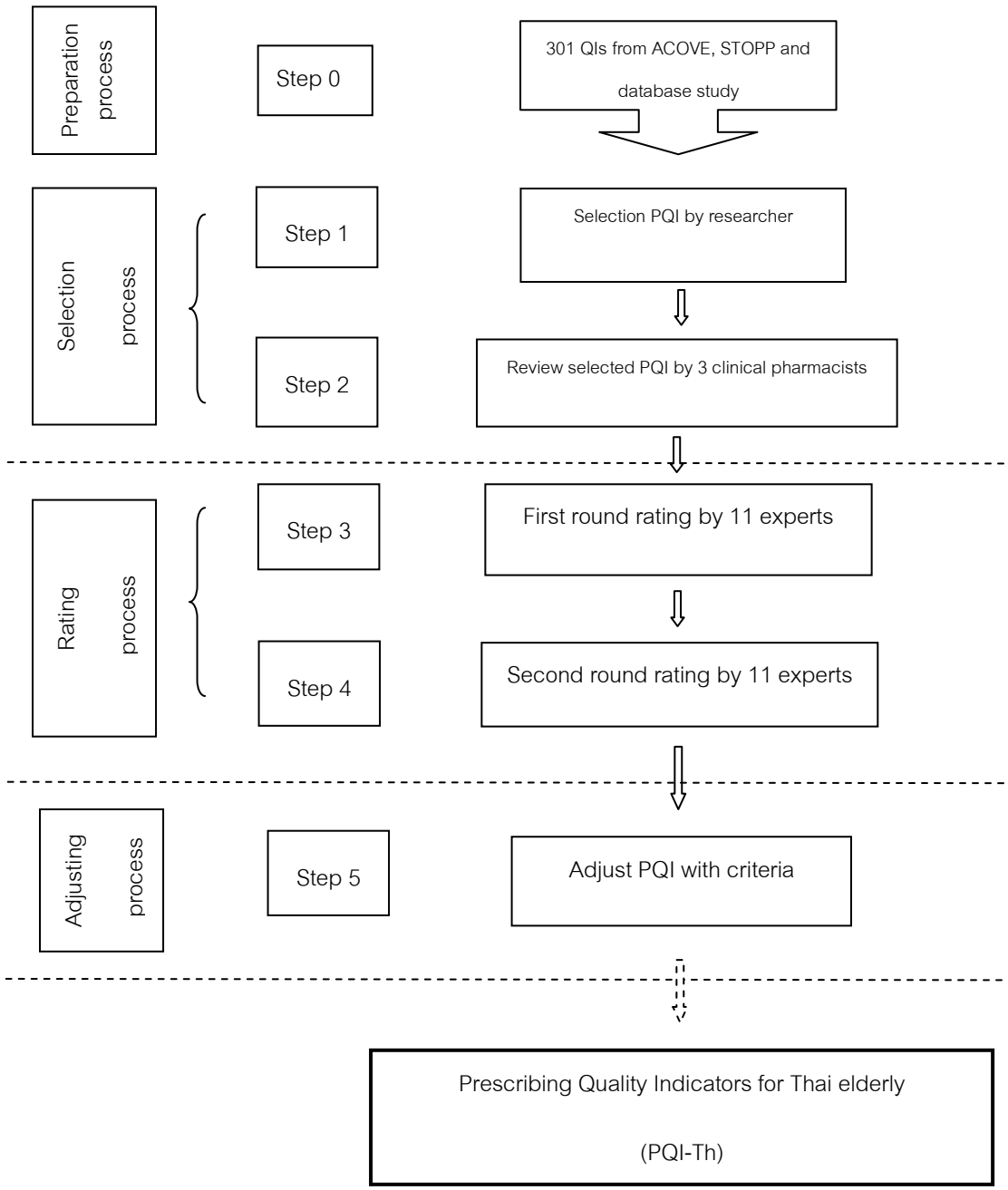


Figure 2 Process of developing PQIs

CHAPTER IV

RESULTS

The objectives of the study were to explore the situation of medication use in elderly patient in tertiary care hospital in Thailand, and to develop and assess the quality indicator for evaluating medication use for elderly in Thailand. In this chapter, the finding was separately presented according to the objectives and methodologies.

Part I. The medication use situation in the elderly

For presenting the situation of medication prescribed, the patterns of medication prescribing and the occurrence of suboptimal medication prescription were described.

For analyzed the medication use situation, database from 4 tertiary care hospital were used. The character of each hospital was showed in table 5. Four hospitals that included to this study are the same size hospital (500-1000 beds hospital)

Table 5. Hospital characteristic

	Hospital size	No. of medical doctor	No. of pharmacist	Elderly patient
H1	680	188	34	19,597
H2	937	180	51	33,737
H3	1000	204	44	35,612
H4	780	109	42	24,541

1. **Patients' characteristics:** Demographic data of the elderly patients:

The total 115,047 elderly patients who aged 60 years and older who visited at ambulatory care clinic in four tertiary care hospitals were included. The average age (mean ± SD) was 70.26 ± 7.42 years and approximately 55% were females. More than 50% of elderly patient was categorized into age 60-66.99 years. In part of health insurance scheme, this study

categorized health insurance scheme into 4 groups that are Civil Servants Medical Benefit Scheme (CSMBS), Universal Coverage (UC), CompulsorySocial Security Scheme (SSS) and the other payment type group that contain the Private Voluntary Health Insurance, out of pocket, health benefit scheme for the elderly,health insurance for injuries from traffic accidents, Health benefit scheme for the alien or foreigners. Most of the elderly patients were in the UC while data from center showed the different. Health benefit scheme in center 4 showed the high percentage in the other payment type because this center located in the southern part of Thailand and some part of patient are the alien or foreigners. Although this study population was the elderly, SSS were reported in a small part for elderly patient who were employed after 60 years old.

The demographic and clinical characteristics of the elderly patients from 4 hospitals were summarized in Table 6. Data from 4 hospitals showed female patient dominated in every age group.

Figure 3 showed the total number of elderly patient from 4 hospitals. Most of elderly patient was in age 60.00-69.99 and the majority of elderly patients in each age group were female. A very old patient group was the minority in this study population.

2.Health service utilization rate among elderly patients:

There were 403,960 ambulatory care visited among 115.047 elderly patients in one year. The average number of health service utilization was 4.35, 4.52, 3.57, 4.89 among the hospital 1, 2, 3 and 4 respectively. Half of the elderly patients visited ambulatory care clinic between 1 and 3 times in one year. By the way, the maximum number of visits wasseventy-five timesin a year that was reportedin thehospital 3(Table 7).

Table 6. Demographic characteristics of the study population (n=115,047)

Demographic	H 1 n (%) N= 19,597	H 2 n (%) N = 33,737	H 3 n (%) N = 35,612	H 4 n (%) N = 24,541
AGE				
Age 60 – 69.99	9,926 (50.65)	17,472 (51.79)	19,327 (54.27)	16502 (67.24)
Age 70-79.99	7,271 (37.10)	12,157 (36.03)	12,216(34.30)	7614 (31.02)
Age ≥ 80	2,400 (12.24)	4,108 (12.81)	4,069 (11.42)	425 (1.73)
Mean ± SD	70.68 ± 7.32	70.43 ± 7.55	69.97 ± 7.40	78.99 ± 7.81
GENDER				
Male	8,199 (41.83)	14,840 (43.98)	16,828 (47.26)	10623(43.29)
Female	11,398 (58.16)	18,897 (56.01)	18,784 (52.74)	13918 (56.71)
Health insurance scheme				
CSMBS[1]	5,474 (27.93)	13,721 (40.67)	11,781(38.08)	10171 (41.44)
UC[2]	9,392 (47.92)	19,365 (57.40)	18,684 (52.46)	3150 (12.83)
SSS[3]	287 (1.46)	241 (0.71)	323 (0.91)	266 (1.08)
Other	4,444 (22.67)	410 (1.21)	4,824 (13.55)	10,954 (44.65)

[1] = "Civil Servant Medical Benefit Scheme", [2] ="Universal coverage", [3] = "Social Security Scheme"

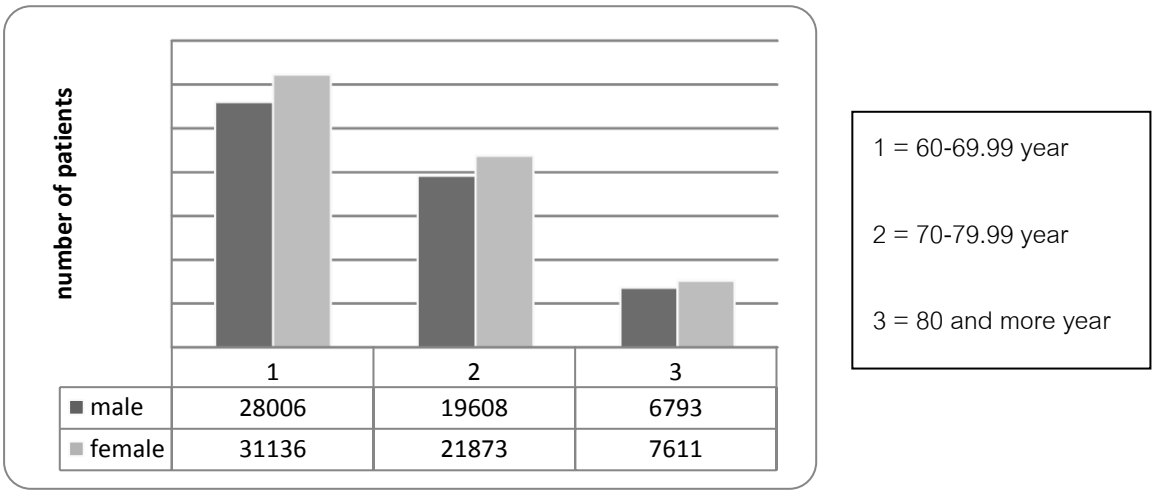


Figure 3. Number of patient at ambulatory care clinic,classified by age and sex

Table 7.Average number of the elderly patient visit in one year period

Setting	Total number of registered elderly patients who visited to clinic	Average number of visit/year (Mean ± SD)
H1	85,394	4.35±3.73
H2	93,533	4.52± 4.40
H3	104,948	3.57± 3.35
H4	120,085	4.89 ± 3.59

3.The disease information among the elderly patients

The disease information in this study was classified according to ICD-10 category. According to ICD-10 chapter code, the classification is divided into 21 chapters. Disease diagnosed in elderly patient between 4 hospitals showed the same pattern. Chapter IX, disease of the circulation system was the most disease diagnosed in all study hospitals. The second and the third rank of diagnosis were chapter IV and chapter XIII which were endrocrine, nutritional and metabolic diseases, and diseases of the musculoskeletal system and connective tissue. Table 8 showed the percentage of ICD-10 in terms of ICD -10 chapters. Moreover, data were also showed disease in theblocks of categories- three-character categories. Hypertensive disease (ICD-10 code were I10-I15),diabetes mellitus (ICD-10 code were E10-E14), and metabolic disorders (ICD-10 code were E70-E90)were the three major diseases that caused elderly patients to visit the ambulatory care clinic of these study population.

Table 8. Number of ICD -10 chapterdiagnosed to elderly patient in one year

ICD-10 Chapters	H1	H2	H3	H4
I. Certain infectious and parasitic diseases	1,695 (1.47)	1,853 (1.86)	3,573 (2.02)	1,105 (1.89)
II . Neoplasms	2,34(2.04)7	2,725 (2.74)	8,207 (4.64)	1,633 (2.79)
III. Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	738(0.64)	1,009 (1.01)	2,120(1.20)	443(0.76)
IV. Endrocrine, nutritional and metabolic diseases[2,3]	**19,761(17.15)**	**14,702 (14.76)**	**22,868 (12.93)**	**6,809 (11.66)**
V. Mental and behavioural disorders	2,860(2.48)	1,723 (1.73)	1,504 (0.85)	690 (1.182)
VI. Diseases of the nervous system	1,698(1.47)	1,815 (1.82)	5,469 (3.09)	848 (1.45)
VII. Diseases of the eye and adnexa	7,130(6.19)	6,105 (6.13)	9,739 (5.51)	5,332 (9.13)
VIII. Diseases of the ear and mastoid process	899(0.78)	1,281 (1.29)	1,376 (0.78)	793 (1.36)
IX. Diseases of the circulation system[1]	**32,127(27.89)**	**17,828 (17.90)**	**39,714 (22.45)**	**10,277 (17.61)**
X. Diseases of respiratory system	5,518(4.79)	5,962 (5.98)	6,926 (3.92)	3,060 (5.24)
XI. Diseases of the digestive system	5,073(4.40)	7,649 (7.68)	10,269 (5.81)	4,116 (7.05)
XII. Diseases of the skin and subcutaneous tissue	1,710(1.48)	1,831 (1.84)	2,812 (1.59)	1,424 (2.44)
XIII. Diseases of the musculoskeletal system and connective tissue[2,3]	**11,413(9.91)**	**12,451 (12.50)**	**26,791 (15.15)**	**5,600 (9.59)**
XIV. Disease of the genitourinary system	6,009(5.22)	5,264 (5.28)	14,185 (8.02)	2,625 (4.49)
XV. Pregnancy, childbirth and the puerperium	6 (0.01)	6 (0.01)	5 (0.00)	8 (0.01)
XVI. Certain conditions originating in the perinatal period	2 (0.00)	0	4(0.00)	2 (0.00)
XVII. Congenital malformations, deformations and chromosomal abnormalities	17 (0.01)	72 (0.07)	143 (0.08)	73 (0.12)
XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	4,589 (3.98)	6,055 (6.08)	6,138 (3.47)	3,184 (5.45)
XIX. Injury, poisoning and certain other consequences of external causes	1,369 (1.19)	1,710 (1.72)	1,657 (0.94)	1,841 (3.15)
XX. External causes of morbidity and mortality	12 (0.01)	1,512 (1.52)	1,450 (0.82)	869 (1.49)
XXI. Factors influencing health status and contact with health services	10,229 (8.88)	8,072 (8.10)	11,939(6.75)	7,635 (13.08)
Total	115,202 (100)	99,625 (100)	176,889 (100)	58,367 (100)

1,2,3 are the rank of disease diagnosed in elderly patient

This study reported that elderly patients often had multiple chronic diseases. More than 60% of elderly patients were diagnosed with 2 two different diseases while only 39% of the elderly patients have been diagnosed with one disease, The maximum number of different diagnosed was 24 diseases, found in 1 female patient who visited at H3. Table 9 showed the number of elderly patients who have had the diseases diagnosed. The average number of disease among four centers was compared by using Kruskal-Wallis test. The mean rank of diseases per patient in four centers was statistically significant difference ($p < 0.01$).

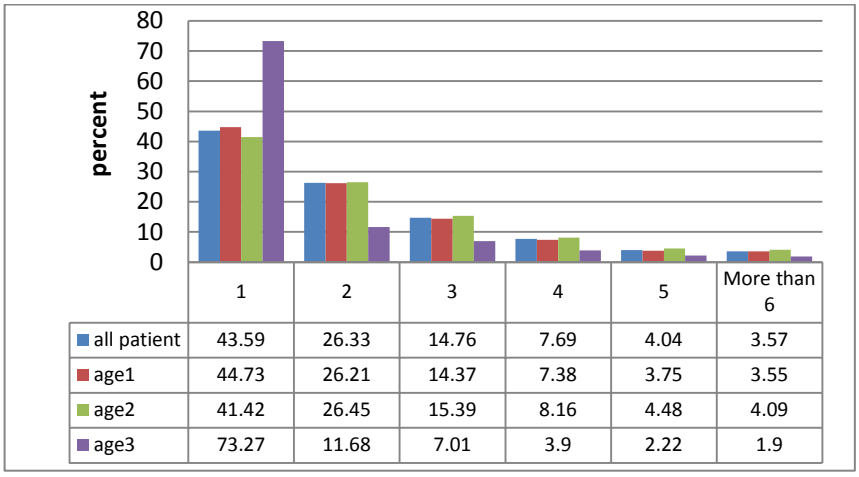
Table 9. Number of the elderly patients with different disease diagnosed according to ICD-10*

No. of disease	Total number of elderly patients	H1 (%)	H2 (%)	H3 (%)	H4 (%)
1	39,460 (38.22)	6,658 (34.46)	9,713 (32.82)	14,453 (44.34)	8,636 (39.72)
2	24,316 (23.55)	4,565 (23.63)	6,326 (21.37)	7,899 (24.23)	5,526 (25.42)
3	15,645 (15.15)	3,156 (16.34)	4,731 (15.99)	4,416 (13.55)	3,342 (15.37)
4	9,583 (9.28)	1,961 (10.15)	3,289 (11.11)	2,467 (7.56)	1,866 (8.58)
5	5,795 (5.61)	1,245 (6.44)	2,127 (7.19)	1,399 (4.29)	1,024 (4.71)
6	3412(3.30)	699 (3.62)	1333 (4.50)	811 (2.49)	570(2.62)
7	2089 (2.02)	436 (2.26)	826 (2.79)	470 (1.44)	357 (1.64)
8	2944 (2.85)	679 (3.51)	1250 (4.22)	679 (2.08)	417 (1.92)
9	732 (0.71)	150 (0.78)	301 (1.02)	169 (0.52)	112 (0.52)
10	440 (0.43)	101 (0.52)	182 (0.61)	94 (0.29)	63 (0.29)
$\geq$ 11	551 (0.52)	107 (0.55)	107 (0.36)	125 (0.38)	125 (0.58)
total	**103,245**	**19,318**	**29,595**	**32,594**	**21,738**

ICD-10* = ICD -10 at three characters

The percentage of patient in each age group classified by the number of different disease diagnosed was shown infigure 4.This bar chart plot between the number of disease and percentage of diagnose/patient in three age group. In all age groups, most of the elderly patients (60-70% of the studied patients) have had at least one or two diseases. The number of disease among aged group was compared by using Kruskal-Wallis test. The mean rank of

diseases per patient in three aged group was statistically significant difference ($p < 0.01$). The meanings of this statistical test is the median value of disease diagnose to elderly in each age group are different.



