แบบจำลองเชิงสาเหตุของพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง

นางสาวสมลักษณ์ เทพสุริยานนท์

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาพยาบาลศาสตรดุษฎีบัณฑิต
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A CAUSAL MODEL OF MEDICATION ADHERENCE BEHAVIOR IN THE ELDERLY WITH HYPERTENSION

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สมลักษณ์ เทพสุริยานนท์: แบบจำลองเชิงสาเหตุของพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง (A CAUSAL MODEL OF MEDICATION ADHERENCE BEHAVIOR IN THE ELDERLY WITH HYPERTENSION): อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ศ. ดร. วิฒา จีระแพทย์, อ.ที่ปรึกษาวิทยานิพนธ์ร่วม: รศ. ดร. สุจิตรา เหลืองอมรเลิศ, 250 หน้า

การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อพัฒนาแบบจำลองเชิงสาเหตุและทดสอบความสัมพันธ์เชิงสาเหตุระหว่างปัจจัยความซับซ้อนของแผนกำหนดการใช้ยา รายได้ครอบครัว อายุ ความเชื่อด้านสุขภาพ ระดับความรู้คิดและสติปัญญา การสนับสนุนทางสังคมและพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง กรอบแนวคิดของแบบจำลองเชิงสาเหตุพัฒนามาจากแบบจำลองความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโดยปาร์คและโจนส์ (Park and Jones, 1997) กลุ่มตัวอย่างคือ ผู้สูงอายุโรคความดันโลหิตสูง จำนวน 422 คน มารับการรักษาที่แผนกผู้ป่วยนอกโรงพยาบาลทั่วไปใน 5 ภาคของประเทศไทยได้แก่ ภาคเหนือ ภาคใต้ ภาคกลาง ภาคตะวันออกและภาคตะวันออกเฉียงเหนือ คัดเลือกโดยการสุ่มตัวอย่างแบบมีขั้นตอน เก็บรวบรวมข้อมูลโดยใช้ แบบประเมินระดับความรู้คิดและสติปัญญา แบบสอบถามความเชื่อด้านสุขภาพ แบบสอบถามการสนับสนุนทางสังคม แบบวัดความซับซ้อนของแผนกำหนดการใช้ยา และแบบสอบถามพฤติกรรมความสม่ำเสมอในการรับประทานยา วิเคราะห์ข้อมูลโดยใช้สถิติโปรแกรม SPSS for Window version 15 และ LISREL version 8.52.

ผลการวิเคราะห์พบว่า แบบจำลองมีความกลมกลืนกับข้อมูลเชิงประจักษ์ และสามารถอธิบายความผันแปรของพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูงได้ร้อยละ 70 ระดับความรู้คิดและสติปัญญา ความเชื่อด้านสุขภาพ และการสนับสนุนทางสังคมมีอิทธิพลโดยตรงทางบวกต่อพฤติกรรมความสม่ำเสมอในการรับประทานยา การสนับสนุนทางสังคมทำนายพฤติกรรมความสม่ำเสมอในการรับประทานยาได้ดีที่สุด ความซับซ้อนของแผนกำหนดการใช้ยามีอิทธิพลโดยตรงทางบวกกับความเชื่อด้านสุขภาพ และมีอิทธิพลทางอ้อมต่อพฤติกรรมความสม่ำเสมอในการรับประทานยา รายได้ครอบครัวมีอิทธิพลโดยตรงทางบวกกับความเชื่อด้านสุขภาพและระดับความรู้คิดและสติปัญญา และมีอิทธิพลทางอ้อมต่อพฤติกรรมความสม่ำเสมอในการรับประทานยา อายุมีอิทธิพลโดยตรงทางลบกับระดับความรู้คิดและสติปัญญา และมีอิทธิพลทางอ้อมต่อพฤติกรรมความสม่ำเสมอในการรับประทานยา

ผลการวิจัยบ่งชี้ว่า การพัฒนาการปฏิบัติการพยาบาลเพื่อส่งเสริมพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง พยาบาลต้องประเมินอายุ รายได้ครอบครัว ระดับความรู้คิดและสติปัญญา ความซับซ้อนของแผนกำหนดการใช้ยาที่ผู้สูงอายุได้รับ ส่งเสริมให้ผู้สูงอายุได้รับการสนับสนุนทางสังคมอย่างเพียงพอและมีความเชื่อด้านสุขภาพที่ดี

สาขาวิชา : พยาบาลศาสตร์ ลายมือชื่อนิสิต.....

ปีการศึกษา : 2553 ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก.....

ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์ร่วม.....

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SOMLUK TEPSURIYANONT: A CAUSAL MODEL OF MEDICATION ADHERENCE BEHAVIOR IN THE ELDERLY WITH HYPERTENSION. ADVISOR: PROF. VEENA JIRAPAET, Ph.D., R.N., CO-ADVISOR: ASSOC.PROF. SUCHITTRA LUANGAMORNLERT, DNSc., R.N., 250 pp.

The purpose of this study was to examine the causal relationship among regimen complexity, family income, age, health beliefs, cognitive function, social support, and medication adherence behavior in the elderly with hypertension. The srudy was based on medication adherence model (Park and Jones, 1997). Multi-stage random sampling was employed to obtain the sample of 422 elderly with hypertension who visited five general hospitals in Thailand. Research instruments consisted of the Chula Mental Test, the Health Belief Questionnaire, the Personal Resource Questionnaire, the Medication Regimen Complexity Index, and the Morisky Medication Adherence Scale. Data were analyzed using SPSS for Window version 15 and LISREL version 8.52.

The goodness of fit indices illustrated that medication adherence model fit with the empirical data ($\chi^2 = 57.77$, $df = 42$, p-value = 0.053, GFI=0.98, AGFI=0.95, RMSEA= 0.03), and explained 70% of the variance of medication adherence. Cognitive function, health beliefs, and social support have positive direct effect on medication adherence. Social support was the most influential factor affecting medication adherence. In addition, regimen complexity and family income had a significant positive direct effect on health beliefs and had a significant positive indirect effect on medication adherence through health beliefs. Family income had a significant positive direct effect on cognitive function and indirect effect on medication adherence through cognitive function. Age had a significant negative direct effect on cognitive function and indirect effect on medication adherence through cognitive function.

The findings indicated the prominent components of nursing intervention focusing on promote medication adherence behavior in the elderly with hypertension. Nurses should assessment about age, family income, cognitive function, regimen complexity of the elderly. Promote social support and health beliefs in the elderly with hypertension.

Field of Study : Nursing Science
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Student's Signature Somluk Tep...
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CHAPTER I

INTRODUCTION

Background and significance of the study

Hypertension is a chronic disease and a major health burden typically found in the elderly. Data from the National Health and Nutrition Examination Survey from 1988 to 2004 revealed that 67% of adult Americans aged 60 years and older were hypertensive patients (Ostchega et al., 2007). In Thailand, based on the health examination survey which was conducted in 2009-2010, it was found that the prevalence of hypertension in the elderly was 38-47% and hypertension was the top of the chronic diseases among them (Vichai Aekplakorn, 2010). Moreover, hypertension was the leading cause of admission to the hospital for Thai elderly (Somsak Chunharas, 2009). The prevalence of hypertension rises sharply, not only with age but also with the incidence of heart failure, stroke, and coronary heart disease (Perry et al., 1995; Psaty et al., 2001).

Antihypertensive medications have been reported as a highly effective treatment in reducing blood pressure level and in reducing the adverse outcomes, especially among the elderly, and the benefits are more than twice in young people (Hansson et al., 1998; Mulrow et al., 1998). However, hypertension control declines as a function of age and largely reflects an inadequate control of blood pressure (Hajjar and Kotchen, 2003). In Thailand, the incidence of blood pressure control among the elderly was only 22-25% (Vichai Aekplakorn, 2010: 276). The major explanation for this low rate of control was poor medication adherence (Joint National

Committee on Prevention, Detection Evaluation and Treatment of High Blood Pressure, 1997).

A study of medication taking in Thai hypertensive, found that 45.7% had poor adherence to antihypertensive medication and 60% of them were elderly (Amphai Auksornsiri, 2002). The consequences of poor medication adherence among the elderly included poor blood pressure control (Haynes et al., 1982) and hospital admission (Maronde et al., 1989; Col, Fanale, and Kronholm, 1990). It also results in considerable cost to patients, employers, health insurers, and the healthcare system (Eisenhauer, 2006). Furthermore, the non-adherence and errors in self-administration of medications were found to be common and often led to serious medical problems that compromised the already frail health of the elderly (Branin, Onaga, and Fuller, 1999). Poor medication adherence leads to ineffective pharmacologic management of chronic conditions, and can also contribute to adverse drug events (Gurwitz et al., 2003). Thus, poor adherence to the medication regimen continues to be the principle clinical problem of the hypertensive elderly patient.

The hypertensive elderly had an increasing risk of poor medication adherence due to cognitive and physical changes associated with aging (Maddigan et al., 2003). The elderly represent a group with unique characteristics, problems, and special needs (Adelman, Greene, and Charon, 1991) and they often have complicated medical programs implemented at home. The higher number of drugs usually prescribed for the elderly makes drug regimens more complex (Eisenhauer, 2006). The more complicated the dosing regimen, the more pills taken daily, and the more often pills must be taken, the greater the chance of error and adverse drug reaction (Gurwitz et al., 2003).

Regarding cognitive changes and pathophysiological alterations resulting from the aging process, the elderly may experience confusion or forgetfulness regarding drug administration. Failure in remembering and tracking has been associated with non-adherence to medication regimens. The elderly forget the way to correctly take medications and fail to remember to take the medication at the correct times (Ebersole et al., 2005; Insel and Cole, 2005). Additionally, physical limitations affect the patient's ability to open medication vials and packaging or to administer certain types of medications (Eisenhauer and Murphy, 1998). Limitations in vision interfere with the reading of instructions, especially of bottle labels. The practice of giving rapid-fire directions is not effective in addressing the person with hearing impairments or the normal age-related need for slightly slower verbalizations (Ebersole et al., 2005). Financial restraints are also important in that they may affect the patient's ability to actually obtain the medication and supporting resources. In a poll conducted by the Associated Press, 33% of older persons stated they had trouble paying for prescription drugs. Many had to put off filling prescriptions because they could not afford the cost (Institute for Sale Medication Practices, 2003). As a result, reduced their medication dosage or discontinued a drug when they experienced side effects that were bothersome or that they felt their prescriber did not address (Eisenhauer, 2006). Support from one's social network provides necessary information, encouragement, or logistic means for ensuring medication adherence (Starks, 1991; Hill et al., 1999; Supaporn Naewbood, 2005). The elderly will consistently with medication regimen if they believe that their illness is serious enough to treat, that it will be effectively treated with the drugs as prescribed, and that any side effects are worth the possible benefit (Taylor, 1999).