	1	2	3	4	5	More than 6
all patient	43.59	26.33	14.76	7.69	4.04	3.57
age1	44.73	26.21	14.37	7.38	3.75	3.55
age2	41.42	26.45	15.39	8.16	4.48	4.09
age3	73.27	11.68	7.01	3.9	2.22	1.9

Age 1= 60-69.99, age 2 = 70-79.99, age 3 = 80 and more

Figure 4. The percentage of patient with different number of diseases in each age group

4. The characteristics of drugs prescribed

4.1 The average number of medication per prescription

A total of 1,278,496 medications were prescribed to elderly patients via 299,190 prescriptions, giving a mean of 3.97-4.52 medications per prescription. Table 10 showed the average number of medication per prescription in each hospital. Moreover, number of medication prescribed to elderly was calculated and the average number of medication prescribed to elderly among health insurance scheme was compared. Since most of elderly patient in this study population using CSMBS and UC as a main health insurance, 2 type of health insurance scheme were used for analysis the medication prescribed among scheme.

Using chi-square statistical test, the average number of medication per patient among scheme showed a significant different (*p value <0.00*) in all hospital. Elderly patient under CSMBS received more medication than elderly patient under UC (see table 11).

Table 10 The average number of medication per prescription in each hospital

	H1	H2	H3	H4
No. of prescription	82,996	92,517	45,276	78,301
No. of medication	329,134	414,352	180,973	354,037
Average ± SD	3.97 ± 2.56	4.48 ± 3.0	4.00 ± 2.54	4.52 ± 2.78

Table 11 The average of medication per patient compared among schemes

Hospital	Health insurance scheme		Chi-square
	CSMBS	UC	
H1	23.80	17.71	544.92*
H2	21.39	13.29	169.63*
H3	19.70	11.21	234.92*
H4	16.74	16.05	242.62[a]

*significant different at p value <0.001

4.2 The proportion of National List of Essential Medicines

The percentage of medication prescribing in term of essential drug according to the NationalList of Essential Medicine across aged group were showed in table 12. The researcher summed all items of the medication prescribed in each age group and classified whether the medication were in the List or not. The findings of this part showed that more than 70% of medication prescribed in all age group of all hospitals was classified as essential drugs. In this part, the medication prescribed for patient under CSMBS and UC were analyzed. The average number of medication that elderly patient received during study showed in table 13. At H1 hospital, elderly patient under CSMBS received the average number of medication according to the national list of essential drug at 17.10 and received non essential medication (NED) at the average of 6.69 medications per patient. The average number of medication prescribed to patient under CSMBS were significant higher than an average number of medication prescribed to patient under UC both ED and NED medicine,

this data showed similarity in 4 hospitals. The average number of medication per patient were compare by using Chi-square test, the average number of medication prescribed under CSMBS and UC was significant different (*p value* < *0.01*).

Table 12 The percentage of the essential drug* prescribedto each age group.

Age group	Total	H1	H2	H3	H4
Age 1	77.76	77.25	80.32	81.10	73.64
60-69.99	N = 1103587	N = 238664	N = 300194	N = 225939	N = 338790
Age 2	77.12	77.21	80.08	79.33	72.61
70-79.99	N = 462766	N = 93373	N = 110152	N = 124409	N = 134832
Age 3	77.67	77.59	76.69	81.83	72.84
80 and older	N = 15923	N = 2753	N = 3682	N = 5522	N = 3966

*ED = the National List of Essential Medicine, version2008

Table 13 Theaverage number of the essential drug* and non essential drug prescribed classified by health insurance scheme

		Health insurance scheme	
Center	Drug class	CSMBS	UC
H1	ED	17.10	14.63
	NED	6.69	3.08
H2	ED	15.64	11.94
	NED	5.75	1.34
H3	ED	13.41	9.17
	NED	6.29	2.04
H4	ED	11.97	13.84
	NED	4.76	2.21

*ED = the National List of Essential Medicine, version2008, NED = non essential medicine

4.3 The classification of drugs prescribed according to ATC groups

The number of medication prescribed in this study was presented by ATC code. From aggregation data of 4 hospitals, the top five of medication prescription according to ATC, 1st level

was showed in table 14.Approximately 25% of medication prescribed found in both group of medications that are medication in “alimentary and metabolism”,and “cardiovascular system” according to ATC, 1st level.Half of medication that was prescribed to the elderly patient was under the two main groups of medications. When consideration in chemical subgroup of medication- the ATC, 4th level, the medication in HMG CoA reductase inhibitors (C10AA) (4.88%), platelet aggregration inhibitors excluding heparin (B10AC) (4.23) and proton pump inhibitors (A02BC) (3.82) were the top three prescribed in four hospitals. Detail of prescription was showed in table 15.

Table 14 Top five of medication prescription according to the anatomical main group

No.	Anatomical main group (ATC, 1st level)	Total number of prescription	Percentage
1	A: alimentary and metabolism	383,152	24.76
2	C: cardiovascular system	381,688	24.67
3	N: nervous system	190,293	12.30
4	M: musculo-skeletal system	163,534	10.57
5	B: Blood and blood forming organs	144,335	9.33

Table 15 Top five of medication prescription according to the ATC chemical subgroups.

No	ATC, 4th level	Chemical subgroup	Total number of prescription	Percentage
1	C10AA	HMG CoA reductase inhibitors	75,716	4.88
2	B01AC	Platelet aggregation inhibitors excl. heparin	65,717	4.23
3	A02BC	Proton pump inhibitors	59,310	3.82
4	C08CA	Dihydropyridine derivatives	46,730	3.01
5	M02AC	Preparations with salicylic acid derivatives	37,969	2.45

From aggregate data of four hospitals, the most common medication prescribed were simvastatin, followed by aspirin, omeprazole, vitamin B 1-6-12 and paracetamol. Table

16showed the prescribing frequency of those medicationsin term of percentage comparing to all medication prescribed.

Table 16 Thepercentage of the top five prescribing medication in each hospital.

	Total	H1	H2	H3	H4
1	Simvastatin (3.82)	Simvastatin (3.90)	Simvastatin (4.30)	Vitamin B1-6-12 (4.24)	Simvastatin (4.40)
2	Aspirin (3.50)	Omeprazole (3.77)	Omeprazole (3.30)	Omeprazole (3.71)	Aspirin (4.29)
3	Omeprazole (3.45)	Atenolol (3.46)	Aspirin (3.27)	Aspirin (3.32)	Vitamin B1-6-12 (3.46)
4	Vitamin B1-6-12 (3.36)	Aspirin (3.22)	Vitamin B1-6-12 (2.95)	Simvastatin (2.90)	Folic acid (3.39)
5	Paracetamol (2.48)	Analgesic balm (3.12)	Paracetamol (2.79)	Paracetamol (2.55)	Omeprazole (3.02)

5. Suboptimal medication prescription

5.1Poly-pharmacy: five or more medications in a prescription.

Thirty-eight percent of prescription had five or more medications in one prescription and was recorded as poly-pharmacy. The detail of drug prescription from four hospitals showed in table 17. The number of medication prescription among age group was compared by using Kruskal-Wallis test. The median value of number of medication among the three age group was statistically significant difference (*P<0.01*).

Table 17 Number of prescription with poly-pharmacy in 4 hospitals

	H1	H2	H3	H4	Total
No. of prescription	82,996	92,517	45,276	78,301	299,090
No. of prescription with poly-pharmacy (%)	29,359 (39.4%)	38,632 (41.8%)	15,375 (34%)	33,038 (42.2%)	116,404 (39.92%)

5.2 Appropriateness of medication prescription

This study were review the appropriateness of medication prescribed in two points. Firstly, the duplication medication prescribing was identified by using the ATC, 4th level and the second point is potentially inappropriate medication prescription that was determined by using the Winit-wajtana criteria.

5.2.1 Duplication medication prescrription

The finding of this study reported 3.36-7.89 % duplication medication of the total prescription. The duplication found in 2 patterns that are 2 medications in same ATC, 4th level prescribed in one prescription and another is also 3 medications in same ATC, 4th level. Table18 was showed the number of duplication medication. The duplication medications were found in 117 chemical subgroups in 4 hospitals. Most common duplication medication was medication in antivertigo preparation (N07CA) accounted for 16,836 times of prescribed or 4.41% of total prescription. For example, elderly patient received cinnarizine, flunarizine and betahistinemesylate in the same prescription, all of these medications are in the same chemical subgroup according to the ATC classification system. The second rank of duplication found in Platelet aggregation inhibitors excl. heparin and the example of duplication medication prescribed aspirin with beroprost sodium or clopidogrel or ticlopidine. More details of duplication medication showed in table 19 and 20.

Table 18 The percentage of duplication prescriptionper prescription

Hospital	Total prescription (%)	2 medications in same ATC, 4th level	3 medications in same ATC, 4th level
H1	2,792 (3.36)	2,772	22
H2	7,378 (7.89)	7,329	53
H3	7,125 (6.86)	7,016	95
H4	5,163 (6.59)	4,643	520

Table 19 Frequency of duplication prescription at chemical subgroup; aggregate data from 4 hospitals

	ATC, 4th level	Chemical subgroup	Number
1	N07CA	Antivertigo preparations	16,836
2	B01AC	Platelet aggregation inhibitors excl. heparin	3,102
3	C01DA	Organic nitrates	2,362
4	A10BB	Sulfonamides, urea derivatives	1,757
5	N05BA	Benzodiazepine derivatives	1,653
6	R03AK	Adrenergics and other drugs for obstructive airway diseases	1,165
7	S01XA	Other ophthalmologicals	1,057
8	M01AX	Other antiinflammatory and antirheumatic agents, non-steroids	1,009
9	H02AB	Glucocorticoids	957
10	A03FA	Propulsives	929

Table 20 Percentage of duplication medicationper prescription

Rank	ATC, 4th level	Chemical subgroup	Medications	Number of medication (%)
1	N07CA	Antivertigo preparations	Cinarizine + flunarixine + betahistatinemyselate	16,836 (5.63%)
2	B01AC	Platelet aggregation inhibitors excl. heparin	Aspirin + beroprost sodium or clopidogrel or ticlopidine	3,102 (1.04%)
3	C01DA	Organic nitrates	Isosorbide 5 mononitrate + isosorbidedinitrate	2,362 (0.79%)
4	A10BB	Sulfonamides, urea derivatives	Glibenclamide + glipizide + gliclazide	1,757 (0.59%)
5	N05BA	Benzodiazepine derivatives	Diazepam + alprazolam + lorzepam	1,653 (0.55%)

5.2.2 The potentially inappropriate medication prescription (PIM)

The potentially inappropriate medication (PIM) prescription was determined by using the Winit-wajtana criteria (appendix A). The frequency of PIPs was highest among age 60-69.99 years at 8.92%, followed by age 70.00-79.99 years, 2.45%. Moreover, PIMs were more prescribed in female (Table 21). The accumulated data from 4 hospitals showed 1,278,496 prescribing medications in 299,190 prescriptions. There were evidence of PIM in 11.46 % and evidence of inappropriate drug-drug interaction in 1.20% of 299,190 ambulatory care visits with prescriptions. The total of 52,558 PIPs were found in 19medications according to the criteria. NSAIDs were the most frequency prescribing, followed by Cox II inhibitors. Diclofinac that accounted as rarely appropriate medication was the most common PIP in 4 hospitals, followed by celecoxib and meloxicam in 5.43%, 2.75% and 2.31% respectively. Potentially drug-drug interaction was issued to 3,582 prescriptions or 1.20 % of total prescriptions, the interaction of aspirin and NSAIDs was the most common drug-drug interaction in this study population (table 22, 23).

Table 21 Percentage of PIM according to age group and gender (n=299,190)

Age group	Number of PIMs		Total PIMs
	Male	Female	
60.00-69.00	9258	17446	26704 (8.92)
70.00-79.99	2970	5388	8358 (2.45)
80 and more	95	140	235 (0.08)
Total	12323 (4.12)	22974 (7.68)	34297 (11.46)

Table 22 Potentially inappropriate medication prescriptions

Drug or drug class	Total number of presctiptionaccording the list	Percentage of prescribed
diclofenac	**16,247**	**5.431**
celecoxib	**8,235**	**2.752**
meloxicam	**6,897**	**2.313**
Hyoscine	4,589	1.53
ibuprofen	4,369	1.46
nimesulide	3,510	1.17
etoricoxib	2,084	0.69
Metoclopramide	1,696	0.57
diacerein	1,274	0.42
clinoril	1,228	0.41
naproxen	616	0.21
piroxicam	535	0.18
mefenamic acid	535	0.18
lumiracixub	386	0.13
oxoprofen	265	0.9
parecoxib	89	0.03
valdecoxib	1	0
tenoxicam	1	0
lornoxicam	1	0

Table 23 Drug-drug interaction prescriptions

Drug – drug interaction	Total number of presctiption according the list	Percentage of prescribed
Aspirin - NSAIDs	3,356	1.12
Warfarin - NSAIDs	226	0.08

The finding from phase 1 study showed the situation of medication prescription to the elderly. Pattern of medication prescription were described.

The average number of medication prescription between CSMBS and UC are significant different. Patient under CSMBS received more medication that UC. The inappropriate duplication medication was found in this study. Medication in anti vertigo was mostly found as inappropriate duplication. For PIM analysis, NSAIDs was mostly found as inappropriate medication, especially diclofenac and celecoxib.

List of inappropriate duplication medication were used as some part in quality indicator in phase 2 study.

Part II. Developing the prescribing quality indicators for Thai elderly (PQI-Th)

The processes of developing the PQI-Th compose of 6 steps in four main processes that are preparation process for preparing the first draft of PQIs, followed by the selectionprocess that 2 steps inside, the rating process that required experts for scoring the PQIs, and the last step was adjusting process for using in real practice. Figure 6.showed a process of developing the PQIs-Th.

1Preparation Process

The preparation process is the process for preparing the first draft of PQIs. In this process, the researcher performed the systematic literature reviews from ACOVE and STOPP and 231 QIs from ACOVE, 65 QIs from STOPP were selected. Moreover, from the results in part 1, five interested PQIs which reflected the inappropriate prescribing found in the real practice in the sampled hospitals and were not documented in the both references were also identified as the important PQI. This step resulted in the first draft of candidate prescribing quality indicators of the total 301 QIs.

2 Selection process

Step 1: Screening the set of prescribing quality indicators by researcher.

First draft 301 QIswas a combination of particular indicators from ACOVE, STOPP and output from phase I study. Due to the fact that ACOVE is a set of indicators for assessing the quality of care that covered four domains of care which were prevention, diagnosis, treatment and follow up, so that some specific statements of QIrelatedwith only the medication prescriptionwere selected. Forty-five quality indicators were selected from231 indicators in ACOVE (table 24).In the same way, The Screening Tool of Older People's potentially inappropriate Prescriptions(STOPP), the explicit criteria developed bya group of experts in Ireland for screening and identifying potentially inappropriate medication in elderly, was also screened to pick only themedication related indicators. As a result, the researcher selected fifty one out of sixty fivestatements (Table 25). Therefore, the total number of PQIs were 99

that were from the twoprinciple studies, ACOVE and STOPP,the only medication prescribing related QI (94 PQIs) and from the part one studied result, (5 PQIs).

However, ACOVE and STOPP are presented in a different format of statement and classified in a different aspect. Ninety-nine PQIs were re-classified into a new format that makes them friendly to experts for scoring in the next step.

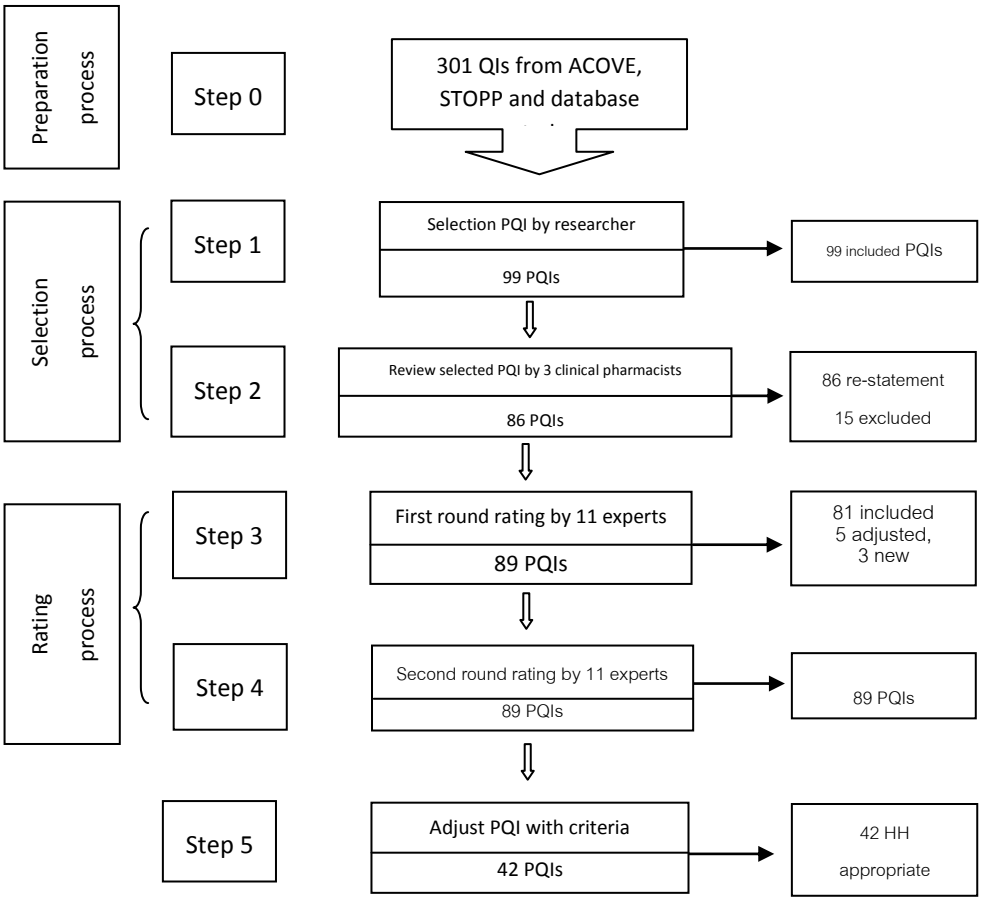


Figure 5 Thedevelopment process of prescribing quality indicators showing the number of PQIs retrieved from each step.

Table 24 Selected QI from ACOVE quality indicators

	Topic area	No. of QI	No. of QI Selected indicators
1	Continuity and coordination of care	13	2
2	Dementia	14	2
3	Depression	17	5
4	Diabetes mellitus	10	2
5	End-of-life care	14	0
6	Falls	6	0
7	Hearing loss	6	0
8	Heart failure	14	4
9	Hospital care	9	0
10	Hypertension	7	4
11	Ischemic heart disease	13	4
12	Malnutrition	8	0
13	Medication use	12	8
14	Osteoarthritis	11	2
15	Osteoporosis	9	3
16	Pain management	7	2
17	Pneumonia	11	0
18	Pressure ulcers	11	0
19	Preventive care	8	0
20	Stroke and atrial fibrillation	10	2
21	Urinary incontinence	10	0
22	Vision care	12	0
	Total	231	45

Table 25 Selected QI from STOPP

	Topic area	No. of QI	No. of selected QI
1	Cardiovascular system	17	6
2	Central nervous system and psychotropic drug	13	12
3	Gastrointestinal system	5	5
4	Respiratory system	3	3
5	Musculoskeletal system	8	5
6	Urogenital system	6	6
7	Endocrine system	4	4
8	Drug that adversely affect those prone to falls (≥ 1 fall in past three months)	5	5
9	Analgesic drugs	3	3
10	Duplication drug classes	1	0
	Total	65	49

Step 2: Validating the screening PQI by clinical pharmacists.

In this step, three clinical pharmacists checked the validity of quality indicators, the up-to-date of PQIs and the availability of medication in Thai situation (See Appendix A). In this process, an agreement of expert was important. If each PQI statement was rejected by one expert, it will be deleted from a second draft indicator. The second draft PQI was composedof 86 statementsdivided in 9 categories(Table 26)

3. Rating process

A two round of modified delphi technique was employed. The results of this process were showed in Step 3 and Step 4 below.

Table 26 The comparing numbers of the PQI from Step 1, 2 and 3

	Topic area	The first draft PQIs	The second draft PQIs
1	Cardiovascular system	21	21
2	Central nervous system and psychotropic drug	20	16
3	Gastrointestinal system	9	6
4	Respiratory system	3	3
5	Musculoskeletal system	15	13
6	Urogenital system	10	6
7	Endocrine system	8	8
8	Duplication drug classes	5	5
9	Medication management	8	8
	Total	99	86

Step 3: First round rating

3.1 Experts' characteristics.

The eleven experts in clinical practice were invited and voluntarily participated in this study. There are six physicians and five pharmacists. From six physicians, three of them are specialty in internal medicine; one expert is endocrinologist and two of neurologist. Four of all physicians work in government hospital in Bangkok while the others work in private hospital in the North part of Thailand. Five pharmacists involve in this part, two of them are a lecturer in university and the less of them are senior hospital pharmacists.

After sending the questionnaire, researcher called to all experts for remind them in the third week and most of experts sent back the results within four weeks as indicated. In week five, researcher made a second call to the expert who did not sent

back the questionnaires. By the way, all questionnaires were sent back completely within 6 weeks

3.2 The results from first round rating

Eighty-six PQIs were sent out to all experts in this step (See appendix B).Five indicators were edited and three indicators were added. Result of this step in term of quantity was summarized in table 27. Moreover, there is some comment from all experts that was showed in table 28.

Table 27 Number of statement in quality indicator in round I

No	Category	Number of statement	
		1st round sent out	1st round sent back
1	Cardiovascular system	21	22 (20+1 EQI+ 1 NQI)
2	Central nervous system and psychotropic drug	16	17 (14+ 2 EQI+ 1 NQI)
3	Endocrine system	8	8
4	Gastrointestinal system	6	6
5	Musculoskeletal system	13	13
6	Respiratory system	3	3
7	Urogenital system	6	6
8	Duplication drug class	5	5
9	Medication management	8	9 (6 + 2 EQI+ 1 NQI)
	total	86	89

* EQI = edited quality indicator, NQI = new quality indicator

For preparing the second round questionnaire, the score of rating by experts were calculated by using SPSS version 16.0. The frequency of score rating in each statement and the median score of expert group within each statement were calculate and presented in the second round questionnaires.

Step 4: Second round rating; a step for developed a final draft of PQI

In the second round rating, result from round one were analyzed and sent with the edited questionnaire to experts. A set of PQI in this step compose of 89 statements, 81 old statements, 5 edited statements and 3 new indicators (See Appendix C). According to the protocol, the median score of rating in first round were documented in the second round questionnaire. Moreover, the frequency of rating in each indicator and the score of first round rate were included. Figure 7showed some part of the second round questionnaires.

In this step, the appropriateness of quality indicators were analyzed according the criteria recommend by RAND/UCLA appropriateness method (RAM). From 89 statement of QI, there is no indicator classified as disagreement within group. All of 89 were classified as 'Appropriate' indicator in term of important of QI. However, this study found 5 indicators were classified as 'Uncertain' indicator in the aspect of feasibility of implementation.

Table 28 Comment from first round rating

Part of PQIs	Edited PQIs		New PQIs
	Old PQIs	New PQIs	
cardiovascular system	Electrolytes checked at least annually for patient taking diuretic	Electrolytes checked every 3 month for patient taking diuretic	Avoid using drug in statin group in combination with potent CYP3A4inhibitor (fluoxetin, cimetidine, antifuncal, macrolide, etc)
central nervous system and psychotropic drug	If no response to antidepressant therapy within week 8, dose adjustment or drug change should be done If inadequate antidepressant response within week 16, dose adjustment or drug change should be done.	If no response to antidepressant therapy within week 2-3, dose adjustment or drug change should be done. If inadequate antidepressant response within week 6-8, dose adjustment or drug change should be done.	*Avoid using drugs in combination that may cause serotonin syndrome (eq. tramadol with TCA)*
medication management	Drug regimen should be reviewed at least annually. Follow up on response to newly started long term therapy with medication within 6 months	drug regimen should be reviewed every visit Follow up on response to newly started long term therapy with medication within 3 months	Avoid using any combination of drug that prolong QT interval (quinolone, antipsychotics, macrolides)

No.	Indicators	Importance	Me	Feasibility of implement	Me
I	**Cardiovascular system (21)**				
		5 2 4		1 3 3 4	
1	Long-acting medications should be used to treat hypertension	1 2 3 4 5 6 7 8 **9**	8	1 2 3 4 5 6 7 8 **9**	8
		2 2 2 2 3		1 1 2 1 2 4	
2	β –Blocker should be used to treat in heart failure	1 2 3 4 5 6 7 8 **9**	3	1 2 3 4 5 6 7 8 **9**	8
		1 1 3 4 2		1 1 2 3 4	
3	β –Blocker should be used to treat in patient who had a myocardial infarction	1 2 3 4 5 6 **7** 8 9	8	1 2 3 4 5 6 7 8 **9**	8
		1 1 1 3 1 4		1 1 2 4 3	
4	ACE inhibitor should be used to treat in patient with hypertension and renal insufficiency	1 2 3 4 5 6 **7** 8 9	7	1 2 3 4 5 6 **7** 8 9	8
		1 5 5		1 1 5 4	
5	ACE inhibitor should be used to treat in patient with heart failure	1 2 3 4 5 6 7 8 **9**	8	1 2 3 4 5 6 7 8 **9**	8
		1 3 7		1 3 7	
6	Aspirin should be offered to patient with coronary artery disease	1 2 3 4 5 6 7 8 **9**	9	1 2 3 4 5 6 7 8 **9**	9
		4 3 4		1 3 3 4	
7	Warfarin or aspirin should be offered to for patient with atrial fibrillation	1 2 3 4 5 6 7 8 **9**	8	1 2 3 4 5 6 7 **8** 9	8
		2 2 7		2 3 6	
8	Lipid-lowering drugs should be offered to IHD patient with LDL cholesterol level > 130 mg/dL and no diet response	1 2 3 4 5 6 7 8 **9**	9	1 2 3 4 5 6 7 8 **9**	9
		1 1 1 2 6		1 1 2 7	
9	Old QI: olytes checked at least annually for patient taking diuretic	1 2 3 4 5 6 7 8 **9**	9	1 2 3 4 5 6 7 8 **9**	9
	Edit QI: Electrolytes checked every 3 month for patient taking diuretic	1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9	

1= median score from first round

2= frequency of rating by all experts

3= own score in first round

4= edited PQIs from first round

Figure 6 Example of the second round questionnaire

4. Adjustment process

This process include step 5 for adjusted PQIs with criteria

Step 5: Adjusted PQIs with criteria

5.1 Adjusted the appropriate of PQIs with criteria

Based on the appropriateness method, the high priority appropriate PQIs were identified. PQIs with a median score between 8 and 9 was classified in 'high priority' indicator both important of PQIs and feasibility of implement these indicator in real situation. There was 9 group of priority, most of PQIs, 47.19% of total indicator (42 out of 89), were classified as a high priority PQIs both important and feasibility to implement aspects. (table 29 and 30). No PQIs were classified into uncertain important and high priority for implementation; uncertain important and priority for implementation and uncertain important and uncertain for implementation.

The median score of each statement in two rounds were compared. For the importance of PQIs, the median score changed in 11 statements while 8 statements were reported the median score changed in part of the feasibility of implementation (Table 31). After second round rating, the level of appropriate was changed in 7 items. Five of seven PQIs were changed from appropriate to high priority appropriate, while 1 PQIs was changed the level of appropriate from high priority to appropriate. For example, the level of appropriate of CVS12; β –Blocker should be used to treat in heart failure; was changed from uncertain to appropriate.

5.2 Adjustment of PQI

There are 2 main points of benefit of developed PQIs. For prescriber, the set of PQIs will be work as a guideline for medication prescribing in elderly patients. Another point was for pharmacist or auditor, the set of PQIs will be a guideline for monitoring the appropriate medication prescribing in the elderly. The sophisticate of indicator set will take into account; thus the friendly user indicator was produced. A set of PQIs categorized by the system of diseases was produced for prescriber (table 32), and PQIs according to dimension of appropriate use was developed for pharmacists (table 33).

Table 29 High priority prescribing quality indicator

No	Category	No. of QIs Results from 2 round rating	High priority PQI	Percentage
1	Cardiovascular system (CVS)	22	15	68.18
2	Central nervous system and psychotropic drug (CNS)	17	4	23.53
3	Endocrine system (ES)	8	2	25.00
4	Gastrointestinal system (GIS)	6	5	83.33
5	Musculoskeletal system (MSS)	13	7	53.85
6	Respiratory system (RS)	3	2	66.67
7	Urogenital system (US)	6	1	16.67
8	Duplication drug class (DD)	5	2	40.00
9	Medication management (MM)	9	4	44.44
	total	89	42	47.19

Table 30 The priority of appropriateness PQIs by system

PQIs system	High priority important and high priority for implementation : HH	High priority important and priority for implementation; HP	High priority important and uncertain for implementation; HU	priority important and high priority for implementation; PH	priority important and priority for implementation; PP	priority important and uncertain for implementation; PU
CVS	15	3	0	3	1	0
CNS	4	10	0	0	3	0
ES	2	4	1	0	0	1
GIS	5	1	0	0	0	0
MSS	7	4	1	0	1	0
RS	2	1	0	0	0	0
US	1	4	0	0	1	0
DD	2	1	0	0	0	2
MM	4	4	0	1	0	0
Total	42	30	2	4	6	3

Table 31. Median score changed in Importance of QIs

PQIs	Statement of QIs	Importance of PQIs			Feasibility to implement PQIs		
		1st round median	2nd round median	changed	1st round median	2nd round median	mode
CVS2	β–Blocker should be used to treat in heart failure	6	7	↑			
CVS11	Potassium and creatinine level checked within 1 month after starting ACE inhibitor	9	8	↓			
CVS12	INR checked within 4 days after starting warfarin				8	9	↑
CVS15	Avoid using β –Blocker for patient with hypertension if patient has asthma	8	7	↓			
CVS16	Avoid using first- or second- generation short acting calcium channel blocker for patient with heart failure				8	7	↓
CVS18	Avoid using of aspirin and warfarin in combination without histamine H2 receptor antagonist (except cimetidine because of interaction with warfarin) or proton pump inhibitor				7	8	↑
CNS28	Avoid using TCA's with constipation.	7	8	↑			

Table 31. Median score changed in Importance of QIs (continue)

PQIs	Statement of QIs	Importance of PQIs			Feasibility to implement PQIs		
		1st round median	2nd round median	changed	1st round median	2nd round median	mode
EN41	Osteoporosis treatment medication (HRT or biphosphonate or calcitonin) within 3 months of diagnosis.	7	8	↑			
GI46	Avoid using PPI for peptic ulcer disease at full therapeutic dosage for > 8 week.	7	8	↑	7	6	↓
G148	Avoid using diphenoxylate, loperamide or codeine phosphate for treatment of severe infective gastroenteritis i.e. bloody diarrhea, high fever or severe systemic toxicity.	8	9	↑	8	9	↑
MUS61	Avoid using NSAID with chronic renal failure.	9	8	↓			
URO73	Avoid using alpha-blockers with long-term urinary catheter *in situ* i.e. more than 2 months.	7	8	↑			
DUP74	Avoid using two or more concurrent use of antivertigo drug (flunarizine, cinnarizine and betahistine).	7	8	↑	7	6	↓
DUP76	Avoid using two concurrent use of sulfonamides, urea derivatives (glipizide, gliclazide, glibenclamide, and glimepiride).	9	8	↓	8	9	↑

Table 32 High priority PQIs classified by system of diseases

NO	Statement of Quality Indicator (42 high priority PQIs/ total PQIs)
Cardiovascular system (15/21)	
1	Long-acting medications should be used to treat hypertension
2	β –Blocker should be used to treat in patient who had a myocardial infarction
3	ACE inhibitor should be used to treat in patient with heart failure
4	Aspirin should be offered to patient with coronary artery disease
5	Warfarin or aspirin should be offered to for patient with atrial fibrillation
6	Lipid-lowering drugs should be offered to IHD patient with LDL cholesterol level > 130 mg/dL and no diet response
7	Potassium and creatinine level checked within 1 month after starting diuretic
8	Potassium and creatinine level checked within 1 month after starting ACE inhibitor

Table 32. High priority PQIs classified by system of diseases.(cont.)