Improving medication adherence in hypertensive elderly is reline on the adequate understanding on a pattern and it contributing factors which is still a critical part of the gap of knowledge in this area. The evidence indicates the barriers and contributing factors that influence medication adherence behavior among the elderly are regimen complexity, family income, age, health beliefs, cognitive function, and social support.

Although the relationships among factors that affect medication adherence in the elderly are present, only linear correlation designs and explored few selected variables. The causal relationships among the many significant factors that affect medication adherence have still not been established, and the existing knowledge is inadequate for planning effective nursing interventions to promote medication adherence in the elderly. The rationale is confirmed by only few variables that were adapted in previous studies of intervention design to promote medication adherence in the elderly and yet still do not offer an impressive increase in the adherence behavior in the population of the elderly and not reduced the incidence of uncontrolled blood pressure (Vichai Aekplakorn, 2010). This evidence reflects a need for exploration of a clear picture of the direct and indirect relationships among the variables that contribute to medication adherence among the hypertensive elderly. Thus, there is a need for a better understanding of the patterns among factors contributing to medication adherence among the hypertensive elderly in order to add more comprehensive knowledge for nursing care disease-management.

Nurses have a major role in promoting safe and effective management of medications. However, the existing knowledge for increasing medication adherence among the hypertensive elderly is still inadequate for planning for effective nursing

intervention. The causal model is a very useful method for the elegant description of the relationships within a set of variables. Its advantages include that the fact that the complex relationships among variables can be depicted with a single model and the total effects of causal variables on effect variables can be calculated and compared (Bozionelos, 2003). The benefit of the causal model also provides in-depth understanding of both the direct and indirect relationship among factors, the pathway of the relationships, the magnitude of the linkages between factors, and the degree of significance of each factor (Asher, 1983) affecting medication adherence behavior in the elderly with hypertension, which is essential for developing effective nursing intervention for promoting medication adherence in the elderly with hypertension.

Research questions

1. Does the hypothesized causal model that explains the medication adherence behavior in the elderly with hypertension, including regimen complexity, family income, age, health beliefs, cognitive function, and social support adequately fit the data?

2. Do health beliefs, cognition function, and social support have direct effects on medication adherence behavior?

3. Does regimen complexity have an indirect effect on medication adherence behavior through health beliefs?

4. Does family income have an indirect effect on medication adherence behavior through health beliefs and cognitive function?

5. Does age have an indirect effect on medication adherence behavior through cognitive function?

Purpose of the study

1. To develop a causal model for explaining medication adherence behavior in the elderly with hypertension, including regimen complexity, family income, age, health beliefs, cognitive function, social support, and medication adherence behavior.

2. To examine the causal relationships between variables, including regimen complexity, family income, age, health beliefs, cognitive function, social support, and medication adherence behavior in the elderly with hypertension.

Research hypotheses and rationales

The following hypotheses are formulated to test the causal effects proposed in this study:

Hypothesis 1: Health beliefs have a positive direct effect on medication adherence behavior.

Rationale: The patients have multiple reasons based on their health beliefs for why they choose to adhere to medication. It would appear that adherence is better when the elderly fell susceptible to the illness or its complications (Jin et al., 2008). The elderly believes that the illness or its complications could pose severe consequences for their health (DiMatteo, Haskard and Williams, 2007; Jin et al., 2008; Molloy et al., 2009). The elderly believes that therapy would be effective or they perceive benefits from the therapy, choose to adherence (Brown and Segal, 1996; Horne and Weinman, 1999; Ross et al., 2004; Phatak, and Thomas, 2006). The previous studies also found that health beliefs were strongly related to medication adherence (Huang, 1996; Li, 2004; Ross et al., 2004; George et al., 2006; Kressin et

al., 2007). Therefore, the hypothesis is proposed that health beliefs have a positive direct effect on medication adherence behavior among the elderly with hypertension.

Hypothesis 2: Cognitive function has a positive direct effect on medication adherence behavior.

Rationale: Cognitive function also plays an important role in adherence, especially for the elderly (Park, 1994). Adequate cognitive function is required to understand the illness, its treatment, and the purpose of taking medication. Patients must receive information about their medication in order to comprehend and remember what the medication regimes require from them, when to take the medication, what kinds of side effects can be expected, and how to deal with them (Van Vliet et al., 2006). For some elders, taking medication properly is difficult. Many reviews and research studies indicate that cognitive impairment and poor understanding of the purpose of the drug often leads to forgetfulness and poor medication adherence (Okuno, Yanagi, and Tomura, 2001; Salas et al., 2001; Jeste et al., 2003). Several authors have demonstrated the positive relationships between knowledge deficit and poor adherence of the elderly. Forgetfulness and lack of knowledge often lead to improper intake of the medication (Cohen et al., 1998; Barat, Andreasen, and Damsgaard, 2001). Therefore, the hypothesis is proposed that cognitive function has a positive direct effect on medication adherence behavior among the elderly with hypertension.

Hypothesis 3: Social support has a positive direct effect on medication adherence behavior.

Rationale: Several studies have provided evidence of an association between social support and medication adherence behavior in the elderly (Anderson et al.,

2000; Barat et al., 2001; Sales et al., 2001; Supaporn Naewbood, 2005). Support can come from the spouse, family members, friends, neighbors, colleagues, and health professionals (Haber, 2003). Perceived social support, either from family members or from health care providers, is related to medication adherence behavior (Bosworth and Oddone, 2002). Support from one's social network may provide necessary information, encouragement, or logistic means for ensuring medication adherence as well as increasing the likelihood of individuals seeking preventive health care services, such as hypertensive screening and treatment (Bosworth and Oddone, 2002).

A statistically significant correlation has been suggested between medication adherence and the tangible support (Kitchie, 2003). The role of social support in the elderly with hypertension has been linked to adherence, not only through informational and tangible support for reinforcing therapeutic knowledge, but also through external cues, such as reminders for taking medications, filling prescriptions, seeking care for side effects, and care giving (Anderson et al., 2000). Patients that believe that they have social support demonstrate greater treatment adherence (Krueger, Berger, and Felkey, 2005). Therefore, the hypothesis is proposed that social support has a positive direct effect on medication adherence behavior among the elderly with hypertension.

Hypothesis 4: Regimen complexity has a positive direct effect on health beliefs and an indirect effect on medication adherence behavior through health beliefs.

Rationale: Regimen complexity can be defined according to the multiple characteristics of the prescribed regimen, including the number of dosage forms, the daily dosage frequency, and the number of additional instructions (George et al., 2004). The elderly that have multiple medications also have multiple characteristics of

the medication to prescribe. The more complex the medication, the more the elderly perceive the severity of their illness and that medications benefits for them, therefore, were more adherent than those perceived low severity and low medication benefits. Sharkness and Snow (1992) and Monane et al. (1994) found that elderly patients with more than one chronic illness, requiring the use of more than one drug, were more likely to believe themselves in need of treatment, and therefore, were more adherent than those needing only one drug. This is similar to the study of Lagi et al. (2006), who found that patient taking drugs ≥3 pills per day who were hypertensive with risk factors and hypertension with comorbidity showed greater adherence than patients taking drug 1-2 pills per day that were hypertensive. Adherence was also higher in people taking higher numbers of medications, those who perceived their medications was benefits and necessary for them (Treharne, Lyons, and Kitas, 2004; Neame and Hammond, 2005; Aikens and Piette, 2009).

Hypothesis 5: Family income has a positive direct effect on health beliefs and an indirect effect on medication adherence behavior through health beliefs.

Rationale: Thai elderly have reported that they often received income from their children (Knodel and Napaporn Chayovan, 2009). Their incomes then frequently come from their family members. Income has been seen to have the greatest impact on the health belief model variables and health behaviors in the elderly (Wacker, 1990). They can easily access health care programs (Al-Ali and Haddad, 2004). They have discussions with a physician about their susceptibility to the disease and the benefits of medication. These ideas of susceptibility and benefits make them adhere to the medication regimen. Unson et al. (2005) have described the mechanism through which family income affects use of osteoporosis medications and hormone therapy by

increasing knowledge about osteoporosis and hormone therapy. Another possible link between family income and medication use is through perceived susceptibility. Having a discussion with a physician about osteoporosis was seen to be associated with increased perceptions of susceptibility. Arcangelo (1991) found that the elderly with lower income and those that felt that medications had a poor benefit, misused medications more frequently than those with higher income and who felt that the medications worked well. Therefore, the hypothesis is proposed that family income has a positive direct effect on health beliefs and an indirect effect on medication adherence behavior through health beliefs.

Hypothesis 6: Family income has a positive direct effect on cognitive function and an indirect effect on medication adherence behavior through cognitive function.

Rationale: The elderly with a higher family income also have higher cognitive status because they have enough money to buy vitamins and food that are useful for cognitive functions. Adequate nutrient intake is essential in maintaining cognitive status in the elderly (Kim, 2003). Lindeman et al. (2000) found a significant association between serum folate and vitamin C, and annual family income. The elderly that have family income above the poverty level (greater than $15,000) have higher vitamin concentration. Kim et al (1998) revealed that one's cognitive function score had a strong relationship with food intake, such as total amounts of foods, fish and shellfish, milk and dairy products, and total animal food, fruit, bread, and sugar. The elderly that have adequate cognitive functioning can understand the illness, its treatment, and the purpose of taking the medication. They also comprehend, organize, and remember the requirement of the medication regimen (Van Vliet et al., 2006). They then adhere to the medication regimen. Therefore, the hypothesis is proposed

that family income has a positive direct effect on cognitive function and an indirect effect on medication adherence behavior through cognitive function.

Hypothesis 7: Age has a negative direct effect on cognitive function and an indirect effect on medication adherence behavior through cognitive function.