NO	Statement of Quality Indicator (42 high priority PQIs/ total PQIs)
9	INR checked within 4 days after starting warfarin
10	Avoid using digoxin at a long-term dose > 125µg/day for patient with impaired renal function
11	Avoid using first- or second- generation short acting calcium channel blocker for patient with heart failure
12	Avoid using diltiazem or verapamil for patient with NYHA Class III or IV heart failure
13	Avoid using warfarin for patient with first, uncomplicated deep venous thrombosis for longer than 6 months duration
14	Avoid using warfarin for patient with first uncomplicated pulmonary embolus for longer than 12 months duration
15	Avoid using aspirin, clopidogrel, dipyridamole or warfarin for patient with concurrent bleeding disorder
Central nervous system and psychotropic drugs (4/16)	
16	Avoid using a monoamine oxidase inhibitor (MAOI) for at least 2 weeks after termination of paroxetine, sertraline, fluvoxamine and citalopram, and for at least 5 weeks after termination of fluoxetine.

Table 32. High priority PQIs classified by system of diseases.(cont.)

NO	Statement of Quality Indicator (42 high priority PQIs/ total PQIs)
17	Edit QI: If no response to antidepressant therapy within week 2-3, dose adjustment or drug change should be done.
18	Edit: If inadequate antidepressant response within week 6-8, dose adjustment or drug change should be done.
19	*Avoid using drugs in combination that may cause serotonin syndrome (eq. tramadol with TCA)*
Endrocrine system (2/8)	
20	Avoid using estrogens with a history of breast cancer or venous thromboembolism.
21	Avoid using estrogens without progestogen in patients with intact uterus.
Gastrointestinal system (5/6)	
22	Avoid using diphenoxylate, loperamide or codeine phosphate for treatment of diarrhea of unknown cause.

Table 32. High priority PQIs classified by system of diseases.(cont.)

NO	Statement of Quality Indicator (42 high priority PQIs/ total PQIs)
23	Avoid using diphenoxylate, loperamide or codeine phosphate for treatment of severe infective gastroenteritis i.e. bloody diarrhea, high fever or severe systemic toxicity.
24	Avoid using prochlorperazine or metoclopramide with Parkinsonism.
25	Avoid using anticholinergic, antispasmodic drugs with chronic constipation.
26	Documentation of ulcer or gastrointestinal bleeding history and, if present, justification for NSAID use.
Musculoskeletal system (7/13)	
27	Acetaminophen should be used as a first-line medication treatment for patient with osteoarthritis.
28	PPI should be offered to patient with ulcer or gastrointestinal bleeding risk factors who is taking an NSAID.
29	Bowel regimen should be used for prevent constipation for patient taking opiate.

Table 32. High priority PQIs classified by system of diseases.(cont.)

NO	Statement of Quality Indicator (42 high priority PQIs/ total PQIs)
30	Patient who started NSAID should be warned of the risks of them.
31	Avoid using NSAID with chronic renal failure.
32	Avoid using long-term corticosteroids (>3 months) as monotherapy for rheumatoid arthritis or osteoarthritis.
33	Avoid long-term using of powerful opiates e.g. morphine or fentanyl as first line therapy for mild-moderate pain.
Respitory system (2/3)	
34	Avoid using theophylline as monotherapy for COPD.
35	Avoid using systemic corticosteroids instead of inhaled corticosteroids for maintenance therapy in moderate-severe COPD.
Urogenital system (1/6)	
36	Avoid using bladder antimuscarinic drugs in patient with chronic glaucoma.

Table 32. High priority PQIs classified by system of diseases.(cont.)

NO	Statement of Quality Indicator (42 high priority PQIs/ total PQIs)
Duplication drug class (2/5)	
37	Avoid using two concurrent use of organic nitrate (isosorbidemononitrate and isosorbidedinitrate).
38	Avoid using two concurrent use of sulfonamides, urea derivatives (glipizide, gliclazide, glibenclamide, and glimepiride).
Medication management (4/8)	
39	Medications prescribed by other physicians should acknowledge to nonprescribing physician.
40	Patient medication record of every physician should contain an up-to-date medication list.
41	Edit: Follow up on response to newly started long term therapy with medication within 3 months
42	Follow up on newly started long term therapy with medication at next visit with same provider

Table 33. High priority PQIs according to dimension of appropriate use

No.	**Statement of Quality Indicator** (HH PQIs/ ALL PQIs)
Prescribing indicated medication, (9/16 items)	
1	Long-acting medications should be used to treat hypertension
2	β –Blocker should be used to treat in patient who had a myocardial infarction
3	ACE inhibitor should be used to treat in patient with heart failure
4	Aspirin should be offered to patient with coronary artery disease
5	Warfarin or aspirin should be offered to for patient with atrial fibrillation
6	Lipid-lowering drugs should be offered to IHD patient with LDL cholesterol level > 130 mg/dL and no diet response
7	Acetaminophen should be used as a first-line medication treatment for patient with osteoarthritis.
8	PPI should be offered to patient with ulcer or gastrointestinal bleeding risk factors who is taking an NSAID.
9	Bowel regimen should be used for prevent constipation for patient taking opiate.

Table 33. High priority PQIs according to dimension of appropriate use(cont.)

No.	**Statement of Quality Indicator** (HH PQIs/ ALL PQIs)
Avoiding inappropriate medication (22/60 items)	
10	Avoid using digoxin at a long-term dose > 125µg/day for patient with impaired renal function
11	Avoid using first- or second- generation short acting calcium channel blocker for patient with heart failure
12	Avoid using diltiazem or verapamil for patient with NYHA Class III or IV heart failure
13	Avoid using warfarin for patient with first, uncomplicated deep venous thrombosis for longer than 6 months duration
14	Avoid using warfarin for patient with first uncomplicated pulmonary embolus for longer than 12 months duration
15	Avoid using aspirin, clopidogrel, dipyridamole or warfarin for patient with concurrent bleeding disorder
16	Avoid using a monoamine oxidase inhibitor (MAOI) for at least 2 weeks after termination of paroxetine, sertraline, fluvoxamine and citalopram, and for at least 5 weeks after termination of fluoxetine.

Table 33. High priority PQIs according to dimension of appropriate use(cont.)

No.	**Statement of Quality Indicator** (HH PQIs/ ALL PQIs)
17	*Avoid using drugs in combination that may cause serotonin syndrome (eq. tramadol with TCA)*
18	Avoid using estrogens with a history of breast cancer or venous thromboembolism.
19	Avoid using bladder antimuscarinic drugs in patient with chronic glaucoma.
20	Avoid using two concurrent use of organic nitrate (isosorbidemononitrate and isosorbidedinitrate).
21	Avoid using two concurrent use of sulfonamides, urea derivatives (glipizide, gliclazide, glibenclamide, and glimepiride).
22	Avoid using estrogens without progestogen in patients with intact uterus.
23	Avoid using diphenoxylate, loperamide or codeine phosphate for treatment of diarrhea of unknown cause.
24	Avoid using diphenoxylate, loperamide or codeine phosphate for treatment of severe infective gastroenteritis i.e. bloody diarrhea, high fever or severe systemic toxicity.
25	Avoid using prochlorperazine or metoclopramide with Parkinsonism.

Table 33- High priority PQIs according to dimension of appropriate use(cont.)

No.	**Statement of Quality Indicator** (HH PQIs/ ALL PQIs)
26	Avoid using anticholinergic, antispasmodic drugs with chronic constipation.
27	Avoid using NSAID with chronic renal failure.
28	Avoid using long-term corticosteroids (>3 months) as monotherapy for rheumatoid arthritis or osteoarthritis.
29	Avoid long-term using of powerful opiates e.g. morphine or fentanyl as first line therapy for mild-moderate pain.
30	Avoid using theophylline as monotherapy for COPD.
31	Avoid using systemic corticosteroids instead of inhaled corticosteroids for maintenance therapy in moderate-severe COPD.
Education, continuity, and documentation (4/7 items)	
32	Documentation of ulcer or gastrointestinal bleeding history and, if present, justification for NSAID use.
33	Patient who started NSAID should be warned of the risks of them.
34	Patient medication record of every physician should contain an up-to-date medication list.

Table 33. High priority PQIs according to dimension of appropriate use(cont.)

No.	**Statement of Quality Indicator** (HH PQIs/ ALL PQIs)
35	Medications prescribed by other physicians should acknowledge to non-prescribing physician.
Medication monitoring (7/9 items)	
36	Potassium and creatinine level checked within 1 month after starting diuretic
37	Potassium and creatinine level checked within 1 month after starting ACE inhibitor
38	INR checked within 4 days after starting warfarin
39	If no response to antidepressant therapy within week 2-3, dose adjustment or drug change should be done.
40	If inadequate antidepressant response within week 6-8, dose adjustment or drug change should be done.
41	Edit: Follow up on response to newly started long term therapy with medication within 3 months
42	Follow up on newly started long term therapy with medication at next visit with same provider

CHAPTER V

DISCUSSION AND CONCLUSION

Discussion

Part I. The medication use situation in the elderly

This research composes of 2 study phases according to the objectives. Phase 1 of this study attempted to explore the situation of medication prescription and to determine the quality of medication prescribing in the elderly by using the criteria for Thai older patient. The result of medication use from phase 1 was incorporated into phase 2 study. Phase 2 study was developed the prescribing quality indicators for Thai elderly (PQI-Th)by using the well-known quality indicator – ACOVE quality and STOPP as a starting point.

This study was the first study in Thailand attempt to explore the pattern of medication prescription and to determine the quality of medication prescribing in the elderly by using the Winit-watjana criteria – the country-specific criteria - by analyzing the computerized databases from 4 tertiary care hospitals. Female elderly patients (55.47%) is the major population in this study, this finding is concordance with result from USA, Ireland and also in Japan, Taiwan and Hong Kong (Zhan, Sangl et al. 2001; Higashi, Shekelle et al. 2004; Steinman, Seth Landefeld et al. 2006; Ma, Lum et al. 2008; Buck, Atreja et al. 2009; Lai, Hwang et al. 2009; Akazawa, Imai et al. 2010; Bradley, Fahey et al. 2012; Oliveira, Amorim et al. 2012), while some studies from India show in a difference (Shah, Gajjar et al. 2012). The mean age that found in this study is 70.26 ± 7.42 years; this result is similar to the finding from other studies (Zhan, Sangl et al. 2001; Simon, Chan et al. 2005; Wessell, Nietert et al. 2008; Lai, Hwang et al. 2009; Fadare, Agboola et al. 2013). An average number of ambulatory care visits in this study was 3.5 visits per year, which was less than the result from the USA (5.6-6.8 visits/ year) (Buck, Atreja et al. 2009)

The majority of disease found in this study is hypertensive diseases that is similar to study from Nigeria and India (Zaveri, Mansuri et al. 2010; Fadare, Agboola et al. 2013) and 60% of elderly have more than 1 disease. However, number of disease of the elderly patient when adjusted by age group showed a different. Seventy percent of very old patient have only disease. The reason of this situation may be the patient with multiple diseases has no long-lived. For this finding, the health care policy for elderly should be separated into two sectors that are for older patient and another for very old.

The average number of medication per prescription from four hospitals, 3.97- 4.52, was consistent with the average number of medication prescribed to elderly from other studies. This finding show a higher number than the number that recommendation by WHO, which is not more than 2 items per prescriptions. Studies from India, Nigeria, and Brazil reported a mean of 4.3, 3.8 and 3.2 medications per prescription respectively (Zaveri, Mansuri et al. 2010; Guaraldo, Cano et al. 2011; Fadare, Agboola et al. 2013), while some study from USA, Croatia and Poland reported a higher mean number than this study, which were 5.6-9.1, 7.5 and 6.6 respectively (VlahoviĆ-Palcevski and Bergman 2004; Cannon, Choi et al. 2006; Steinman, Seth Landefeld et al. 2006; Rajska-Neumann A and Wieczorowska-Tobis K 2007; Buck, Atreja et al. 2009). The difference of the average number of medication per prescription between the study and the others, especially in developed countries, could be partly affected by health insurance policy for the elderly, medical culture or the budget constrain.

Fifty percent of medication prescribed to elderly come from medication in alimentary and metabolism group and medication for cardiovascular system. The most frequent medication prescribed is HMG CoA reductase inhibitors esp. simvastatin for dyslipidemia, that was similar to the study by Higashi et al.(Higashi, Shekelle et al. 2004), while other studies reported antihypertensives drug was the most prescribed medication (Zaveri, Mansuri et al. 2010; Shah, Gajjar et al. 2012; Fadare, Agboola et al. 2013). Study from India and Nigeria reported that calcium channel blocker (10.5%) and diuretic (10.4%) were most prescribed and

followed by multivitamin and analgesic drug, while this study reported that simvastatin was the most prescribed medication, followed by aspirin and omeprazole. The patterns of medication prescription were difference; it could be resulted from the difference of diseases, environment, culture, and treatment guidelines.

The quality of medication prescription in this study was assessed both in forms of duplication medication and inappropriate medication prescription. Based on a search from published literatures, this study seem to be the first study in Thailand that using the ATC classification system for detecting any duplication medication. The average rate of duplication medication is 6.17% (3.36% – 7.89%). Most common duplication medication was medication in anti-vertigo preparation (N07CA) found in 5.63% and benzodiazepine derivatives (N05BA) in 0.55% while a study from the USA (Laurier, Moride et al. 2002) reported the concomitant use of at least 2 benzodiazepines in 8.5%.

Prescribing concomitant medication in same chemical subgroup (the ATC, 4^{th} level) might be either appropriate or inappropriate depending on the dosage of the medications, drug administration, drug regimen, disease and the guideline of the therapy. Prescribing duplication medication to the elderly may increase the risk of medication related problems, particularly increase the side effects. Medication in anti-vertigo preparation was the most common found as duplication medication in this study because vertigo or dizziness was frequency found in the elderly. For treating this symptom, the combination of cinnarizine, flunarizine and betahistinemesylate were usually prescribed in clinical practices. However, this pattern was not consistent with the guideline of treatment according to Thai National Formulary 2010: for central nervous system, volume 1 that recommended only betahistinemesylate{The national commission on the elderly, #1074}.. Moreover, prescribing glibenclamide combined with glipiziede for diabetes mellitus was also found in this study, was not concordant with the guideline recommendation (วงศ์ถาวราวัฒน์ 2548) The other duplication medication found in this study were clopidogrel and aspirin for patient at high risk of cardiovascular disease

(Braunwald, Antman et al. 2002). This pattern is rational for prescribing according to the guidelines. Therefore, for analyzing the appropriateness of medication prescribing in term of inappropriate duplication, the ATC, 4^{th} level can be used as a screening tool.