Rationale: It has been well documented that changes in cognitive functioning increase with age (Lezak, 1995; Glisky and Glisky, 1999). Age related declines in some of these underlying cognitive mechanisms have been well-documented and these mechanisms contribute to forgetting to take medication as prescribed or to not understand how to properly take medication among older adults (Salthouse, 1991). The researchers that have investigated cognition and medication adherence in the elderly have reported that age affects adherence to medication through cognitive skills (Isaac and Tamblyn, 1993; Park et al., 1994). The oldest old was to be the poorest adherent, the results suggesting continuous deterioration of various cognitive skills that support optimal adherence to complex regimens (Park et al., 1992; Park et al., 1994). Thus, increasing age places elders at greater risk of deficits in memory or general cognitive function; the apparent relation between adherence and age then may be mediated by cognition rather than age itself (Ownby, 2006). Therefore, the hypothesis is proposed that age has a negative direct effect on cognitive function and an indirect effect on medication adherence behavior through cognitive function.

Scope of the Study

This study is a cross-sectional study that develops and tests a causal model of medication adherence behavior among Thai elderly with hypertension aged 60 years and over that visited the outpatient department of general hospital in Thailand.

Definitions of terms

Medication adherence behavior is defined as the extent to which a person's behavior in terms of taking medications coincides with medical advice. It is measured by the Morisky Medication Adherence Scale (Morisky et al., 2008).

Health beliefs is defined as a set of perceptions an elderly holds about susceptibility to complication of hypertension, severity of hypertension, benefits of taking antihypertensive drugs, and barriers to taking antihypertensive drugs. It is measured by the Health Beliefs Questionnaire (Hamilton, 1982).

Cognitive function is defined as the ability to perform intellectual tasks such as thinking, remembering, perceiving, communicating, orientating, calculating, and problem solving. It is measured by the Chula Mental Test (CMT) (Sutthichai Jitapunkul, Chanthong Lailert, and Puangsoi Worakul, 1996).

Regimen complexity is defined as variety in the medication regimen such as dosage forms, dosage frequency, and additional instructions. It is measured by the Medication Regimen Complexity Index (George et al., 2004).

Age is defined as the chronological age of the elderly reported in the year of the study.

Family income is defined as total compensation received by all family members living in the same family. It is measured by the elderly self-report.

Social support is defined as the level perceived with specific supportive behavior when needed, including intimacy, social integration, nurturance, worth, and assistance. It is measured by the Thai version of the Personal Resource Questionnaire (PRQ 85 Part 2) (Brand and Weinert, 1987).

Expected usefulness of the study

1. The findings will add important knowledge about improving medication adherence in elderly patients by providing information regarding the pathway of relationships between factors and health behavior for medication adherence among the elderly.

2. The findings will support nurses' decision making in designing effective nursing intervention by incorporating the contributing factor components and the patterns of correlations influencing medication adherence behavior among the elderly with hypertension.

3. The findings will contribute to future research to confirm that interventions incorporating these components will result in increased and sustained elderly medication adherence and, better yet, will improve outcomes.

CHAPTER II

LITERATURE REVIEW

This chapter presents an integrated review of theoretical and empirical literature describing concepts of the interest and interrelationship among them. The following literature was reviewed, evaluated and summarized herein.

1. Hypertension in the elderly
    1.1 Epidemiology of hypertension in the elderly
    1.2 Treatment for hypertension in the elderly
2. Medication adherence
    2.1 Definition of medication adherence
    2.2 Measuring medication adherence
    2.3 Adherence to antihypertensive medication in the elderly
3. Medication adherence model
4. Factors related to medication adherence
5. Statistic for causal model analysis

1. Hypertension in the elderly

1.1 Epidemiology of hypertension in the elderly

Hypertension is defined as systolic blood pressure ≥ 140 mmHg, diastolic blood pressure ≥ 90 mmHg or treatment with hypertension drugs (Chobanian et al., 2003). Based on data from the Survey of the elderly in Thailand 2007, found that 31.7% of the elderly has hypertension (National Statistical Office, 2007). The prevalence of hypertension has been on the rise in the past decade; the health

examination survey in Thailand, which was conducted in 2009-2010, provides a prevalence of 38-47% among the elderly (Vichai Aekplakorn, 2010: 276). The primary reason for the growing prevalence is arguable to the progressive aging of the population; other reasons may include the increasing number of people with unhealthy lifestyles (smoking, physical inactivity, high saturate fat diet, etc) (Reeves and Rfferty, 2000), and socio-environment factors (excessive exposure to noise, stress, social isolation, etc) (Wirtz et al., 2006).

There are two types of hypertension: primary (or essential) and secondary, based on disease etiology. Primary hypertension accounts for more than 95 percent of diagnosed cases, while secondary hypertension only claims about 2-5 percent of that case pool. Little is known about any identifiable cause of primary hypertension. Despite many years of research, there is no consensus on the pathogenesis of primary hypertension. A number of factors have been implicated in the development of hypertension. These risk factors include excessive sodium consumption (Ruano et al., 2005; Wirtz et al., 2006), high saturated fat diet (Ascherio et al., 1996; Appel et al., 1997; Hermansen, 2000), sedentary life style (Lee and Lip, 2004; Choudhury and Lip, 2005), obesity (Appel et al., 1997, Psaltopoulou et al., 2004), advancing in age (Wang and Vasan, 2005), race (Ascherio et al., 1996; Sowers et al., 2002), smoking (Groppelli et al., 1992), excessive alcohol consumption (Lip and Beevers, 1995), stress/depression (Meyer et al., 2004; Hawkley et al., 2006), and genetic factors (Johnson and Turner, 2005; Sagnella and Swift, 2006). These risk factors are seldom independent, e.g. they often interact with one another and jointly affect a specific individual.

Unlike primary hypertension, secondary hypertension has a clearly determined pathogenesis. There are a number of known conditions that can cause secondary hypertension. These conditions include vascular conditions (coarctation of the aorta, renal artery stenosis), renal disease (intrinsic renal disease, chronic renal failure), endocrinological disorders (phaeochromocytoma, Conn's syndrome), and certain drugs (e.g. oral contraceptives) (Spencer and Lip, 1999).

1.2 Treatment for hypertension in the elderly

Hypertension is manageable and its complications are preventable. The primary goal of treating hypertension is to control blood pressure levels in an effort to prevent cardiovascular events (Chobanian et al., 2003). Treating hypertension often involves concurrent lifestyle modification and pharmacologic treatment.

A healthy lifestyle is a critical step in preventing and treating hypertension. Lifestyle modifications are recommended for patients at all stages of hypertension. Generally, it makes up the sole treatment plan for patients with blood pressure under 140/90 mmHg and those with diabetes or chronic renal diseases whose blood pressure levels are under 130/80 mmHg (Chobanian et al., 2003). Components of lifestyle modification include weight reduction, smoking cessation, healthy eating plan (sodium reduction, lowering saturated fat, eating more fruits/vegetables), getting regular aerobic exercise, and moderation in alcohol consumption (Chobanian et al., 2003). Lifestyle modifications have been widely reported to be effective in controlling blood pressure and reducing cardiovascular risk, both alone and as an addition to pharmacologic therapy (Kelley and Kelley, 2000; Sacks et al., 2001; Xin et al., 2001).

Currently, there are several classes of antihypertensive drugs on the market, including antiotensin-coverting enzyme (ACE) inhibitors, angiotensin-receptor

blockers (ARBs), β-blockers, calcium channel blockers (CCBs), and thiazide-type diuretics and loop diuretics. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII) report recommends thiazide-type diuretics to be used as initial therapy for patients with hypertension, either alone or in combination with one of the other classes, with the exception made for patients with specified compelling indications (post-myocardial infarction and chronic kidney disease) (Chobanian et al., 2003). Table 2.1 provides the current treatment guideline from JNC VII report.

Table 2.1 Classification and management of blood pressure

BP Classification	SBP* mmHg	DBP* mmHg	Lifestyle Modification	Initial drug therapy	
				Without Compelling Indication	With Compelling Indications
Normal	<120	and <80	Encourage	No antihypertensive drug indicated.	Drug(s) for compelling indications.
Prehypertension	120-139	or 80-89	Yes		
Stage 1 Hypertension	140-159	or 90-99	Yes	Thiazide-type diuretics for most. May consider ACEI, ARB, BB, CCB, or combination.	Drug(s) for the compelling indications. Other antihypertensive drugs (diuretics, ACEI, ARB, BB, CCB) as needed.
Stage 2 Hypertension	≥160	or ≥100	Yes	Two-drug combination for most† (usually thiazide-type diuretic and ACEI or ARB or BB or CCB).	

Note: DBP, diastolic blood pressure; SBP, systolic blood pressure.
ACEI, antiotensin coverting enzyme inhibitor; ARB, angiotensin receptor blocker; BB, beta-blocker; CCB, calcium channel blocker.

* Treatment determined by highest blood pressure category

** Treat patient with chronic kidney disease or diabetes to BP goal of < 130/80 mmHg.

Numerous clinical studies have shown that appropriate pharmacological treatment aimed at reducing or normalizing blood pressure contributes to a significant reduction in cardiovascular morbidity and mortality (Psaty et al., 2001). A reduction in diastolic blood pressure of 5-6 mmHg in patient with medium to severe arterial hypertension reduces the incidence of stroke by 40% and the incidence of coronary heart disease by 15% over 5 years (Cutler, MacMahon, and Furberg, 1989). An earlier study showed that a reduction of at least 50% in the emergency of congestive heart failure was attributable to adequate pharmacotherapy (Yusuf, Thom, and Abbott, 1989). The efficacy of antihypertensive therapy has been demonstrated for all stages of hypertension and for the vast majority of cardiovascular disease (Al'absi and Arnett, 2000).

2. Medication adherence

2. 1 Definition of medication adherence

Adherence to medication regimens can be defined as the extent to which a patient takes a prescribed medication regimen in accordance with the instructions or recommendations from the prescriber (Sackett, and Haynes, 1976; Haynes, Taylor, and Sackett, 1979; Vermeire et al., 2001; World Health Organization, 2003; Osterberg and Blaschke, 2005). The term adherence has come to replace compliance in contemporary parlance to emphasize a shared responsibility between prescriber and patient as opposed to blind obedience to a physician’s orders (World Health Organization, 2003; Osterberg and Blaschke, 2005). Inherent in this shift in vocabulary is an increased emphasis on provider and healthcare system-related determinants (and their interaction) of medication adherence. There is a strong

movement away from focusing solely on patient-related factors, but instead to better understand the complex relationship between factors at many levels in the health care system and adherence to prescribed therapy (Miller, 1997; Vermeire et al., 2001; Sabate, 2003; Osterberg and Blaschke, 2005; O'Connor, 2006).

The terms adherence and compliance have been used interchangeable within the literature. Concept analysis by Bissonnette (2008) found no distinct differentiation between adherence and compliance. The most common definition found was "the extent to which patients follow the instruction they are given for prescribed treatment". The term adherence will be used throughout this study because the term is considered to be less value-laden than compliance (LaGreca and Schuman, 1995)

2.2 Measuring medication adherence

There are several methods which can be used to measure adherence to medication. These methods are generally categorized as either direct or indirect measures (Rudd, 1993). Direct measures include blood or urinary levels of medications, metabolites, or markers. Indirect measures include pill counts, pharmacy refill rates, self-report, and electronic adherence monitoring devices. In recent years, research efforts have focused on the use and evaluation of methods for measuring adherence that are seemingly practical in the outpatient clinical setting. Consistent use of a valid, reliable, efficient and cost-effective tool that is acceptable to patients is needed to facilitate clinical decision making in the outpatient setting (Krousel-Wood et al. 2004).

The direct biologic measures, like biologic assays of active or metabolite, confirm actual drug ingestion. However, assays are not feasible in most ambulatory settings due to their high cost and inconvenience for patients. Additionally, significant

variance may exist between patients in their absorption, metabolism, and excretion of medications (Gordis, 1979). There is no clear causal linkage between lab parameters and adherence behaviors. Hence, assays provide little information about the consistency of medication taking.

Patent self-report method uses self-administered questionnaires or interviewers to obtain a patient's subjective evaluation of his or her own treatment adherence behaviors. It is one of the most frequently used methods in measuring medication adherence. Several multi-items questionnaires have been developed with the explicit aim of ascertaining antihypertensive medication adherence (Morisky, Green and Levine, 1986; Kim et al., 2000; Morisky et al., 2008), in an effort to facilitate the identification of barriers to adequate compliance. Morisky et al. (1986) developed a four-item scale to assess patient adherence to blood pressure medication regimens in the outpatient setting. Later, a eight-item questionnaire was developed from a previously validated 4-item scale and supplemented with additional items to better capture barriers surrounding adherence behavior. It is a screening tool in the clinic setting to identify patients who are poorly adherence and at risk for uncontrolled blood pressure (Morisky et al., 2008). The Hill-Bone Compliance to High Blood Pressure Therapy Scale (Kim et al., 2000) includes 14 items, 8 of which are directed at assessing medication taking behavior in hypertensive patients. The advantages of this method over other measures include its feasibility in all care settings, simplicity, and speed (Morisky et al., 1986). Disadvantages of this method include recall bias and subjectivity. The reliability of the self-report method may vary with the study variables such as the type or severity of disease, but frequently demonstrates acceptable validity and reliability (Rudd, 1993). For several of these

self-report tools, high reliability and validity have been reported (Morisky et al., 1986; Shea et al, 1992; Kim et al., 2000).

Electronic adherence monitoring devices are a relatively new method (Rudd, 1993). The “monitor” is a computer chip embedded in the cap of a prescription container. It records the actual time at which the container was opened and medication was presumably taken. The monitor stores multiple day worth of data and can provide a time tracing that becomes the matrix on which the investigator places other observations, measurements, and potential predictors in search of associations. Hence, the monitors assess medication taking events on a dynamic basis. Such electronic compliance monitoring has become the new “gold standard” for pharmacologic treatment studies and other adherence measures. Theoretically, the monitors could provide a probe for factors that facilitate, cue, or inhibit specific occasions of dispensing and presumably consuming medications. However, it remains possible that a patient might open and close the monitor and not actually take the medication. Also, this method is too expensive to be applied to large samples.

The pharmacy refill method uses pharmacy dispending records to monitor the prescribed dosing frequency and interval between prescription refills (Rudd, 1993). Pharmacy refill rates have been used as measures of medication adherence in several studies (Christensen et al., 1997; Caro et al., 1999). Choo et al. (1999) reported on 286 hypertensive individuals who participated in a study of the validity of pharmacy dispensing records and pill counts as measures of medication adherence, using electronic monitoring as the gold standard. Additionally, Moore (2003) recently outlined the advantages of using pharmacy refill rate as a surrogate for medication adherence. First, pharmacy refill rate reflects patients’ decision to continue with

therapy without the influence of pharmaceutical company promotion and sampling to physicians. Second, it reflects patients' effort to obtain the medication as the first step toward taking the medication. Limitation to the use of refill rates in the outpatient setting is the lag time for data availability, which can take as long as 3 months or longer. This method may be confounded by patients obtaining refills at more than one pharmacy or by sharing medications with others.

Pill counts have been employed in many drug trials. This method requires subjects to return their pill supply at each visit so that the pill may be counted. Several obstacles interfere with standard pill counts (Rudd, 1993). These include subjects' changed behaviors due to concerns about being judged, forgetting to return pill vials, losing containers, sharing medication with other individuals, and storing medication in more than one place. The technique of pill counts is also very labor intensive, which makes this method impractical in most practice settings. Under this method, adherence is usually calculated as a percent discrepancy score which the number of pills the patient had actually consumed is divided by the number they should have consumed during a specified time interval (Putnam et al., 1994). It is calculated using the following formula [(prescribed doses – missed doses) ÷ (prescribed doses)]. Adherence may be reported as a continuous variable (e.g., percentage) or as a dichotomous variable (adherence/non-adherence) in which adherence is defined as being within ± 10% or ± 15% of the appropriate number of doses to be taken (Rudd, 1993).

In summary, no measure of adherence proves perfect. The advantages of cost, convenience, and acceptability have generally served as counterweights to accuracy, non-reactivity, and comprehensiveness. There are critical challenges in research

related to adherence measurement. It has not been possible to find as absolute “gold standard” measurement that can be applied to all kinds of related research. Choosing the most appropriate method of adherence measurement will depend on a good understanding of the nature of study and the practical implications of each technique. In this study used self-report assessment of patient’s medication adherence instead of more expensive and cumbersome approaches such as collateral and physiological measures. Self-report drug therapy adherence has repeatedly been shown to be comparable to other measures of adherence, such as pill count, appointment keeping, pharmacy dispensing records, and other physiological measures (DiMatteo et al., 1993; Stephenson, 1999; Haynes, MacDonald and Garg, 2002). Moreover, self-report is widely used, economic feasible in outpatient department, simplicity, speed, and validity and reliability accepted. As such, the present study measured adherence to taking the medication recommended for the antihypertensive medication regimen with the self-report.

2.3 Adherence to antihypertensive medication in the elderly

While it is critical for physicians to make the optimal therapeutic decisions, the ability of patients to manage their hypertension is crucial. Indeed, adherence with therapeutic regimens for example, may prevent or delay the onset of complications, thereby largely influencing the prognosis. It is estimated that 47-48 percent of Thai elderly with hypertension are currently receiving medication therapy and only 22-25 percent of those patients have achieved blood pressure control (Vichai Aekplakorn, 2010: 276). Much of the literature suggests however that suboptimal adherence with pharmacological treatment is a frequent cause of inadequate blood pressure control (Urguhart, 1999; Hughes et al., 2001). With chronic conditions such as hypertension,

stability and proper dosage in pharmacotherapy are essential conditions to guarantee optimal outcomes.

Most evidence supports that poor adherence to prescribed antihypertensive regimens is a leading cause of poor control of blood pressure (Chobanian et al., 2003, Krousel-Wood et al., 2005; Morris et al., 2006). Up to 50% of the remaining patients become nonadherence to antihypertensive therapy in the longer term. It is likely that patient, provider, and system-level factors all play a role in the degree of blood pressure control (Borzecki, Oliveria, and Berlowitz, 2005; Wang and Vasan, 2005; Harmon, Lefante and Krousel-Wood, 2006). Studies have identified that factors such as access to care, having a regular source of health care (especially with a primary care physician), lifestyle modification, medication adherence, good patient-provider communication, are associated with better blood pressure (Shea et al., 1992; Kotchen et al., 1998; Knight et al., 2001; Inkster et al., 2006). However, it is likely that many of these factors improve blood pressure control by modulating adherence to antihypertensive regimens (Chobanian et al., 2003). A simple argument can be made that if a drug is not taken sufficiently, it will not be effective (Chobanian et al., 2003; Osterberg and Blaschke, 2005). Therefore, adherence to medication regimens is a key factor in reducing hypertension-related morbidity and mortality once the patient is aware of the hypertension. Given the rate of blood pressure control in Thai elderly is only 22-25 percent (Vichai Aekplakorn, 2010: 276). There is a large opportunity to improve public health through strategies to improve medication adherence in the elderly with hypertension.

3. Medication adherence model

Park and Jones (1997) propose a conceptual model of medication adherence for the elderly people. This model is representative of an abundance of literature that has identified as well as hypothesized predictors and relationships among the variables related to medication adherence. They explained that individuals may not take their medication at all; they may omit some doses, they may take extra doses or extra quantities within a dose, or they make take it at improper times, in the wrong combination, or without following special instructions associated with the medication. It is becoming increasingly clear that medication adherence is an extraordinarily complex behavior and that effective interventions to improve adherence can be developed only to the extent that we understand mechanisms underlying the behavior. This model identifies three key constructs predict medication adherence: 1) illness representation, 2) cognitive function, and 3) external cues. Indirect variables such as medication and disease variables, individual differences, and age indirectly influence medication adherence by affecting three key constructs. Medication and disease variables indirectly influence adherence by their impact on illness representation. Individual differences indirectly influence adherence by their impact on illness representation and cognitive function. Age is proposed to act only as a mediating factor for cognitive function, that is, risk for nonadherence in the elderly who experience cognitive decline. A conceptual model for medication adherence appears in Figure 2.1.