In the study, 11.46% of total prescription with IMPs was in line with the rate of PIM reported from Western countries at ambulatory care visit (7-40%) (Zhan, Sangl et al. 2001; Hanlon JT, Schmader et al. 2002; Goulding 2004; De Wilde, Carey et al. 2007; Gallagher, Barry et al. 2007; Johnell K 2007; Rajska-Neumann A and Wieczorowska-Tobis K 2007). However, the study showed lower range than the results from the USA (23% - 27.5%), Brazil (34.5%), Ireland (27.6%), Taiwan (19.1%-62.5%) and lower than the median rate from a systematic review of inappropriate medication prescription (20.5%) (Chunliu Zhan, Correa-de-Araujo et al. 2005 ; Gallagher and O'Mahony 2008; Buck, Atreja et al. 2009; Lai, Hwang et al. 2009; Oliveira, Amorim et al. 2012; Opondo, Eslami et al. 2012); and higher than the result from Turkey (9.8%) and Croatia (2.2%) (VlahoviĆ-Palcevski and Bergman 2004; Ay, Akici et al. 2005). Thavornwattanayong and colleague, the study in Thailand, using the Winit-watjana criteria for assessing inappropriate medications reported the lower rate of PIM than this study(Thavornwattanayong, Anothayanon et al. 2010). The reason of the difference might be caused by the different study populations, using the different explicit criteria and different in the methodology.

In our study, NSAIDs was the most common PIMs in 65.31% of all IMPs or 12.28% of total prescriptions, followed by NSAIDS, COX II inhibitors but other studies using Beers criteria reported the differences. The most common PIMs from other studies were long-acting benzodiazepines, diazepam, followed by diphenhydramine and amitriptyline (Aparasu and Mort 2000; Laurier, Moride et al. 2002; Buck, Atreja et al. 2009; Bradley, Fahey et al. 2012). For example, a study from Croatia reported diazepam as PIMs in 56% of all IMPs or 1.2% of total prescriptions (VlahoviĆ-Palcevski and Bergman 2004). Moreover, the nationwide study in Taiwan reported antihistamine prescription as the most common PIMs in 48.3% of all IMPs and

27.6% of total prescriptions; and reported nonselective NSAIDS use in 18.1% and 8.9% (Lai, Hwang et al. 2009). By the way, the result of this study was consistent with Nigerian study which reported NSAIDs as the most common PIMs (30.3%) (Fadare, Agboola et al. 2013). The absolute different PIMs could be the effect of explicit criteria using in each study. This study employed the Winit-watjana criteria (Winit-watjana, Sakulrat et al. 2008), which was developed for Thai elderly patients in year 2008. Only medications that classified as drugs should be avoided and drug rarely appropriate were applied in this study while medications that classified as drug with some indications for elderly patients did not include in this study and Benzodiazepine was classified in the latter group.

Part II. Developing the prescribing quality indicators for Thai elderly (PQI-Th)

The objective of phase 2 study isto develop the prescribing quality indicators for Thai elderly (PQI-Th)by using the well-known quality indicator – ACOVE quality and STOPP as a starting point and information of medication use from phase 1 study.From 301 statement of QIs (231 QI from ACOVE, 65 QI from STOPP and 5 QIs from phase 1 analysis), 101 statements and 86 statements were selected in first step and in the second step, respectively. After adjusted the PQI with criteria, 42 practice statements were accepted with high priority appropriate both importance and feasibility of implement PQIs.

There are several methods using for developing quality indicators are depend on the available information. It is divided in to 2 systems that are non-systematic and systematic method (Campbell, Braspenning et al. 2002). Several consensus techniques exist, including consensus development conferences, the Delphi technique, the nominal group technique, the RAND appropriateness method, and iterated consensus rating procedures. Each method has their pros and cons. Modified Delphi technique is the popular method for developing explicit criteria such as Beers criteria (Fick, Cooper et al. 2003; van der Hooft, W.'t Jong et al. 2005)and STOPP(Gallagher, Ryan et al. 2008). Moreover, the Winit-watjana also used this methodology (Winit-watjanaet al., 2008). This research was develop the PQI by using the

Modified Delphi method for finding consensus of expert and using the appropriateness method according to RAM for adjust the final criteria.

There are advantage point of using ACOVE -US indicator and STOPP-European indicator as a starting point for developing a set of prescribing quality indicator for elderly in Thailand. The process of literature review for develops each indicator item and validity test of each item were omitted. By using this method, it can reduce time consume and cost. Both ACOVE and STOPP was developed base on the rigorous process. The ACOVE quality indicator is a set of evidence-based explicit quality indicators which developed under the RAND/UCLA process -existing guideline, review criteria and expert opinion (RAND, Corporation et al.) and the validity and feasibility of QIs were assessed according to the RAND/UCLA appropriateness method (RAM) (Wenger and Shekelle 2001). STOPP was developed by Gallagher et al in 2008 (Gallagher, Ryan et al. 2008), by using a two round of the Delphi consensus method with 18 experts. Similarly, this study was used the modified Delphi method that widely used developing the quality indicator and assessed the importance and feasibility of PQIs according to RAM recommendation.

After the two round surveys, 89 PQIs were accepted as appropriate PQIs without disagreement. In 89 PQIs, there are 3 new indicators, and 5 edited indicators during the process. However, only 42 practice statements were accepted with high priority appropriate both importance and feasibility of implement PQIs. All indicators were appropriate after two round analysis. It could be PQIs in this study derived from the valid quality indicator. Although we have focused on the presence or absence of US indicators and UK indicator set in PQI-Th set as a means of assessing the applicability of the former in a second country, there were also indicators which appeared in the PQIs-Th set alone. Sometimes these were clearly due to differences in the panel process— for example, detailed indicators on the management of patient with cardiovascular disease require electrolytes checked at every 3 month for patient who taking diureticsometimes they were related to the different healthcare context. We have focused on differences in professional practice in the results reported here. However, there

are a number of additional reasons for differences between the two sets of indicators. Firstly, the literature reviews were different; with the UK reviews are comprehensive and focused on primary care evidence and the US reviews are focused on tertiary care evidence.The UK reviews were on average 14.7 pages long and contained 69 references and the US reviews were on average 8.3 pages long and contained 30 references. But this step was omitted in this study. In addition, there may have been differences which related to the selection of indicators for scoring by the panels and the composition of the panels. Finally, the reproducibility of the panel process is not perfect, although the reliability of panels rating the same set of indicators is generally regarded as acceptable.

The characters of panel have direct effect to scoring and finding the consensus. RAND/UCLA recommends 7-15 members in panels. The expert panel in this study composes of 11 experts. This number of experts is concordance with the study in the Netherlands (Marchall, et al. 2003) and the UK (Steel, et al. 2004).

There are some disadvantages of our panel that affect to the scoring. Since there are a few of geriatrician in Thailand, this study were invited all experts that have an experience in geriatric field for many years instead. The second is the panel composed of two main groups of expert that are physicians and pharmacists. The different perspective may affect to scoring and consensus. Finally, the understanding of method is important part for scoring. Some of expert is not familiar to the process of rating and re-rating.

There were some strengths of this study. First, this study was using the large computerized prescription database from several hospitals for analysis, that reflected a large part of the situation of medication prescription for the elderly in Thailand and giving more accurate information than using patient medication records. The second strength was the tool for assessing the appropriateness of medication prescription that were ATC, 4^{th} level system and the Winit-watjana criteria which was proper for assessing PIM in Thailand. However, there were some limitations of this study. This study did not apply a full version of the criteria for

assessing the inappropriate medication since the researcher wanted to focus only high severity of inappropriate medications. The other weak point was that this research lacked of the data on medication dosage, duration of treatment, medication adherence and adverse drug reaction and this study was not take into account of the medication costs. For further research, the full version of the criteria and more medication information should be taken into account; and the factor associated of inappropriate prescription should be incorporated into the study.

This study applied the methodology of developing PQIs by using the rigorous indicator as a starting point and incorporate with the problem of prescribing in real practice, for reduce both cost and time to develop. This study has significant implications for other developing countries that plan to use indicators to improve quality and manage performance. We believe that there is considerable scope for countries to collaborate in the development of quality indicators.

Conclusions

This study explored the situation of medication prescription in the elderly by using the computerized prescription database from four tertiary care hospitals. Medication in cardiovascular system is the most common prescribed, particular simvastatin. The inappropriate duplication medication prescribing can be detected by the ATC, 4^{th} level. The majority of inappropriate medication was NSAIDs, especially diclofenac which was classified as drug rarely appropriate according to the Winit-watjana criteria. The findings from phase 1 show the potential inappropriate duplication medication that put into phase 2 study. The phase 2 study was organized in three phases with six steps: (1) Propose the candidate prescribing quality indicators by using worldwide indicator from western and problem of medication use in our country, (2) Screening the set of prescribing quality indicators by researcher, (3) : Validating the screening PQI by clinical pharmacists (4) mailing the round-

onie questionnaire and analysis of the answers and creation of the new questionnaire, (5) mailing of this round-two questionnaire based on round-one synthesis and (6) final analysis; adjusting the quality indicators. From 301 statement of QI (231 QI from ACOVE, 65 QI from STOPP and 5 QIs from phase 1 analysis, 101 statements and 86 statements were selected in first step and in the second step, respectively. And the final set of PQI-Th composes of 42 high priority indicators. The PQI-Th set can use as a guideline for prescribing medication to the elderly, which not disease specific.

Recommendations

The PQI-Th set can use as a guideline for prescribing medication to the elderly which not disease specific. They are some recommendation before apply this indicator to real practice. The qualitative research should be done for find the opinion of geriatrician or healthcare provider who involve with indicator in the future. For example, make an in-depth interview the geriatrician about the opinion of using the PQI-Th. The second point is PQI-Th should be test of feasibility of use in real situation in term of time of burden when using this guideline.

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APPENDICES

Appendix A

Criteria for high risk medication for Thai older

No.	Drug or drug class
Potentially inappropriate medication prescription	
1	phenylbutazone
2	Antispasmodics
	Hyoscine
	belladona
3	Metoclopramide
4	NSAIDS
	oxoprofen
	clinoril
	diclofenac
	tenoxicam
	meloxicam
	ibuprofen
	mefenamic acid
	nimesulide
	diacerein
	lornoxicam
5	NSAIDS, COX II inhibitors
	celecoxib
	parecoxib
	valdecoxib
	etoricoxib
	lumiracixub
6	NSAIDS, long-action
	piroxicam
	naproxen
7	Oxybutynin
Drug – drug interaction	
8	Aspirin - NSAIDs
9	Warfarin - NSAIDs

Appendix B

Quality indicator for validity checked.

คำชี้แจงสำหรับผู้เชี่ยวชาญในการคัดกรองตัวชี้วัด

ชุดตัวชี้วัดเพื่อการสั่งใช้ยาในผู้สูงอายุนี้ พัฒนาขึ้นเพื่อวัตถุประสงค์

1. เพื่อเป็นแนวทางในการสั่งใช้ยาอย่างเหมาะสมในผู้ป่วยสูงอายุ ได้แก่ ให้มีการสั่งใช้ยาตามข้อบ่งใช้ และไม่มีการสั่งใช้ยาที่มีข้อห้ามใช้หรืออาจก่อให้เกิดผลกระทบทางคลินิคที่รุนแรงกับผู้ป่วยสูงอายุ
2. เพื่อส่งเสริมให้เกิดความเข้าใจในการใช้ยา และเกิดความต่อเนื่องในการดูแลรักษาด้วยยาในผู้ป่วยสูงอายุ

วัตถุประสงค์ของการคัดกรองตัวชี้วัด

1. เพื่อให้ได้ ตัวชี้วัดเชิงคุณภาพ ที่มีความถูกต้อง (validity) ตามหลักวิชาการของการดูแลรักษาด้วยยาในผู้ป่วยสูงอายุ
2. เพื่อให้ได้ตัวชี้วัดที่เป็นไปตามวัตถุประสงค์ของการพัฒนาตัวชี้วัดที่ระบุไว้ด้านบน

วิธีการ

ผู้เชี่ยวชาญเลือกตอบความถูกต้อง (Validity) โดยเลือก YES หรือ NO ในแต่ละข้อของตัวชี้วัด ตามความเห็นของท่าน โดยคำนึงถึงหลักการใช้ยาและการรักษาในผู้ป่วยสูงอายุเป็นหลัก ในงานวิจัยนี้คำว่าผู้สูงอาย (elderly) หมายถึง ผู้ที่อายุ มากกว่าหรือเท่ากับ 60 ปี

ในกรณีที่ผู้เชี่ยวชาญเลือกให้ความเห็นว่า YES หรือ NO ผู้เชี่ยวชาญอาจชี้แจงเหตุผล ที่สนับสนุนการตอบดังกล่าว

ผู้เชี่ยวชาญสามารถแสดงความคิดเห็นเพิ่มเติมที่เกี่ยวข้องกับตัวชี้วัด เช่นแก้ไข หรือ ปรับปรุงข้อความ หรือเพิ่มเติมตัวชี้วัดได้

ข้อมูลอันมีประโยชน์จากการตอบแบบประเมินของผู้เชี่ยวชาญทุกท่านจะถูกนำมารวบรวมไว้ในชุดตัวชี้วัดเพื่อความเหมาะสมในการใช้ยา เพื่อนำไปใช้ในกระบวนการพัฒนาตัวชี้วัดเพื่อความเหมาะสมในการใช้ยา ตามกระบวนการของ RAND/UCLA appropriateness method (RAM) ต่อไป

	ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา	Validity	
Prescribing indicated medications			
1	PPI or misoprostol for patient with ulcer or gastrointestinal bleeding risk factors who is taking an NSAID	yes	no
เหตุผล			
2	ACE inhibitor for diabetic patient with proteinuria	yes	no
เหตุผล			
3	Calcium and vitamin D for patient with osteoporosis	yes	no
เหตุผล			
4	Daily aspirin therapy for patient with diabetes	yes	no
เหตุผล			
5	Lipid-lowering drugs for IHD patient with LDL cholesterol level > 130 mg/dL and no diet response	yes	no
เหตุผล			
6	β –Blocker for patient with heart failure	yes	no
เหตุผล			
7	β –Blocker for patient who had a myocardial infarction	yes	no
เหตุผล			
8	Osteoporosis treatment medication (HRT or biphosphonate or calcitonin) within 3 months of diagnosis.	yes	no
เหตุผล			

	ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา	Validity	
9	ACE inhibitor for patient with hypertension and renal insufficiency	yes	no
เหตุผล			
10	ACE inhibitor for diabetic patient with one additional cardiac risk factor (smoker, hypertension, hypercholesterolemia, or renal insufficiency)	yes	no
เหตุผล			
11	ACE inhibitor for patient with heart failure	yes	no
เหตุผล			
12	Aspirin for patient with coronary artery disease	yes	no
เหตุผล			
13	Calcium and vitamin D for patient taking long-term steroid therapy	yes	no
เหตุผล			
14	Bowel regimen to prevent constipation for patient taking opiate	yes	no
เหตุผล			
15	Warfarin or aspirin for patient with atrial fibrillation	yes	no
เหตุผล			
16	Aspirin with a past history of peptic ulcer disease without histamine H2 receptor antagonist or Proton Pump Inhibitor (risk of bleeding).	yes	no
เหตุผล			
Avoiding inappropriate medication			

	ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา	Validity	
17	Acetaminophen as first-line medication treatment for patient with osteoarthritis	yes	no
เหตุผล			
18	Change from acetaminophen to a different medication when the patient with osteoarthritis has had a trial of maximum dose of acetaminophen	yes	no
เหตุผล			
19	Avoid tertiary amine tricyclic, MAOI, benzodiazepine, or stimulant as first-line antidepressant	yes	no
เหตุผล			
20	Avoid a monoamine oxidase inhibitor (MAOI) for at least 2 weeks after termination of paroxetine, sertraline, fluvoxamine and citalopram, and for at least 5 weeks after termination of fluoxetine	yes	no
เหตุผล			
21	Long-acting medications should be used to treat hypertension	yes	no
เหตุผล			
22	Avoid strongly anticholinergic medication if alternatives exist	yes	no
เหตุผล			
23	Avoid barbiturates unless patient has a seizure disorder	yes	no
เหตุผล			
24	Avoid first- or second- generation short acting calcium channel blocker for patient with heart failure	yes	no

	ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา	Validity	
เหตุผล			
25	Avoid β –Blocker if patient has asthma	**yes**	**no**
เหตุผล			
26	Digoxin at a long-term dose > 125µg/day with impaired renal function* (increased risk of toxicity)	**yes**	**no**
เหตุผล			
27	Loop diuretic as first-line monotherapy for hypertension *(safer, more effective alternatives available)*	**yes**	**no**
เหตุผล			
28	Use of diltiazem or verapamil with NYHA Class III or IV heart failure *(may worsen heart failure).*	**yes**	**no**
เหตุผล			
29	Calcium channel blockers with chronic constipation *(may exacerbate constipation).*	**yes**	**no**
เหตุผล			
30	Use of aspirin and warfarin in combination without histamine H2 receptor antagonist (except cimetidine because of interaction with warfarin) or proton pump inhibitor *(high risk of gastrointestinal bleeding).*	**yes**	**no**
เหตุผล			
31	Warfarin for first, uncomplicated deep venous thrombosis for longer than 6 months duration *(no proven added benefit).*	**yes**	**no**

	ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา	Validity	
เหตุผล			
32	Warfarin for first uncomplicated pulmonary embolus for longer than 12 months duration *(no proven benefit).*	yes	no
เหตุผล			
33	Aspirin, clopidogrel, dipyridamole or warfarin with concurrent bleeding disorder *(high risk of bleeding).* * GFR <50ml/min	yes	no
เหตุผล			
34	Tricyclic antidepressants (TCA's) with dementia *(risk of worsening cognitive impairment).*	yes	no
เหตุผล			
35	TCA's with glaucoma (likely to exacerbate glaucoma).	yes	no
เหตุผล			
36	TCA's with cardiac conductive abnormalities *(pro-arrhythmic effects).*	yes	no
เหตุผล			
37	TCA's with constipation (likely to worsen constipation).	yes	no
เหตุผล			
38	TCA's with an opiate or calcium channel blocker *(risk of severe constipation).*	yes	no
เหตุผล			
39	TCA's with prostatism or prior history of urinary retention *(risk of urinary retention).*	yes	no

	ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา	Validity	
เหตุผล			
40	Long-term (i.e. > 1 month), long-acting benzodiazepines e.g. chlordiazepoxide, fluazepam, nitrazepam, chlorazepate and benzodiazepines with long-acting metabolites e.g. diazepam *(risk of prolonged sedation, confusion, impaired balance, falls)*.	**yes**	**no**
เหตุผล			
41	Long-term (i.e. > 1 month) neuroleptics as long-term hypnotics (risk of confusion, hypotension, extra-pyramidal side effects, falls).	**yes**	**no**
เหตุผล			
42	Long-term neuroleptics (> 1 month) in those with parkinsonism *(likely to worsen extra-pyramidal symptoms)*	**yes**	**no**
เหตุผล			
43	Prolonged use (> 1 week) of first generation antihistamines i.e. diphenydramine, chlorpheniramine, cyclizine, promethazine *(risk of sedation and anti-cholinergic side effects).*	**yes**	**no**
เหตุผล			
44	Diphenoxylate, loperamide or codeine phosphate for treatment of diarrhoea of unknown cause (risk of delayed diagnosis, may exacerbate constipation with overflow diarrhoea, may precipitate toxic megacolon in inflammatory bowel disease, may delay recovery in unrecognised gastroenteritis).	**yes**	**no**
เหตุผล			
45	Diphenoxylate, loperamide or codeine phosphate for treatment of severe infective gastroenteritis i.e. bloody diarrhoea, high fever or severe systemic toxicity *(risk of*	**yes**	**no**

	ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา	Validity	
	exacerbation or protraction of infection)		
เหตุผล			
46	Prochlorperazine (Stemetil) or metoclopramide with Parkinsonism *(risk of exacerbating Parkinsonism).*	**yes**	**no**
เหตุผล			
47	PPI for peptic ulcer disease at full therapeutic dosage for > 8 weeks *(earlier discontinuation or dose reduction for maintenance/prophylactic treatment of peptic ulcer disease, oesophagitis or GORD indicated).*	**yes**	**no**
เหตุผล			
48	Anticholinergic antispasmodic drugs with chronic constipation *(risk of exacerbation of constipation).*	**yes**	**no**
เหตุผล			
49	Theophylline as monotherapy for COPD. *(safer, more effective alternative; risk of adverse effects due to narrow therapeutic index)*	**yes**	**no**
เหตุผล			
50	Systemic corticosteroids instead of inhaled corticosteroids for maintenance therapy in moderate-severe COPD *(unnecessary exposure to long-term side-effects of systemic steroids).*	**yes**	**no**
เหตุผล			
51	Nebulised ipratropium with glaucoma *(may exacerbate glaucoma).*	**yes**	**no**
เหตุผล			

	ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา	Validity	
52	NSAID with moderate-severe hypertension (moderate: 160/100mmHg – 179/109mmHg; severe: ≥180/110mmHg). *(risk of exacerbation of hypertension).*	yes	no
เหตุผล			
53	NSAID with heart failure *(risk of exacerbation of heart failure).*	yes	no
เหตุผล			
54	Warfarin and NSAID together *(risk of gastrointestinal bleeding).*	yes	no
เหตุผล			
55	NSAID with chronic renal failure* *(risk of deterioration in renal function).* * estimated GFR 20-50ml/min	yes	no
เหตุผล			
56	Long-term corticosteroids (>3 months) as monotherapy for rheumatoid arthrtitis or osterarthritis*(risk of major systemic corticosteroid side-effects).*	yes	no
เหตุผล			
57	Bladder antimuscarinic drugs with dementia *(risk of increased confusion, agitation).*	yes	no
เหตุผล			
58	Bladder antimuscarinic drugs with chronic glaucoma *(risk of acute exacerbation of glaucoma).*	yes	no
เหตุผล			
59	Bladder antimuscarinic drugs with chronic constipation *(risk of exacerbation of constipation).*	yes	no

	ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา	Validity	
เหตุผล			
60	Bladder antimuscarinic drugs with chronicprostatism*(risk of urinary retention).*	yes	no
เหตุผล			
61	Alpha-blockers in males with frequent incontinence i.e. one or more episodes of incontinence daily *(risk of urinary frequency and worsening of incontinence).*	yes	no
เหตุผล			
62	Alpha-blockers with long-term urinary catheter *in situ* i.e. more than 2 months *(drug not indicated).*	yes	no
เหตุผล			
63	Glibenclamide or chlorpropamide with type 2 diabetes mellitus *(risk of prolonged hypoglycaemia).*	yes	no
เหตุผล			
64	Beta-blockers in those with diabetes mellitus and frequent hypoglycaemic episodes i.e. $\geq$ 1 episode per month *(risk of masking hypoglycaemic symptoms).*	yes	no
เหตุผล			
65	Oestrogens with a history of breast cancer or venous thromboembolism *(increased risk of recurrence).*	yes	no
เหตุผล			
66	Oestrogens without progestogen in patients with intact uterus *(risk of endometrial cancer).*	yes	no
เหตุผล			

	ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา	Validity	
67	Benzodiazepines *(sedative, may cause reduced sensorium, impair balance).*	yes	no
เหตุผล			
68	Neuroleptic drugs *(may cause gait dyspraxia, Parkinsonism).*	yes	no
เหตุผล			
69	First generation antihistamines *(sedative, may impair sensorium).*	yes	no
เหตุผล			
70	Vasodilator drugs known to cause hypotension in those with persistent postural hypotension i.e. recurrent > 20mmHg drop in systolic blood pressure *(risk of syncope, falls).*	yes	no
เหตุผล			
71	Long-term opiates in those with recurrent falls *(risk of drowsiness, postural hypotension, vertigo).*	yes	no
เหตุผล			
72	Use of long-term powerful opiates e.g. morphine or fentanyl as first line therapy for mild-moderate pain *(WHO analgesic ladder not observed).*	yes	no
เหตุผล			
73	Regular opiates for more than 2 weeks in those with chronic constipation without concurrent use of laxatives *(risk of severe constipation).*	yes	no
เหตุผล			
74	Long-term opiates in those with dementia unless indicted for palliative care or management of moderate/severe chronic pain syndrome *(risk of exacerbation of*	yes	no

	ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา	Validity	
	cognitive impairment).		
เหตุผล			
75	Discontinue or justify the necessity of continuing the new medication if dementia symptoms presents in the correspondence time	**yes**	**no**
เหตุผล			
76	Any regular duplicate drug class prescription e.g. two concurrent opiates, NSAID's, SSRI's, loop diuretics, ACE inhibitors *(optimisation of monotherapy within a single drug class should be observed prior to considering a new class of drug).* This excludes duplicate prescribing of drugs that may be required on a prn basis e.g. inhaled beta2 agonists (long and short acting) for asthma or COPD, and opiates for management of breakthrough pain.	**yes**	**no**
เหตุผล			
Education, continuity, and documentation		Validity	
77	Documentation of ulcer or gastrointestinal bleeding history and, if present, justification for NSAID use	**yes**	**no**
เหตุผล			
78	Documentation of medications prescribed by other physicians	**yes**	**no**
เหตุผล			
79	Patients apprised of risks when NSAID started	**yes**	**no**
เหตุผล			
80	Drug regimen review at least annually	**yes**	**no**

	ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา	Validity	
เหตุผล			
81	Documentation of indication for newly started therapy with medication	yes	no
เหตุผล			
82	Patient education about newly started therapy with medication	yes	no
เหตุผล			
83	Documentation of an up-to-date medication list	yes	no
เหตุผล			
Medication monitoring		Validity	
84	Dose adjustment or drug change by week 8 if no response to antidepressant therapy	yes	no
เหตุผล			
85	Dose adjustment or drug change by week 16 if inadequate antidepressant response	yes	no
เหตุผล			
86	Potassium and creatinine level check within 1 month after starting diuretic	yes	no
เหตุผล			
87	Potassium and creatinine level check within 1 month after starting ACE inhibitor	yes	no
เหตุผล			
88	INR checked within 4 days after starting warfarin	yes	no
เหตุผล			
89	INR checked at least every 6 weeks for patient receiving warfarin	yes	no

	ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา	Validity	
เหตุผล			
90	Follow up on response to newly started long term therapy with medication within 6 months	yes	no
เหตุผล			
91	Follow up on newly started long term therapy with medication at next visit with same provider	yes	no
เหตุผล			
92	Electrolytes checked at lease annually for patient taking diuretic	yes	
เหตุผล			
Education, continuity, and documentation		Validity	
77	Documentation of ulcer or gastrointestinal bleeding history and, if present, justification for NSAID use	yes	no
เหตุผล			
78	Documentation of medications prescribed by other physicians	yes	no
เหตุผล			
79	Patients apprised of risks when NSAID started	yes	no
เหตุผล			
80	Drug regimen review at least annually	yes	no
เหตุผล			
81	Documentation of indication for newly started therapy with medication	yes	no

	ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา	Validity	
เหตุผล			
82	Patient education about newly started therapy with medication	yes	no
เหตุผล			
83	Documentation of an up-to-date medication list	yes	no
เหตุผล			
Medication monitoring		Validity	
84	Dose adjustment or drug change by week 8 if no response to antidepressant therapy	yes	no
เหตุผล			
85	Dose adjustment or drug change by week 16 if inadequate antidepressant response	yes	no
เหตุผล			
86	Potassium and creatinine level check within 1 month after starting diuretic	yes	no
เหตุผล			
87	Potassium and creatinine level check within 1 month after starting ACE inhibitor	yes	no
เหตุผล			
88	INR checked within 4 days after starting warfarin	yes	no
เหตุผล			
89	INR checked at least every 6 weeks for patient receiving warfarin	yes	no
เหตุผล			
90	Follow up on response to newly started long term therapy with medication within 6	yes	no

	ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา	Validity	
	months		
เหตุผล			
91	Follow up on newly started long term therapy with medication at next visit with same provider	**yes**	**no**
เหตุผล			
92	Electrolytes checked at lease annually for patient taking diuretic	**yes**	**no**
เหตุผล			

Appendix C

แบบสำรวจความคิดเห็นผู้เชี่ยวชาญต่อตัวชี้วัดเชิงคุณภาพสำหรับการใช้ยาในผู้ป่วยสูงอายุ

งานวิจัยนี้จัดทำขึ้นเพื่อพัฒนาชุดเครื่องมือชี้วัดเชิงคุณภาพสำหรับการใช้ยาในผู้ป่วยสูงอายุในประเทศไทย โดยอาศัยความคิดเห็นของผู้เชี่ยวชาญด้านการรักษาและการใช้ยาในผู้สูงอายุ โดยใช้ตัวชี้วัดเชิงคุณภาพด้านการใช้ยาสำหรับผู้ป่วยสูงอายุของ Assessing Care of Vulnerable Elders (ACOVE) quality indicators และ Screening tool of older persons' potentially inappropriate prescriptions (STOPP) เป็นเครื่องมือต้นแบบในการพัฒนา

คำชี้แจงในการทำแบบสอบถาม

แบบสำรวจนี้จัดทำขึ้นเพื่อสำรวจความคิดเห็นของผู้เชี่ยวชาญด้านการรักษาและการใช้ยาในผู้สูงอายุ ใน 2 ด้าน ได้แก่ ความสำคัญของตัวชี้วัด (importance) และ ความเป็นไปได้ในการนำตัวชี้วัดไปใช้ (feasibility of implement)

แบบสำรวจความคิดเห็นชุดนี้แบ่งเป็น 2 ส่วน คือ ส่วนที่ 1 ข้อมูลทั่วไป และ ส่วนที่ 2 รายการตัวชี้วัดเชิงคุณภาพ ทั้งหมด 86 ข้อและข้อเสนอแนะ/เพิ่มรายการตัวชี้วัด

ผู้วิจัยใคร่ขอความร่วมมือจากท่านผู้เชี่ยวชาญในการประเมินให้คะแนนในแต่ละข้อของตัวชี้วัดด้วยการ**วงกลมล้อมรอบตัวเลข 1 ถึง 9 ที่ตรงกับระดับความคิดเห็นของท่านมากที่สุด**และเสนอแนะ/เพิ่มรายการตัวชี้วัดที่ท่านเห็นว่าจำเป็นจากประสบการณ์ในการทำงานของท่าน

คำจำกัดความของงานวิจัย

ผู้สูงอายุ (elderly) หมายถึง ผู้ที่มีอายุมากกว่า หรือเท่ากับ 60 ปี

ตัวชี้วัดเชิงคุณภาพด้านการใช้ยา (quality indicator for medication use) หมายถึง ตัวชี้วัดด้านคุณภาพที่มีความจำเพาะกับการใช้ยาในผู้สูงอายุ

ขอขอบพระคุณท่านผู้เชี่ยวชาญทุกท่านที่ช่วยสละเวลาในการตอบแบบสำรวจนี้

นางสาวดารณี เชี่ยวชาญธนกิจ ผู้วิจัย

นิสิตปริญญาเอกหลักสูตรเภสัชศาสตรสังคมและบริหารนานาชาติ)

คณะเภสัชศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

ส่วนที่ 1 ข้อมูลทั่วไป

คำชี้แจง โปรดเลือกข้อที่ตรงกับข้อมูลของท่านโดยทำเครื่องหมาย (/) หรือ กรอกรายละเอียดตามข้อมูลด้านล่างนี้

1. ( ) แพทย์ ( ) เภสัชกร
2. สถานที่ทำงานปัจจุบัน
   ( )คณะแพทย์ศาสตร์ หรือโรงพยาบาลคณะแพทย์ศาสตร์ มหาวิทยาลัย ……...
   ( )โรงพยาบาล (ศูนย์/ ทั่วไป/ ชุมชน)…….. จังหวัด ……...
   ( )คณะเภสัชศาสตร์ มหาวิทยาลัย ……...
   ( )อื่นๆ ……
3. การศึกษาสูงสุด หรือ วุฒิบัตรเชี่ยวชาญ ……...……..
   ……...
4. ประสบการณ์การทำงาน (รวมทุกแห่งตั้งแต่จบการศึกษา) …….. ปี

ส่วนที่ 2 รายการตัวชี้วัดเชิงคุณภาพด้านการใช้ยาในผู้ป่วยสูงอายุ

คำชี้แจง โปรดทำเครื่องหมาย วงกลม ล้อมรอบตัวเลขที่ตรงกับระดับความคิดเห็นของท่าน

No.	Indicators	Importance	Feasibility of implement
	Cardiovascular system		
1	Long-acting medications should be used to treat hypertension	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
2	β –Blocker should be used to treat in heart failure	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
3	β –Blocker should be used to treat in patient who had a myocardial infarction	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
4	ACE inhibitor should be used to treat in patient with hypertension and renal insufficiency	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
5	ACE inhibitor should be used to treat in patient with heart failure	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
6	Aspirin should be offered to patient with coronary artery disease	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
7	Warfarin or aspirin should be offered to for patient with atrial fibrillation	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
8	Lipid-lowering drugs should be offered to IHD patient with LDL cholesterol level > 130 mg/dL and no diet response	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
9	Electrolytes checked at lease annually for patient taking diuretic	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
10	Potassium and creatinine level checked within 1 month after starting diuretic	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
11	Potassium and creatinine level checked within 1 month after starting ACE inhibitor	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
12	INR checked within 4 days after starting warfarin	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
13	INR checked at least every 6 weeks for patient receiving warfarin	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
14	Avoid using digoxin at a long-term dose > 125µg/day for patient with impaired renal function	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
15	Avoid using β –Blocker for patient with hypertension if patient has asthma	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
16	Avoid using first- or second- generation short acting calcium channel blocker for patient with heart failure	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
17	Avoid using diltiazem or verapamil for patient with NYHA Class III or IV heart failure	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
18	Avoid using of aspirin and warfarin in combination without histamine H2 receptor antagonist (except cimetidine because of interaction with warfarin) or proton pump inhibitor	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9