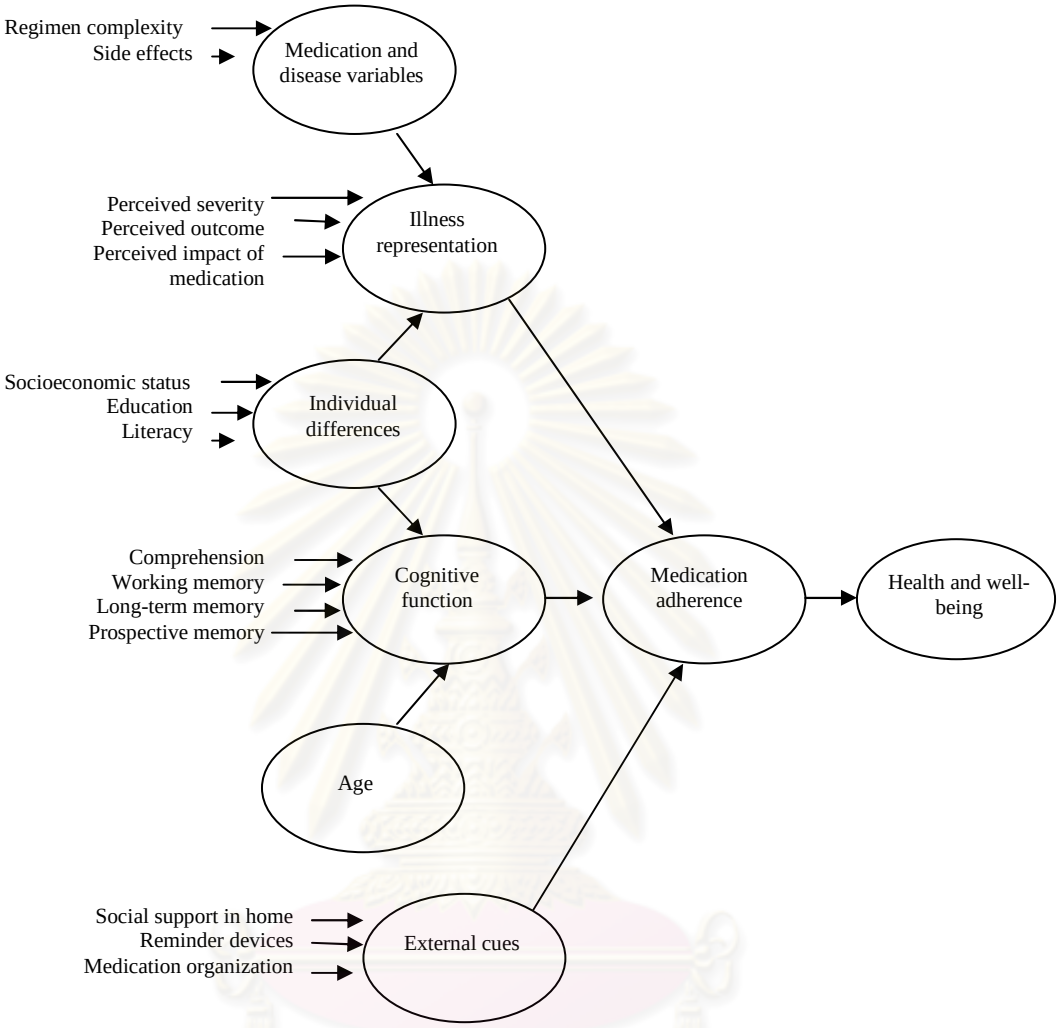


Figure 2.1 Conceptual model of medication adherence (Park and Jones, 1997)

Illness representation may include beliefs about the usefulness of medication and the consequences if one dose not takes medication. Park and Jones (1997) say that an individual chooses to be either adherence or not; the choice probably depends upon the individual's beliefs about the illness and that individual's belief about the degree of success of a particular medication for treatment. Patients with hypertension who believe that they are unlikely to get sick in the future are more likely to be

nonadherence. In addition to the limitation on a person's activities and lifestyle caused by the illness itself, the effectiveness of a drug, along with any side effects, is hypothesized to shape an individual's perception and beliefs about the illness. If a person denies the illness, or if the medication is perceived as ineffective, nonadherence is probable, despite the presence of symptoms.

Cognitive function includes comprehension, working memory, long-term memory, and prospective memory. As Park (1992) notes, accurate medication adherence has a number of cognitive components, including (1) the comprehension of the medication instructions, (2) organization of the individual medication instructions into a medication plan, that is, a temporal sequence that integrates multiple medications and doses, (3) retention of the medication plan, and (4) remembering to take the medication at the planned time. Much of the age related variance that occurs in medication adherence is likely mediated through cognitive function. Considerable evidence shows that **comprehension** declines with age, particularly information that is inferential in nature (Cohen, 1981). This is an important issue with respect to medication adherence since that failure to understand what one is to do with medications preclude accurate adherence (Blackwell, 1979). It is well documented that many aspects of memory declines with age (Salthouse, 1991). Deficits in **working memory** function (the ability to simultaneously store and process information on-line) may contribute to problems in organizing complex medication information, resulting in what is apparently poor comprehension of a regimen (Park, 1992; Park and Kidder, 1996). Declines in **long-term memory** may affect the elderly ability to remember what they are to do with a medication plan once they have developed one.

Another type of memory that has a critical impact on medication adherence is prospective memory; that is, remembering to perform planned actions in the future. Remembering to take medication at the appropriate time is an example of a prospective memory task. **Prospective memory** tied to a contextual cue or an event (such as taking medication with breakfast) does not appear to decline as much with age when compared to prospective memory that is time based, when a response must occur at a specific time, but is not cued by an event (Einstein and MaDaniel, 1990; Park et al, 1992). Park and Kidder (1996) discuss the prospective aspects of medication-taking behavior in detail. They conclude that the retrospective aspects of taking medication (understanding and remembering the regimen) may influence subjects' prospective performance with respect to medication-taking. Because of the time-based nature of medication adherence, this aspect of adherence may be a particularly difficult task for the elderly that can be mitigated to some extent by typing the time based task to an event. They also note that there is evidence that more salient prospective tasks are more likely to be remembered than less salient task.

Overall, there is substantial reason to believe that the cognitive aspects of medication adherence are important element of this complex behavior. Given that the elderly do evidence decline in a number of cognitive domains and that they do appear to comprehend and remember less about medication information than young adults. Park and Jones (1997) conclude that the oldest old were the most nonadherence subject. Much of the human factors approach to medication adherence has focused on supporting and improving the cognitive aspects of adherence.

External cues are also related to medication adherence, such as social support in home, reminder devices, or medication organizers. Social support such as the

support of a family member has a strong effect on health behavior. Partners play a role in reminding patients to take their medications: patients who live with a spouse, partner, or other family member exhibit a higher rate of medical adherence than those who live alone (Park and Jones, 1997). Social support is more likely that it operates as a form of collaborative cognition, providing event-based prospective cues to take medication (Park and Jones, 1997).

Medication and disease variables such as regimen complexity and medication side effects are hypothesized to operate indirectly by affecting the illness representation. Regimen complexity can be defined as how many medication events are prescribed for a patient in a day, and it can be a function of either taking many medications or taking only a few medications that have complex schedules and must be taken three or four times a day. Also some medications have very odd dosing schedules, where large quantities of pills are taken only once or twice a week (e.g., methotrexate for rheumatoid arthritis), which result in complex rules regarding the medication schedule. It is widely believed that nonadherence increases with regimen complexity and that the elderly are particular susceptible to these effects. The mechanism by which elderly adults are believed to be susceptible to regimen effect is primary cognitive-as there are more medication event to integrate and remember, performance deteriorates due to the high cognitive load associated with complexity. The role of perceived side effects in medication adherence may be that patients stop taking medications relatively quickly if they have unacceptable side effects and that only prospective study of the sort conducted by Maddox, Levi, and Thompson (1994) reported that significant amounts of nonadherence occurred for antidepressants, both tricyclics and selective serotonin reuptake inhibitors (SSRIs). A total of 52% of the

patients ceased treatment after 10-12 weeks, and of these, 30% reported unpleasant side effects as the primary reason.

Individual difference variables that have frequently been hypothesized to affect medication adherence relate to education and socioeconomic status. LeSage and Zwygart-Stauffacher (1988) reported an impact of financial difficulties on nonadherence. The failure of Medicare to cover the cost of prescription drugs is widely perceived to be a primary factor in nonadherence. The impact of low socioeconomic status on adherence is likely to have been underestimated in many of the adherence studies, because subjects would not be admitted to most of the studies described here if they had not initially filled their prescriptions. At the same time, failure to fill prescriptions for socioeconomic reasons is not something that can be remedied by a human factors approach.

Of great concern to the human factors specialist is the potential that illiteracy and low education contribute to difficulties in following a prescription regimen. For example, Levy, Mermelstein, and Hemo (1982) reported that a low level of education and nonprofessional employment were significant predictors of hospital admissions that occurred due to nonadherence. They hypothesized that this is due to a poor understanding the consequences of nonadherence as well as an incorrect understanding of how to take the medications. Illiteracy is a particular concern for

adherence behaviors, as illiteracy results in decreased access to the information about when and how to take medications.

The common held belief that the elderly are more nonadherence than young adults. Many studies on adherence focus only on elderly subjects, partially because the elderly are easily isolated as a group using many medications. Park and Jones (1997) found that **age** can predict nonadherence. Park et al. (1992), used bar-code technology to measure adherence in the elderly taking three or more medications and reported that old-old adults (over age 77) were significantly more nonadherence than young-old adults (age 60-76). Congruent with this finding, Park et al. (1994) found that with a group of hypertensive adults, the old-old adults were the most nonadherence and the next group was middle-aged adults. Park and Jones (1997) have consistently found that young-old adults (ages 60-75) are among the most adherent of all subjects. They believe this is because young-old adults have both the cognitive function and the motivation (e.g., perceived vulnerability to disability and death), as well as the time, to take steps to see that medications are taken accurately (Park, 1994).

Medication adherence model by Park and Jones (1997) was developed for every elderly. They explained that individuals may not take their medication at all; they may omit some doses, they may take extra doses or extra quantities within a dose, or they make take it at improper times, in the wrong combination, or without following special instructions associated with the medication. It is becoming increasingly clear that medication adherence is an extraordinarily complex behavior and that effective interventions to improve adherence can be developed only to the extent that we understand mechanisms underlying the behavior. To develop a causal

model for explaining medication adherence behavior in the elderly with hypertension, the researcher review literature which published between 1991 and 2010. But little research was study in medication adherence in the elderly with hypertension. Therefore, this literature review could divide in three parts, factors related to medication adherence in hypertensive patients, chronic illness patients and the elderly population. It could be summarized in table 2.2.