No.	Indicators	Importance	Feasibility of implement
19	Avoid using warfarin for patient with first, uncomplicated deep venous thrombosis for longer than 6 months duration	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
20	Avoid using warfarin for patient with first uncomplicated pulmonary embolus for longer than 12 months duration	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
21	Avoid using aspirin, clopidogrel, dipyridamole or warfarin for patient with concurrent bleeding disorder	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
ข้อเสนอแนะ/ตัวชี้วัดเพิ่มเติม.....			
	Central nervous system and psychotropic drug		
22	Avoid using tertiary amine tricyclic, MAOI, benzodiazepine, or stimulant as first-line antidepressant.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
23	Avoid using a monoamine oxidase inhibitor (MAOI) for at least 2 weeks after termination of paroxetine, sertraline, fluvoxamine and citalopram, and for at least 5 weeks after termination of fluoxetine.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
24	Avoid using barbiturates unless patient has a seizure disorder.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
25	Avoid using tricyclic antidepressants (TCA's) with dementia.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
26	Avoid using TCA's with glaucoma.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
27	Avoid using TCA's with cardiac conductive abnormalities.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
28	Avoid using TCA's with constipation.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
29	Avoid using TCA's with an opiate or calcium channel blocker.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9

No.	Indicators	Importance	Feasibility of implement
30	Avoid using TCA's with prostatism or prior history of urinary retention.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
31	Avoid long-term using (i.e. > 1 month) of long-acting benzodiazepines e.g. chlordiazepoxide, fluazepam, nitrazepam, chlorazepate and benzodiazepines with long-acting metabolites e.g. diazepam.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
32	Avoid long-term using (i.e. > 1 month) of neuroleptics as long-term hypnotics.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
33	Avoid long-term using (i.e. > 1 month) of neuroleptics in those with parkinsonism.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
34	Avoid prolonged using (> 1 week) of first generation antihistamines i.e. diphenydramine, chlorpheniramine, cyclizine, promethazine.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
35	Avoid long-term opiates using in those with dementia unless indicted for palliative care or management of moderate/severe chronic pain syndrome.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
36	If no response to antidepressant therapy within week 8, dose adjustment or drug change should be done.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
37	If inadequate antidepressant response within week 16, dose adjustment or drug change should be done.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
ข้อเสนอแนะ/ตัวชี้วัดเพิ่มเติม.....			
	Endocrine system		
38	Daily ASA should be offered for patient with diabetes who did not other anticoagulant drug	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
39	ACE inhibitor should be offered for diabetic patient with proteinuria	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
40	ACE inhibitor should be used for diabetic patient with one additional cardiac risk factor (smoker, hypertension, hypercholesterolemia, or renal insufficiency)	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9

No.	Indicators	Importance	Feasibility of implement
41	Osteoporosis treatment medication (HRT or biphosphonate or calcitonin) within 3 months of diagnosis.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
42	Avoid using glibenclamide for patient with type 2 diabetes mellitus.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
43	Avoid using β -blockers in patient with diabetes mellitus and frequent hypoglycaemic episodes i.e. 1 episode per month.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
44	Avoid using estrogens with a history of breast cancer or venous thromboembolism.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
45	Avoid using estrogens without progestogen in patients with intact uterus.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
ข้อเสนอแนะ/ตัวชี้วัดเพิ่มเติม.....			
	Gastrointestinal system		
46	Avoid using PPI for peptic ulcer disease at full therapeutic dosage for > 8 week.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
47	Avoid using diphenoxylate, loperamide or codeine phosphate for treatment of diarrhea of unknown cause.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
48	Avoid using diphenoxylate, loperamide or codeine phosphate for treatment of severe infective gastroenteritis i.e. bloody diarrhea, high fever or severe systemic toxicity.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
49	Avoid using prochlorperazine or metoclopramide with Parkinsonism.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
50	Avoid using anticholinergic, antispasmodic drugs with chronic constipation.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
51	Documentation of ulcer or gastrointestinal bleeding history and, if present, justification for NSAID use.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9

No.	Indicators	Importance	Feasibility of implement
ข้อเสนอแนะ/ตัวชี้วัดเพิ่มเติม.....			
	Musculoskeletal system		
52	Acetaminophen should be used as a first-line medication treatment for patient with osteoarthritis.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
53	Change from acetaminophen to a different medication when the patient with osteoarthritis has had a trial of maximum dose of acetaminophen.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
54	PPI should be offered to patient with ulcer or gastrointestinal bleeding risk factors who is taking an NSAID.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
55	Calcium and vitamin D should be offered for patient taking long-term steroid therapy.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
56	Bowel regimen should be used for prevent constipation for patient taking opiate.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
57	Patient who started NSAID should be warned of the risks of them.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
58	Avoid using NSAID with moderate-severe hypertension (moderate: 160/100mmHg – 179/109mmHg; severe: ≥180/110mmHg).	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
59	Avoid using NSAID in patient with heart failure.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
60	Avoid using warfarin and NSAID together.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
61	Avoid using NSAID with chronic renal failure.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
62	Avoid using long-term corticosteroids (>3 months) as monotherapy for rheumatoid arthritis or osteoarthritis.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
63	Avoid long-term using of powerful opiates e.g. morphine or fentanyl as first line therapy for mild-moderate pain.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9

No.	Indicators	Importance	Feasibility of implement
64	Avoid regular opiates using for more than 2 weeks in patient with chronic constipation without concurrent use of laxatives.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
ข้อเสนอแนะ/ตัวชี้วัดเพิ่มเติม.....			
	Respiratory system		
65	Avoid using theophylline as monotherapy for COPD.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
66	Avoid using systemic corticosteroids instead of inhaled corticosteroids for maintenance therapy in moderate-severe COPD.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
67	Avoid using nebulised ipratropium in patient with glaucoma.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
ข้อเสนอแนะ/ตัวชี้วัดเพิ่มเติม.....			
	Urogenital system		
68	Avoid using bladder antimuscarinic drugs in patient with dementia.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
69	Avoid using bladder antimuscarinic drugs in patient with chronic glaucoma.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
70	Avoid using bladder antimuscarinic drugs in patient with chronic constipation.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
71	Avoid using bladder antimuscarinic drugs in patient with chronic prostatism.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9

No.	Indicators	Importance	Feasibility of implement
72	Avoid using alpha-blockers in males with frequent incontinence i.e. one or more episodes of incontinence daily.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
73	Avoid using alpha-blockers with long-term urinary catheter *in situ* i.e. more than 2 months.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
ข้อเสนอแนะ/ตัวชี้วัดเพิ่มเติม.....			
	.....		
	.....		
	.....		
	.....		
	Duplication drug class		
74	Avoid using two or more concurrent use of antivertigo drug (flunaricine, cinnaricine and betahistine).	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
75	Avoid using two concurrent use of organic nitrate (isosorbide mononitrate and isosorbide dinitrate).	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
76	Avoid using two concurrent use of sulfonamides, urea derivatives (glipizide, gliclazide, glibenclamide, and glimepiride).	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
77	Avoid using two concurrent use of benzodiazepine (diazepam, alprazoram, clonazepam, and lorzepam)	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
78	Avoid using two concurrent use of systemic antihistamine (fexofenadine and loratadine).	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
ข้อเสนอแนะ/ตัวชี้วัดเพิ่มเติม.....			
	.....		
	.....		
	.....		
	.....		
	.....		

No.	Indicators	Importance	Feasibility of implement
	Medication management		
79	Avoid using strongly anticholinergic medication if alternatives exist	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
80	Patient education about newly started therapy with medication should be offered.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
81	Drug regimen should be reviewed at least annually.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
82	A clearly defined indication of a new drug prescribed should be documented.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
83	Medications prescribed by other physicians should acknowledge to nonprescribing physician.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
84	Patient medication record of every physician should contain an up-to-date medication list.	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
85	Follow up on response to newly started long term therapy with medication within 6 months	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
86	Follow up on newly started long term therapy with medication at next visit with same provider	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9

ข้อเสนอแนะ/ตัวชี้วัดเพิ่มเติม.....

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***หากมีข้อสงสัย และข้อแนะนำที่เกี่ยวข้องกับการตอบแบบประเมิน

ท่านสามารถติดต่อกับผู้วิจัยได้ตลอดเวลา ทางโทรศัพท์ 089-178-1806 และทาง e-mail address: daraneerx@hotmail.com***

Appendix D

แบบสำรวจความคิดเห็นผู้เชี่ยวชาญต่อตัวชี้วัดเชิงคุณภาพสำหรับการใช้ยาในผู้ป่วยสูงอายุรอบที่ 2

งานวิจัยนี้จัดทำขึ้นเพื่อพัฒนาชุดเครื่องมือชี้วัดเชิงคุณภาพสำหรับการใช้ยาในผู้ป่วยสูงอายุในประเทศไทย โดยอาศัยความคิดเห็นของผู้เชี่ยวชาญด้านการรักษาและการใช้ยาในผู้สูงอายุ โดยใช้ตัวชี้วัดเชิงคุณภาพด้านการใช้ยาสำหรับผู้ป่วยสูงอายุของ Assessing Care of Vulnerable Elders (ACOVE) quality indicators และ Screening tool of older persons' potentially inappropriate prescriptions (STOPP) เป็นเครื่องมือต้นแบบในการพัฒนา

ผลจากการให้คะแนนโดยผู้เชี่ยวชาญในรอบที่ 2 นี้ จะนำมาใช้ในการจัดกลุ่มของตัวชี้วัดตามระดับคะแนนและความสอดคล้องของการให้คะแนน โดยตัวชี้วัดจะมีการจัดระดับเป็น Appropriate, uncertain และ inappropriate ตามเกณฑ์ดังต่อไปนี้

Appropriate (A)คือ ตัวชี้วัดที่มีคะแนนมัธยฐานอยู่ในช่วง 7-8 และ ไม่มี disagreement

Uncertain(U)คือตัวชี้วัดที่มีคะแนนมัธยฐานอยู่ในช่วง 4-6 หรือ ช่วงอื่นที่มี disagreement

Inappropriate (I)คือตัวชี้วัดที่มีคะแนนมัธยฐานอยู่ในช่วง 1-3 และ ไม่มี disagreement

Disagreement หมายถึง มีผู้เชี่ยวชาญอย่างน้อย 1 ใน 3 ของผู้เชี่ยวชาญทั้งหมดให้คะแนนในช่วง 1-3 และ 7-9

ขอขอบพระคุณท่านผู้เชี่ยวชาญทุกท่านที่ช่วยสละเวลาในการตอบแบบสำรวจนี้

นางสาวดารณี เชี่ยวชาญธนกิจ ผู้วิจัย

นิสิตปริญญาเอกหลักสูตรเภสัชศาสตรสังคมและบริหาร (นานาชาติ)

คณะเภสัชศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

ติดต่อผู้วิจัย โทรศัพท์ 089-178-1806 E-mail address: daraneerx@hotmail.com

คำชี้แจง โปรดทำเครื่องหมาย วงกลม ล้อมรอบตัวเลขที่ตรงกับระดับความคิดเห็นของท่าน

No.	Indicators	Importance	Me	Feasibility of implement	Me
I	**Cardiovascular system (21)**				
		5 2 4		1 3 3 4	
1	Long-acting medications should be used to treat hypertension	1 2 3 4 5 6 7 8 9	8	1 2 3 4 5 6 7 8 9	8
		2 2 2 2 3		1 1 2 1 2 4	
2	β –Blocker should be used to treat in heart failure	1 2 3 4 5 6 7 8 9	6	1 2 3 4 5 6 7 8 9	8
		1 1 3 4 2		1 1 2 3 4	
3	β –Blocker should be used to treat in patient who had a myocardial infarction	1 2 3 4 5 6 7 8 9	8	1 2 3 4 5 6 7 8 9	8
		1 1 1 3 1 4		1 1 2 4 3	
4	ACE inhibitor should be used to treat in patient with hypertension and renal insufficiency	1 2 3 4 5 6 7 8 9	7	1 2 3 4 5 6 7 8 9	8
		1 5 5		1 1 5 4	
5	ACE inhibitor should be used to treat in patient with heart failure	1 2 3 4 5 6 7 8 9	8	1 2 3 4 5 6 7 8 9	8
		1 3 7		1 3 7	
6	Aspirin should be offered to patient with coronary artery disease	1 2 3 4 5 6 7 8 9	9	1 2 3 4 5 6 7 8 9	9
		4 3 4		1 3 3 4	
7	Warfarin or aspirin should be offered to for patient with atrial fibrillation	1 2 3 4 5 6 7 8 9	8	1 2 3 4 5 6 7 8 9	8
		2 2 7		2 3 6	
8	Lipid-lowering drugs should be offered to IHD patient with LDL cholesterol level > 130 mg/dL and no diet response	1 2 3 4 5 6 7 8 9	9	1 2 3 4 5 6 7 8 9	9
		1 1 1 2 6		1 1 2 7	
9	Old QI: Electrolytes checked at least annually for patient taking diuretic	1 2 3 4 5 6 7 8 9	9	1 2 3 4 5 6 7 8 9	9
	Edit QI: Electrolytes checked every 3 month for patient taking diuretic	1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9	
		1 1 1 1 2 5		2 1 2 3 3	
10	Potassium and creatinine level checked within 1 month after starting diuretic	1 2 3 4 5 6 7 8 9	8	1 2 3 4 5 6 7 8 9	8
		1 2 2 6		1 2 1 3 4	
11	Potassium and creatinine level checked within 1 month after starting ACE inhibitor	1 2 3 4 5 6 7 8 9	9	1 2 3 4 5 6 7 8 9	8

No.	Indicators	Importance									Me	Feasibility of implement									Me
					1			1	1		2	6						1	2	1	1	6	
12	INR checked within 4 days after starting warfarin	1	2	3	4	5	6	7	8	9	9	1	2	3	4	5	6	7	8	9	9
						1			2	5	3						3	4	3	1	
13	INR checked at least every 6 weeks for patient receiving warfarin	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	7
					1				6	4						1	3	1	3	3	
14	Avoid using digoxin at a long-term dose > 125μg/day for patient with impaired renal function	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	8
						1	2	2	1	5						2	1	1	1	6	
15	Avoid using β –Blocker for patient with hypertension if patient has asthma	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	9
					2			3	4	2						1	1	4	2	3	
16	Avoid using first- or second- generation short acting calcium channel blocker for patient with heart failure	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	7
					1	1		2	5	2					1	2		2	3	3	
17	Avoid using diltiazem or verapamil for patient with NYHA Class III or IV heart failure	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	8
							2	4	2	3					1		2	2	4	2	
18	Avoid using of aspirin and warfarin in combination without histamine H2 receptor antagonist (except cimetidine because of interaction with warfarin) or proton pump inhibitor	1	2	3	4	5	6	7	8	9	7	1	2	3	4	5	6	7	8	9	8
						1	2	2	3	3						1	1	3	3	3	
19	Avoid using warfarin for patient with first, uncomplicated deep venous thrombosis for longer than 6 months duration	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	8
				1		1	2	1	3	3						2	1	2	3	3	
20	Avoid using warfarin for patient with first uncomplicated pulmonary embolus for longer than 12 months duration	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	8
					1				3	7									4	7	
21	Avoid using aspirin, clopidogrel, dipyridamole or warfarin for patient with concurrent bleeding disorder	1	2	3	4	5	6	7	8	9	9	1	2	3	4	5	6	7	8	9	9