Table 2.2 Summary review of the relationship between the key construct variables and medication adherence in hypertensive patients, chronic illness patients and the elderly population.

Author (year)	Subjects	Variables	Relationship pattern
Key construct ***: Health beliefs***			
Rattan Riounin (2007) (Thai)	Hypertension (mean age 55.35)	Health beliefs and medication behavior	Health beliefs (r= .31, p<0.05) perceived susceptibility (r=.21, p<0.01), perceived severity (r=.44, p<0.05), perceived benefits (r=.59, p<0.01),
Sumalee Wungthanakorn, Chutima Pratidumrongkul, and Pranee Khomchan (2008) (Thai)	Hypertension (mean age 60.2±10.06)	Perceived barriers and medication taking	β = -.35, t =-3.425, p<0.05
Edo (2009)	Hypertension (age 35-74)	Perceived benefits Perceived susceptibility and medication adherence	Perceived benefits (r=.46, p<0.0001), perceived susceptibility (r=.30, p=0.002)
Atulomah (2010)	Hypertension (mean age 62.2±12.19)	Perceived severity and medication adherence	r=.46, p<0.0001

Table 2.2 Summary review of the relationship between the key construct variables and medication adherence in hypertensive patients, chronic illness patients and the elderly population (continued)

Author (year)	Subjects	Variables	Relationship pattern
Key construct ***: Cognitive function***			
Feldman (2003)	Elderly	Executive function and medication adherence	r = -.57, p <.01
Insel and Cole (2005)	Elderly	Cognitive function and medication adherence	r= .42, p<0.05
Insel et al. (2006)	Elderly	Cognitive function and medication adherence	r= .21, p<0.05
		Executive function and working memory and medication adherence	r =.40, p <.01
Schutte (2006)	Elderly	Retrospective memory and medication adherence	r= -.42, p <.05
Key construct ***: Social support***			
Byrd (2004)	Hypertension (mean age 59.59)	Social support from family, friends, and significant others, and medication adherence	r=.41, p<.001; r=.51, p<.001; r=.44, p<.001
Supaporn Naewbood (2005) (Thai)	Hypertension (mean age 63.4)	Social support and medication adherence	r= 0.24, p<0.01
Volis et al. (2005)	Elderly with depression	Social support and medication adherence	r= 0.30, p<0.01
Johnson et al. (2009)	Elderly with HIV	Social support and medication adherence	r= 0.24, p<0.01

Table 2.3 Summary review of the relationship between the indirect variables and the key construct variables predict medication adherence in hypertensive patients, chronic illness patients and the elderly population.

Author (year)	Subjects	Variables	Relationship pattern
Indirect variables and ***health beliefs***			
Treharne, Lyons, and Kitas (2004)	Rheumatoid arthritis (mean age 58.8)	number of medication and belief in necessity of medications	r=.30, p<0.01
Neame and Hammond (2005)	Rheumatoid arthritis	number of medication and belief in necessity of medications	r=.26, p<0.001
		number of medication and concerned about potential adverse consequences	r=.20, p=0.001
Werner (2003)	Elderly	Income and perceive benefits	r =.22, p<.05
Purnell (2007)	African American (mean age 59.7)	Family income and perceive benefits, perceived barriers	r = .31, p<.05, r = -.31, p<.05
Lee, Fogg, and Menon (2008)	Korean American Women (mean age 60)	Family income and perceive barriers	r = -.47, p<.01
Indirect variables and ***cognitive function***			
Werner (2003)	Elderly	Income and cognitive function	r =.20, p<.05
		Age and memory problem	r =.33, p<.001
Badiger, Kamath, and Ashalatha (2010)	Elderly	Income and cognitive function	r =.37, p<.001
		Age and cognitive function	r = -.36, p<.01

From summary review of the relationship between the key construct variables and medication adherence in hypertensive patients, chronic illness patients and elderly population, found that health beliefs has a significant relationship with medication adherence with the magnitude of the relationship from r=.21 to .59. Park and Jones (1997) explained that illness representation include perceived severity, perceived outcome, and perceived impact of medication, were predict medication adherence. They also explained that beliefs about the usefulness of medication and the consequences if one dose not takes medication. An individual chooses to be either adherence or not; the choice probably depends upon the individual's beliefs about the illness and that individual's belief about the degree of success of a particular medication for treatment. In the previous research, they use health beliefs to represent illness representation (Morrell, et al., 1997; Park et al., 1999). Therefore, this study was selected health beliefs in the hypothesized causal model.

Cognitive function has a significant relationship with medication adherence with the magnitude of the relationship from -57 to .42. Park and Jones (1997) explained that cognitive function includes comprehension, working memory, long-term memory, and prospective memory, were predict medication adherence. Therefore, this study was selected cognitive function in the hypothesized causal model.

And social support has a significant relationship with medication adherence with the magnitude of the relationship from .24 to .51. Park and Jones (1997) explained that external cues are also related to medication adherence, such as social support in home. Therefore, this study was selected social support in the hypothesized causal model

From summary review of the relationship between the indirect variables and the key construct variables predict medication adherence in hypertensive patients, chronic illness patients and elderly population, found that number of medication has a significant relationship with belief in necessity of medication and potential adverse consequences with the magnitude of the relationship from .20 to .30. Hall et al. (2007) were compatible their findings with existing theories and models of health behavior. They explained that the balance of concerns and acceptance of the necessity of medication is similar to the concepts of perceived barriers and benefits of action from the health belief model as well Horne and Weinman's research (1999) on perceived risks and benefits in medication adherence. Park and Jones (1997) explained that regimen complexity can be defined as how many medication events are prescribed for a patient in a day, and it can be a function of either taking many medications or taking only a few medications that have complex schedules and must be taken three or four times a day. They also explained that medication and disease variables such as regimen complexity indirectly affect medication adherence through the illness representation. Therefore, this study was selected regimen complexity in the hypothesized causal model.

Income has a significant relationship with health beliefs and cognitive function with the magnitude of the relationship from -.47 to .31 and .20 to.37. Park and Jones (1997) explained that individual difference variables that have frequently been hypothesized to affect medication adherence relate to socioeconomic status. Impact of financial difficulties affect on adherence. The failure of Medicare to cover the cost of prescription drugs is widely perceived to be a primary factor in nonadherence. Based on the literature review of among the elderly, it was found that income influencing

medication adherence in the elder. In Thai culture, families often are important sources of economic support to elderly people, providing money, food and goods (Knodel and Napaporn Chayovan, 2009). Therefore, the study was selected family income in the hypothesized causal model.

Age has a significant relationship with cognitive function with the magnitude of the relationship from -.33 to -.36. Therefore, this study was selecting these variables in the model. Park and Jones (1997) explained that age is proposed to act only as a mediating factor for cognitive function, that is, risk for nonadherence in the elderly who experience cognitive decline. Therefore, the study was selected age in the hypothesized causal model.

The study derives each empirical indicator by using Hierarchy of Middle-Range Theoretical Deduction proposed by Fawcett (2000). She suggested that a theoretical model provide the structure. Its concepts and proposition cannot be tested directly and cannot be empirically measurable. More concrete and specific concepts and propositions, in particular phenomena, have to be derived from a theoretical model where a middle range theory must be formulated. The concepts must be operationally defined and empirically tested. Hypotheses must be derived from the proposition of the theory. Concepts needed to test the direction and strength of the relationship between concepts. Each concept is linked to empirical indicators which provide a method to measure the variable. An explicit conceptual-theoretical-empirical structure, by using medication adherence model, is developed to test a hypothesized causal model of medication adherence behavior in the elderly with hypertension presented as Figure 2.2.

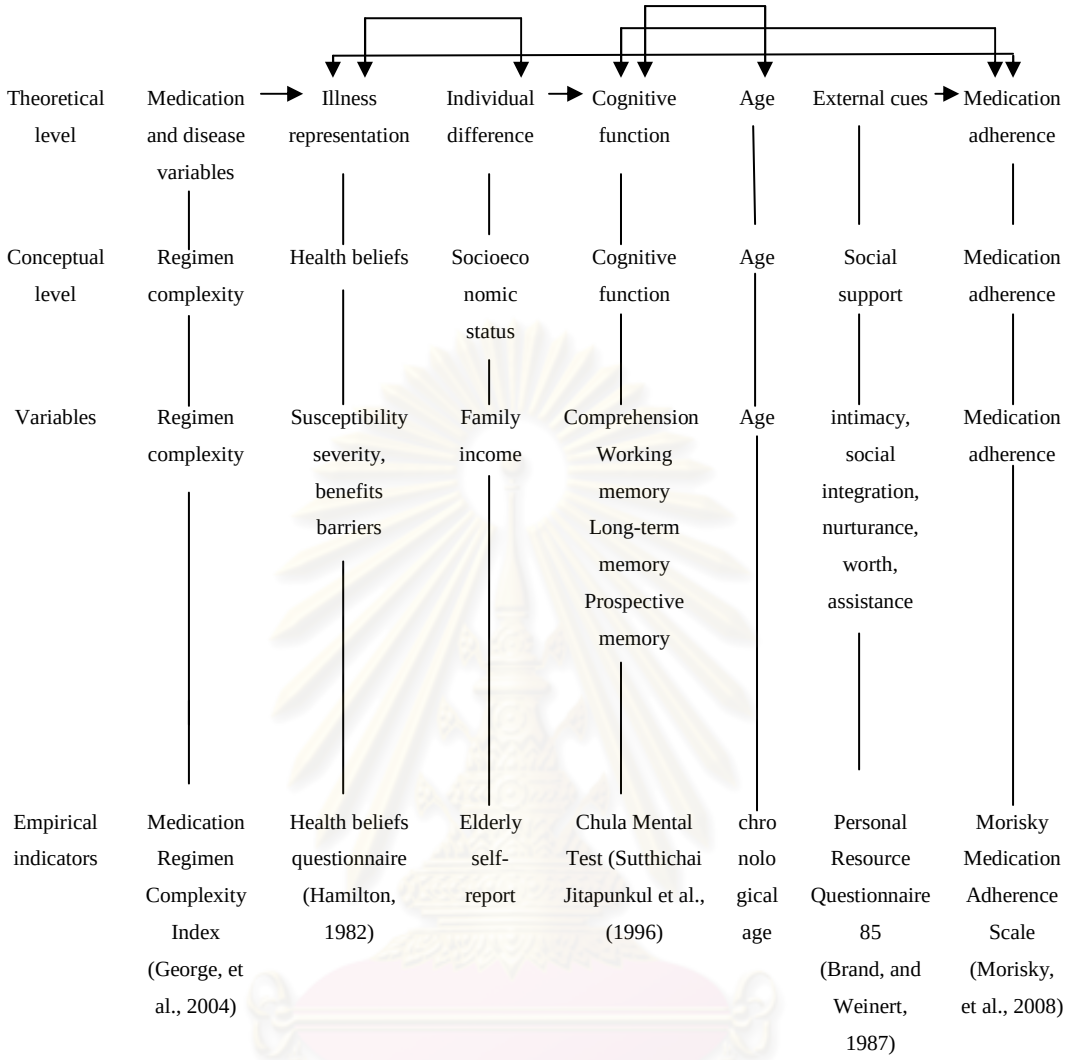


Figure 2.2 Hierarchy of Middle-Range Theoretical Deduction (Fawcett, 2000)

Therefore, a hypothesized causal model of medication adherence among the elderly with hypertension is presented in Figure 2.3.