No.	Indicators	Importance	Me	Feasibility of implement	Me
	ตัวชี้วัดเพิ่มเติม				
	Avoid using drug in statin group in combination with potent CYP3A4 inhibitor (fluoxetin, cimetidine, antifuncal, macrolide, etc)	1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9	
II	**Central nervous system and psychotropic drug (16)**				
		4 5 2		*1 6 3 1*	
22	Avoid using tertiary amine tricyclic, MAOI, benzodiazepine, or stimulant as first-line antidepressant.	1 2 3 4 5 6 7 8 9	*8*	1 2 3 4 5 6 7 8 9	*7*
		1 1 6 3		*1 3 4 3*	
23	Avoid using a monoamine oxidase inhibitor (MAOI) for at least 2 weeks after termination of paroxetine, sertraline, fluvoxamine and citalopram, and for at least 5 weeks after termination of fluoxetine.	1 2 3 4 5 6 7 8 9	*8*	1 2 3 4 5 6 7 8 9	*8*
		1 4 3 3		*1 6 1 3*	
24	Avoid using barbiturates unless patient has a seizure disorder.	1 2 3 4 5 6 7 8 9	*8*	1 2 3 4 5 6 7 8 9	*7*
		1 2 4 4		*1 1 2 4 3*	
25	Avoid using tricyclic antidepressants (TCA's) with dementia.	1 2 3 4 5 6 7 8 9	*8*	1 2 3 4 5 6 7 8 9	*7*
		1 3 3 4		*1 1 2 3 4*	
26	Avoid using TCA's with glaucoma.	1 2 3 4 5 6 7 8 9	*8*	1 2 3 4 5 6 7 8 9	*7*
		1 2 6 2		*1 1 4 2 3*	
27	Avoid using TCA's with cardiac conductive abnormalities.	1 2 3 4 5 6 7 8 9	*8*	1 2 3 4 5 6 7 8 9	*7*
		4 2 3 2		*1 4 3 2 1*	
28	Avoid using TCA's with constipation.	1 2 3 4 5 6 7 8 9	*7*	1 2 3 4 5 6 7 8 9	*7*
		1 4 2 4		*1 1 1 1 6 1*	
29	Avoid using TCA's with an opiate or calcium channel blocker.	1 2 3 4 5 6 7 8 9	*7*	1 2 3 4 5 6 7 8 9	*7*
		1 4 3 3		*1 6 2 2*	
30	Avoid using TCA's with prostatism or prior history of urinary retention.	1 2 3 4 5 6 7 8 9	*8*	1 2 3 4 5 6 7 8 9	*7*

No.	Indicators	Importance									Me	Feasibility of implement									Me
						1			3	4	3						1	2	3	2	3	
31	Avoid long-term using (i.e. > 1 month) of long-acting benzodiazepines e.g. chlordiazepoxide, nitrazepam, and benzodiazepines with long-acting metabolites e.g. diazepam.	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	7
							3	2	4	2						1	4	4		2	
32	Avoid long-term using (i.e. > 1 month) of neuroleptics as long-term hypnotics.	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	7
							1	2	5	2						1	4	4		2	
33	Avoid long-term using (i.e. > 1 month) of neuroleptics in those with parkinsonism.	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	7
					1		3	2	4	1				1		1	1	6		2	
34	Avoid prolonged using (> 1 week) of first generation antihistamines i.e. diphenydramine, chlorpheniramine, cyclizine, promethazine.	1	2	3	4	5	6	7	8	9	7	1	2	3	4	5	6	7	8	9	7
						2		2	4	3					1	1		5	1	3	
35	Avoid long-term opiates using in those with dementia unless indicated for palliative care or management of moderate/severe chronic pain syndrome.	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	7
							1	2	7	1					1		1	3	4	2	
36	Old QI: If no response to antidepressant therapy within week 8, dose adjustment or drug change should be done.	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	8
	Edit QI: If no response to antidepressant therapy within week 2-3, dose adjustment or drug change should be done.	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9	
							1	3	5	2					1			5	3	2	
37	Old QI: If inadequate antidepressant response within week 16, dose adjustment or drug change should be done.	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	7
	Edit: If inadequate antidepressant response within week 6-8, dose adjustment or drug change should be done.	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	7

No.	Indicators	Importance									Me	Feasibility of implement									Me
	ตัวชี้วัดเพิ่มเติม																				
	Avoid using drugs in combination that may cause serotonin syndrome (eq. tramadol with TCA)	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9	
III	**Endocrine system (8)**																				
					1	*1*	*1*	*2*	*5*	*1*					*1*	*2*	*3*	*3*	*2*		
38	Daily ASA should be offered for patient with diabetes who did not take other anticoagulant drug	1	2	3	4	5	6	7	8	9	*8*	1	2	3	4	5	6	7	8	9	*7*
							1		*4*	*6*									*6*	*5*	
39	ACE inhibitor should be offered for diabetic patient with proteinuria	1	2	3	4	5	6	7	8	9	*9*	1	2	3	4	5	6	7	8	9	*8*
								4	*4*	*3*								*4*	*3*	*4*	
40	ACE inhibitor should be used for diabetic patient with one additional cardiac risk factor (smoker, hypertension, hypercholesterolemia, or renal insufficiency)	1	2	3	4	5	6	7	8	9	*8*	1	2	3	4	5	6	7	8	9	*8*
							3	*3*	*4*	*1*				*1*		*3*	*3*	*2*	*2*		
41	Osteoporosis treatment medication (HRT or biphosphonate or calcitonin) within 3 months of diagnosis.	1	2	3	4	5	6	7	8	9	*7*	1	2	3	4	5	6	7	8	9	*6*
		1		*1*		*1*	*1*	*4*	*2*	*1*				*2*		*2*	*4*	*2*	*1*		
42	Avoid using glibenclamide for patient with type 2 diabetes mellitus.	1	2	3	4	5	6	7	8	9	*7*	1	2	3	4	5	6	7	8	9	*6*
						1	*1*	*2*	*6*	*1*					*1*	*1*	*2*	*4*	*2*	*1*	
43	Avoid using β -blockers in patient with diabetes mellitus and frequent hypoglycaemic episodes i.e. 1 episode per month.	1	2	3	4	5	6	7	8	9	*8*	1	2	3	4	5	6	7	8	9	*7*
								1	*5*	*5*								*1*	*7*	*3*	
44	Avoid using estrogens with a history of breast cancer or venous thromboembolism.	1	2	3	4	5	6	7	8	9	*8*	1	2	3	4	5	6	7	8	9	*8*
					1	*1*		*2*	*3*	*4*						*2*	*1*	*1*	*5*	*2*	
45	Avoid using estrogens without progestogen in patients with intact uterus.	1	2	3	4	5	6	7	8	9	*8*	1	2	3	4	5	6	7	8	9	*8*

No.	Indicators	Importance	Me	Feasibility of implement	Me
IV	**Gastrointestinal system (6)**				
		2 1 1 2 4 1		2 2 2 3 1 1	
46	Avoid using PPI for peptic ulcer disease at full therapeutic dosage for > 8 week.	1 2 3 4 5 6 7 8 9	7	1 2 3 4 5 6 7 8 9	6
		1 1 1 6 2		2 3 5 1	
47	Avoid using diphenoxylate, loperamide or codeine phosphate for treatment of diarrhea of unknown cause.	1 2 3 4 5 6 7 8 9	8	1 2 3 4 5 6 7 8 9	8
		2 1 3 5		4 4 3	
48	Avoid using diphenoxylate, loperamide or codeine phosphate for treatment of severe infective gastroenteritis i.e. bloody diarrhea, high fever or severe systemic toxicity.	1 2 3 4 5 6 7 8 9	8	1 2 3 4 5 6 7 8 9	8
		2 3 2 4		1 1 3 4 2	
49	Avoid using prochlorperazine or metoclopramide with Parkinsonism.	1 2 3 4 5 6 7 8 9	8	1 2 3 4 5 6 7 8 9	8
		1 1 2 5 2		1 1 1 7 1	
50	Avoid using anticholinergic, antispasmodic drugs with chronic constipation.	1 2 3 4 5 6 7 8 9	8	1 2 3 4 5 6 7 8 9	8
		2 4 5		3 4 4	
51	Documentation of ulcer or gastrointestinal bleeding history and, if present, justification for NSAID use.	1 2 3 4 5 6 7 8 9	8	1 2 3 4 5 6 7 8 9	8
V	**Musculoskeletal system (13)**				
		2 6 3		1 3 4 3	
52	Acetaminophen should be used as a first-line medication treatment for patient with osteoarthritis.	1 2 3 4 5 6 7 8 9	8	1 2 3 4 5 6 7 8 9	8
		2 1 2 5 1		1 2 5 2 1	
53	Change from acetaminophen to a different medication when the patient with osteoarthritis has had a trial of maximum dose of acetaminophen.	1 2 3 4 5 6 7 8 9	8	1 2 3 4 5 6 7 8 9	7
		1 4 6		1 1 5 4	
54	PPI should be offered to patient with ulcer or gastrointestinal bleeding risk factors who is taking an NSAID.	1 2 3 4 5 6 7 8 9	9	1 2 3 4 5 6 7 8 9	8

No.	Indicators	Importance									Me	Feasibility of implement									Me
				1		1			2	5	2		1			1			2	4	1	2	
55	Calcium and vitamin D should be offered for patient taking long-term steroid therapy.	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	7
			1		1	1		1	6	1				1	1	1	1	3	3	1	
56	Bowel regimen should be used for prevent constipation for patient taking opiate.	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	7
								3	2	6				1				2	2	6	
57	Patient who started NSAID should be warned of the risks of them.	1	2	3	4	5	6	7	8	9	9	1	2	3	4	5	6	7	8	9	9
				1		1	2	1	3	3				2			2	5		2	
58	Avoid using NSAID with moderate-severe hypertension (moderate: 160/100mmHg – 179/109mmHg; severe: ≥180/110mmHg).	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	7
			1	1		1	2		4	2			1	1			4	2	1	2	
59	Avoid using NSAID in patient with heart failure.	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	6
				1			1	4	1	4				1			2	5	2	1	
60	Avoid using warfarin and NSAID together.	1	2	3	4	5	6	7	8	9	7	1	2	3	4	5	6	7	8	9	7
				1			1		3	6				1			2	2	3	3	
61	Avoid using NSAID with chronic renal failure.	1	2	3	4	5	6	7	8	9	9	1	2	3	4	5	6	7	8	9	8
						1		1	6	3						1	1	3	3	3	
62	Avoid using long-term corticosteroids (>3 months) as monotherapy for rheumatoid arthritis or osteoarthritis.	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	8
								2	3	6							2	2	2	5	
63	Avoid long-term using of powerful opiates e.g. morphine or fentanyl as first line therapy for mild-moderate pain.	1	2	3	4	5	6	7	8	9	9	1	2	3	4	5	6	7	8	9	8
								4	5	2						2		5	2	2	
64	Avoid regular opiates using for more than 2 weeks in patient with chronic constipation without concurrent use of laxatives.	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	7

No.	Indicators	Importance	Me	Feasibility of implement	Me
VI	**Respiratory system (3)**				
		1 1 6 3		*2 1 2 4 2*	
65	Avoid using theophylline as monotherapy for COPD.	1 2 3 4 5 6 7 8 9	*8*	1 2 3 4 5 6 7 8 9	*8*
		1 1 4 5		*2 6 3*	
66	Avoid using systemic corticosteroids instead of inhaled corticosteroids for maintenance therapy in moderate-severe COPD.	1 2 3 4 5 6 7 8 9	*8*	1 2 3 4 5 6 7 8 9	*8*
		2 3 3 3		*1 2 3 4 1*	
67	Avoid using nebulised ipratropium in patient with glaucoma.	1 2 3 4 5 6 7 8 9	*8*	1 2 3 4 5 6 7 8 9	*7*
VII	**Urogenital system (6)**				
		1 2 5 3		*1 1 5 2 2*	
68	Avoid using bladder antimuscarinic drugs in patient with dementia.	1 2 3 4 5 6 7 8 9	*8*	1 2 3 4 5 6 7 8 9	*7*
		1 1 1 4 4		*1 3 4 3*	
69	Avoid using bladder antimuscarinic drugs in patient with chronic glaucoma.	1 2 3 4 5 6 7 8 9	*8*	1 2 3 4 5 6 7 8 9	*8*
		1 1 3 3 5		*1 2 5 2 1*	
70	Avoid using bladder antimuscarinic drugs in patient with chronic constipation.	1 2 3 4 5 6 7 8 9	*8*	1 2 3 4 5 6 7 8 9	*7*
		1 3 5 2		*7 3 1*	
71	Avoid using bladder antimuscarinic drugs in patient with chronic prostatism.	1 2 3 4 5 6 7 8 9	*8*	1 2 3 4 5 6 7 8 9	*7*
		1 4 2 3 1		*2 2 3 3 1*	
72	Avoid using alpha-blockers in males with frequent incontinence i.e. one or more episodes of incontinence daily.	1 2 3 4 5 6 7 8 9	*7*	1 2 3 4 5 6 7 8 9	*7*
		1 1 2 2 4 1		*1 1 2 4 2 1*	
73	Avoid using alpha-blockers with long-term urinary catheter *in situ* i.e. more than 2 months.	1 2 3 4 5 6 7 8 9	*7*	1 2 3 4 5 6 7 8 9	*7*
VIII	**Duplication drug class (5)**				
		1 3 2 3 2		*1 2 2 2 3 1*	
74	Avoid using two or more concurrent use of antivertigo drug (flunarizine, cinnarizine and betahistine).	1 2 3 4 5 6 7 8 9	*7*	1 2 3 4 5 6 7 8 9	*6*

No.	Indicators	Importance									Me	Feasibility of implement									Me
							1	3	3	4						1	1	2	3	4	
75	Avoid using two concurrent use of organic nitrate (isosorbide mononitrate and isosorbide dinitrate).	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	8
					1			1	2	6							1	2	2	6	
76	Avoid using two concurrent use of sulfonamides, urea derivatives (glipizide, gliclazide, glibenclamide, and glimepiride).	1	2	3	4	5	6	7	8	9	9	1	2	3	4	5	6	7	8	9	9
					1	1	1	4	1	3				1		2	3	1	2	2	
77	Avoid using two concurrent use of benzodiazepine (diazepam, alprazoram, clonazepam, and lorazepam)	1	2	3	4	5	6	7	8	9	7	1	2	3	4	5	6	7	8	9	6
					1	1	1	4	1	3					1	1	3	2	2	2	
78	Avoid using two concurrent use of systemic antihistamine (fexofenadine and loratadine).	1	2	3	4	5	6	7	8	9	7	1	2	3	4	5	6	7	8	9	7
IX	**Medication management (8)**																				
						1		4	2	4						1	3	4	1	2	
79	Avoid using strongly anticholinergic medication if alternatives exist	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	7
							1	1	2	7				1				4	1	5	
80	Patient education about newly started therapy with medication should be offered.	1	2	3	4	5	6	7	8	9	9	1	2	3	4	5	6	7	8	9	8
		1						3	4	3				1		1	1	2	3	3	
81	Old QI: Drug regimen should be reviewed at least annually.	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	8
	Edit QI: drug regimen should be reviewed every visit	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9	
								3	2	6				1		1	1	5	1	2	
82	A clearly defined indication of a new drug prescribed should be documented.	1	2	3	4	5	6	7	8	9	9	1	2	3	4	5	6	7	8	9	7
							1	1	6	3							4	1	4	2	
83	Medications prescribed by other physicians should acknowledge to nonprescribing physician.	1	2	3	4	5	6	7	8	9	8	1	2	3	4	5	6	7	8	9	8
								1	4	6					1		2	2	3	3	
84	Patient medication record of every physician should contain an up-to-date medication list.	1	2	3	4	5	6	7	8	9	9	1	2	3	4	5	6	7	8	9	8

No.	Indicators	Importance	Me	Feasibility of implement	Me
		1 6 4		2 3 3 3	
85	Old QI: Follow up on response to newly started long term therapy with medication within 6 months	1 2 3 4 5 6 7 8 9	8	1 2 3 4 5 6 7 8 9	8
	Edit: Follow up on response to newly started long term therapy with medication within 3 months	1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9	
		1 1 5 4		1 1 3 4 2	
86	Follow up on newly started long term therapy with medication at next visit with same provider	1 2 3 4 5 6 7 8 9	8	1 2 3 4 5 6 7 8 9	8
	ตัวชี้วัดเพิ่มเติม				
	Avoid using any combination of drug that prolong QT interval (quinolone, antipsychotics, macrolides)	1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9	

ข้อเสนอแนะ เพื่อการพัฒนา .....

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ขอกราบขอบพระคุณท่านผู้เชี่ยวชาญทุกท่าน ที่สละเวลาในการตอบแบบประเมินนี้

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