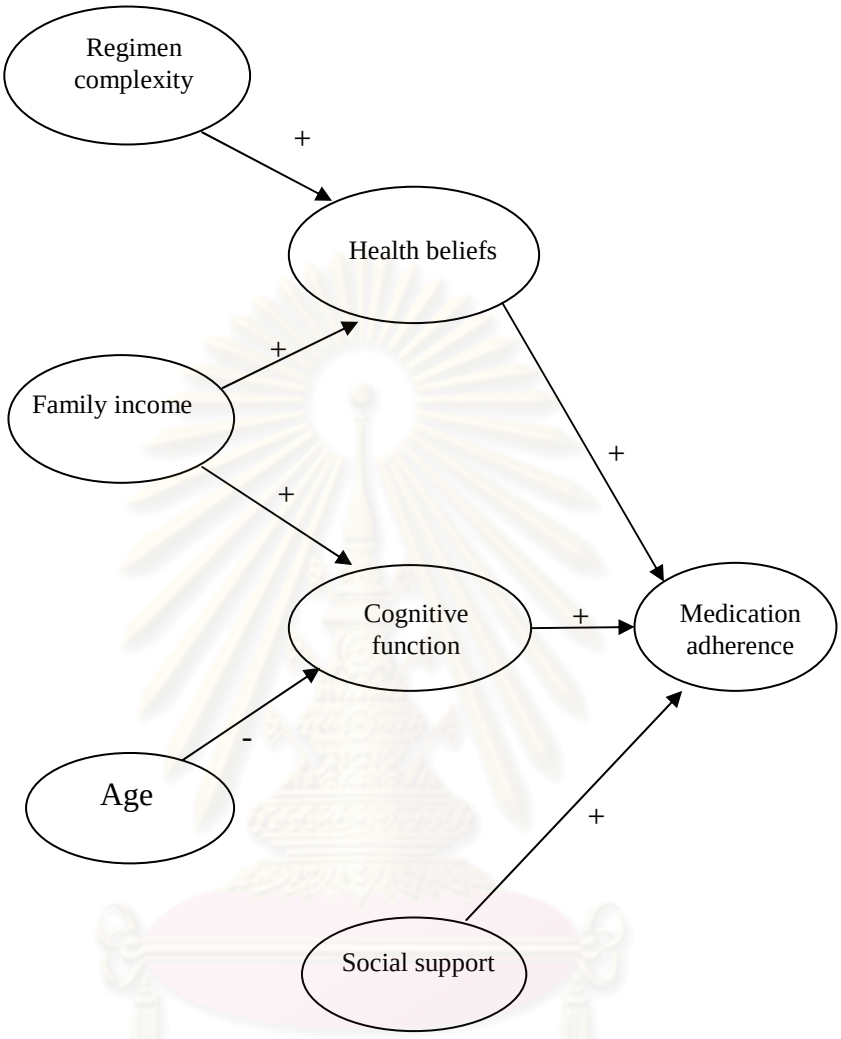


Figure 2.3 A hypothesized causal model of medication adherence behavior in the elderly with hypertension

4. Factors related to medication adherence in the elderly

4.1 Health Beliefs

Health beliefs are an important factor for understanding the psychosocial factors that contribute to medication adherence (Becker and Maiman, 1975). Health beliefs for medication adherence have been defined as a set of perceptions an individual holds about susceptibility to disease, the severity of disease, the benefits

and barriers on taking medication (Becker and Maiman, 1975). The patients have multiple reasons based on their health beliefs for why they choose to adherence to medication. Previous studies suggested that the elderly who perceived greater benefits, higher necessity (i.e the patient's belief that he/she needs to take the medication) and fewer concerns about their prescribed drugs have better self-reported medication adherence.

Brown and Segal (1996) were examined the relationships between health beliefs and the use of both prescribed medication and home remedies among a group of African American and White American hypertensive. The samples were 300 individuals, mean age was 60 years who had been medically diagnosed as having hypertension and had been prescribed at least one antihypertensive medication. Using the health belief model (HBM) as the theoretical framework. Perceived adverse effects of medication (OR = 1.43, $p<.01$) and perceived benefits of home remedies (OR = 1.18, $p<.04$) were significantly associated with compliance with antihypertensive medication. Multivariate logistic regression analyses indicated that age, costs of prescribed mediation and benefits of use of home remedies predicted compliance with antihypertensive mediation.

Huang (1996) was examined the medication-taking behavior of older adults living in the communities. Factors influencing their medication-taking behavior were also explored. Samples were 401 persons and age over 65 years. The results revealed correlations between major variables that correlation coefficient is .2488 ($p<.001$) between health belief and medication taking behavior, .3035 ($p<.001$) between medication knowledge and medication-taking behavior, .2708 ($p<.001$) between health belief and medication knowledge. These results showed that the health beliefs

of the elderly have a positive correlation with both medication knowledge and medication-taking behavior.

Arnsten, Gelfand, and Singer (1997) were conducted a case-control study with the elderly who received anticoagulation therapy. Forty-three patients who had been discharged from the Anticoagulation Therapy Unit (ATU) for noncompliance (cases) and 89 randomly selected compliant ATU controls were interviewed. Scripted telephone interviews assessed perceived health benefits of and barriers to the therapy. Assessment of these health beliefs indicated the elderly who felt less burdened by taking warfarin and perceived more health benefits were significantly more likely to adhere to their prescribed medication regimen based on self-report.

Horne and Weinman (1999) were measured the elderly personal beliefs about the necessity of their prescribed medication and their concerns about taking it, and evaluated the relationship between beliefs and self-reported medication adherence among those with chronic illness. Approximately 89% of the subjects believed their prescribed medicines were essential for maintaining optimal health. Conversely, over 36% reported strong concerns about the possible adverse effects of using the drugs. Comparisons of mean scores for the necessity of medication therapy across different illness groups found the elderly who were adherent to their medication regimens perceived significantly greater benefits of their medicines than potential adverse effects. The elderly beliefs about their medication efficacy were the strongest predictor, explaining 19% of the variance in self-reported adherence.

Sappok et al. (2001) were assessed the rate of and predictors for compliance with secondary stroke prevention 1 year after cerebral ischemia and to identify reasons for noncompliance. The 386 patients could finally be evaluated. Of the

patients, 87.6% were still on antithrombotic medication, and 70.2% were treated with the same agent prescribed on discharge. Of the patients with hypertension, diabetes, and hyperlipidemia, 90.8%, 84.9%, and 70.2% were still treated for their respective risk factors. Logistic regression analyses revealed age (OR 1.03, 95% CI 1.00 to 1.06), stroke severity on admission (OR 1.09, 95% CI 1.00 to 1.20), and cardioembolic cause (OR 4.13, 95% CI 1.23 to 13.83) as independent predictors of compliance.

Pattama Surit (2001) was studied the effects of social support, health beliefs on self-care behaviors of elderly Thai persons with diabetes. A sample of 85 subjects participated in this study. The findings found a significant relationship between overall health beliefs and self-care behaviors (diet, exercise, oral medication, blood glucose monitoring, hygiene and foot care, and complication management) (p<.001) the findings supported that elderly Thai with diabetes who had a high level of overall health beliefs had higher self-care behavior than those who had a low level of overall health beliefs. Moreover, overall health beliefs were found to be the best predictor for self-care behaviors.

Egede (2003) was determined the effectiveness of physician advice on hypertension-related lifestyle modification in individuals with diabetes. Data on adults with one or more physician visit in the 1998 National Health Interview Survey (NHIS) were analyzed (diabetes, n = 1,609; no diabetes, n = 19,672). Controlling for covariates, individuals with diabetes were more likely to receive advice (odds ratio [OR] 1.94 for weight loss, 1.99 for exercise, and 2.16 for medications). Adherence was more likely in individuals with diabetes (OR 1.40 for losing weight and 2.16 for taking medications). Adherence in people with diabetes did not differ by sex or

race/ethnicity. Subjects 18–44 years old were least likely to report losing weight (OR .15) or taking medications (.31) compared with subjects ≥65 years old.

Li (2004) was studied cultural factors related to medication compliance in Chinese immigrants with hypertension. A convenience samples were 200 Chinese immigrants with hypertension. The finding indicted that the sample mean age was 70.6 (±10.3). Four factors were statistically significant with non-medication adherence: Lower Perceived Susceptibility in General [OR=3.77(95% CI 1.19, 12.01)]; Higher perceived benefit of Chinese herbs [OR=2.21(95% CI 1.02, 4.81)]; Lower Perceived Benefits of Western Medications for Hypertension [OR=2.78 (95% CI 1.23, 6.84)]; and Longer Length of Stay in the US [OR=2.48 (95% CI 1.12, 5.50)].

Aspects of illness perception were found to be associated with compliance. Higher emotional response to illness was related to poorer compliance (mean difference .23 (.07–.38), p=.004). Patients who had lower consequence perceptions had higher compliance (mean difference .18 (.05–.31), p=.009). Lower personal control beliefs were associated with higher compliance (mean difference .28 (.14–.42), p<.001), whereas high-treatment control beliefs were associated with high compliance (mean difference .16 (.03–.28), p=.015). When a distinction was made between control and cure in treatment beliefs, compliance was found to be associated with a strong belief in the ability of treatment to cure hypertension rather than control it (mean difference .27 (.08–.47), p=.006).

Ross et al. (2004) were described hypertensive patients' beliefs about their illness and medication using the self-regulatory model and investigate whether these beliefs influence compliance with antihypertensive medication. They recruited 514 patients from a secondary care hypertension clinic and shared care scheme. The mean

age of patient was 60 years. Analysis shows that patients who believe in the necessity of medication are more likely to be compliant (odds ratio (OR)) 3.06 (95% CI 1.74-5.38), $p<.001$). Other important predictive factors in this population are age (OR 4.82 (2.85-8.15), $p<.001$), emotional response to illness (OR 0.65 (.47-.90), $p=.01$) and belief in personal ability to control illness (OR 0.59 (.40-.89), $p=.01$). Beliefs about illness and about medicines are interconnected; aspects that are not directly related to compliance influence it indirectly.

Grégoire et al. (2006) were determined noncompliance among patients those who were persistent with therapy. A prospective cohort study was conducted, in which individuals prescribed a new antihypertensive monotherapy were identified through a network of 173 pharmacies. Of 509 eligible participants, 118 (23.2%) reported noncompliance with their drug treatment. Noncompliance was significantly associated with the use of angiotensin-converting enzyme inhibitors (adjusted OR [AOR] 3.0; 95% CI 1.17 to 7.92) compared with the angiotensin II receptor blocker losartan, and with the belief that hypertension is not a risk factor for cardiovascular diseases (AOR 2.0; 95% CI 1.21 to 3.33). On the other hand, noncompliance was inversely associated with the use of more than four pills of medication per day (AOR .3; 95% CI 0.15 to 0.64).

Lagi et al. (2006) were investigated pharmacological compliance in hypertensive patients. Compliance was evaluated in 285 patients. The mean age was 72±12 years. Compliance was evaluated at a series of follow-up at 3 month intervals and at 36 months of observation. The results found that compliance at 36 months was good or sufficient in 56% of patients, but differed according to hypertensive and drug status. Compliance was better in patients with a higher level vs lower level of

hypertension severity. Specifically, compliance was better in hypertensive with co-morbidity (76%) than in hypertensive without co-morbidity (37%) or hypertensive with risk factors (65%). Moreover, compliance was better in patients with a more complex therapeutic regimen.

Rattan Riounin (2007) was described health beliefs and disease control behaviors of persons with hypertension in Primary Care Unit of Li hospital, Lumphun province. The samples were selected by purposive sampling and consisted of 185 hypertensive patients. The results revealed that the health beliefs of hypertensive patients were at a high level and the perceived barriers was at a low level. Overall score of disease control behaviors were at a high level. The subscales of diet control behaviors, drugs used behaviors, stress management behaviors and follow up behaviors were at a high level but the exercises behaviors subscale was at a middle level, and correlation between health beliefs and disease control behaviors was to be positively statistically significant at an average level ($r=.362$, $p<.05$).

Sumalee Wungthanakorn, Chutima Pratidumrongkul, and Pranee Khomchan (2008) were studied the medication taking behaviors of hypertensive patient. The results revealed that the perceived severity, benefits, and barriers taken together significantly affected medication taking behaviors, which accounted for 16% of explained variance in medication taking behaviors ($R^2=.16$, $F=5.518$, $p<.01$). Perceived barriers was the only significant predictors of medication taking behaviors of hypertensive patients ($\beta = -.347$, $t = -3.425$, $p<.05$).

Edo (2009) was studied factors that affected compliance with hypertension medications and lifestyle modification strategies in a sample of 102 hypertensive persons. Individual perception of the benefits and risks of hypertension treatment as

well as cues to action were found to be significant determinants of compliance behavior. Perception of benefits demonstrated a significant relationship with treatment compliance (r=.46, p<.0001) indicating that patients who perceived benefits of taking medications and effecting lifestyle modifications were likely to be compliance with their treatment. Perception of risk demonstrated a significant relationship with treatment compliance (r=.30, p=.002). This relationship implies that patients who perceived risk of developing complications of hypertension were likely to comply with their treatment. A significant relationship were also found between treatment compliance and internal factor (r=.37, p=.001) and between cues to action and treatment compliance (r=.45, p<.0001).

Atulomah (2010) was studied treatment adherence and risk of non-compliance among hypertensive at a Teaching Hospital in Ogun state, southwest Nigeria. One hundred and three participants were enrolled for the study by systematic random selection. Results indicated that 56 males and 47 females with the mean age 62.6±12.69 years participated in the study. Perception of severity of hypertension complications from poor treatment and threat to life positively correlated with treatment (r=.46, p<.0001). There was no significant difference in measures of adherence to treatment and perception of risk of poor treatment recorded between males and females.

Park et al. (2010) were evaluated the factors affecting medication adherence in geriatric diabetic patients treated at private clinics and tertiary hospitals and compared the factors affecting medication adherence between these two patient groups. The samples included 108 diabetic patients older than 65 years treated at one tertiary hospital and 157 patients older than 65 years treated at two private clinics. The results

showed that drug storage and self-efficacy were factors affecting adherence to medication in tertiary hospital patients (p<0.05). The adherence was high in cases of proper drug storage (odds ratio [OR], 5.401) and in cases with high self-efficacy (OR, 13.114). In private clinic patients, financial level (p<.05), recognition of the seriousness of diabetes complications (p<.05) and self-efficacy (p<.01) were associated with medication adherence. The medication adherence was significantly lower in patients whose financial state were moderate than those with lower (OR, 0.410), and medication adherence was significantly higher in patients who had higher perceived severity (OR, 2.936) and in patients with higher self-efficacy (OR, 4.040).

It can be concluded that health beliefs has a positive direct effect on medication adherence. The elderly that perceive susceptible to the complication of disease, perceived severity of disease, perceived medications benefits and necessity, and perceived low barriers to take medication, could adherence to the medication regimens. Therefore, the health beliefs are an important factor for predicting medication adherence behavior in the elderly with hypertension. It is included in the proposed model.

4.2 Cognitive function

As Park (1992) notes, accurate medication adherence has a number of cognitive components, including (1) the comprehension of the medication instructions, (2) organization of the individual medication instructions into a medication plan, that is, a temporal sequence that integrates multiple medications and doses, (3) retention of the medication plan, and (4) remembering to take the medication at the planned time. Therefore, cognition refers to the process, by which information is acquired, stored, shared, and used. Intellectual task such as thinking,

remembering, perceiving, communicating, calculating, and problem solving are all examples of cognitive function (Bunten, 2001).

Cognitive function also plays an important role in adherence, especially for the elderly (Park, 1994). Adequate cognitive function is required to understand the illness, its treatment, and the purpose of taking medication. Patients must received information about their medication to comprehend and remember what the medication regimes require from them, when to take medication, what kind of side effects can be expected, and how to deal with them (Van Vliet et al., 2006). Many reviews and research studies indicate that cognitive impairment and poor understanding of the purpose of the drug often leads to forgetfulness and medication nonadherence (Jeste et al., 2003; Okuno et al., 2001; Salas et al., 2001).

Gray, Mahoney, and Blough (2001) were assessed prevalence and risk factors for medication under- and over adherence in a two-week period following hospital discharge in adults 65 years. Participants were one hundred forty-seven older participants taking three or more medications who were hospitalized for medical illness, received home nursing after discharge, and completed the two-week interview. Results showed that Forty-five (30.6%) participants were under adherent and 27 (18.4%) participants were over adherent with at least one medication. In a multivariate model, under adherence was predicted by poor cognition (OR 2.5; 95% CI 1.02 to 6.10) and higher medication use (OR 1.16; 95% CI 1.03 to 1.31, for each 1-unit increase in number of medications). Both poor cognition and low education were significantly associated with over adherence in univariate analysis; however, neither variable was significant once included in the multivariate model.

Okuno et al. (2001) were investigated the association between cognitive impairment and compliance with prescribed medications among functionally independent Japanese elderly in the community. The subjects of this study were 220 elderly persons aged 60 years and over, who lived in the community. Results indicated that poor compliance was associated with the subjects who had a lower education level, had lower Mini-Mental State Examination scores, had concern about taking drugs, who intentionally self-selected (intentional noncompliance) prescribed drugs, had a poor relationship with a physician, who did not have one dose package, and those who did not use a medical calendar. In multiple logistic regression analyses, intentional noncompliance (OR 19.65, 95%, CI 9.22-41.92), cognitive impairment (MMSE≤23; OR 2.94, 95%, CI 1.32-6.58), and a poor relationship with a physician (OR 6.24, 95%, CI 1.55-25.20) were independent predictors of poor compliance for elderly in the community. They found that cognitive impairment was one of the predictors for poor compliance among the elderly who are functionally independent in the community.

Salas et al. (2001) were studied compliance with antihypertensive treatment in elderly patients with cognitive impairment. They followed-up on 1,573 patients (mean age, 68 years) during an average period of 1,609 days. Results showed that the risk of noncompliance in cognitively impaired elderly subjects was 2.0 (95%, CI 1.4-2.8) after adjustment for age, sex, education, income, living situation, and smoking. Stratification by living situation showed that the risk increase predominantly occurred in those who lived alone (OR 2.9, 95%, CI 1.2-7.5). Cognitive function is an independent predictor of compliance with antihypertensive drugs in elderly patients who are living alone.

Jeste et al. (2003) were evaluated predictors of medication adherence among middle-aged and older outpatients with schizophrenia. Participants included 110 outpatients with schizophrenia or schizoaffective disorder. The results found that age, drugs attitude score, and dementia rating scores were all correlated with medication management performance. In a stepwise regression analysis, only dementia rating scores were predictive of medication management performance. Among the dementia rating subscales, conceptualization and memory were the best statistical predictors of medication management performance. This study concluded that cognitive functions, especially conceptualization and memory, were the strongest patient-related predictors of his or her ability to manage medications, over and above the effects of age, gender, education level, symptom severity, and attitudes toward medications. These results suggest a need for intervention studies focused on improving or at least compensating for, specific cognitive deficits such as those in memory and conceptualization among patients with schizophrenia in order to improve their ability to manage medications.

Feldman (2003) was studied medication adherence in the elderly that contributions of cognitive function and health beliefs. The samples were ninety-five volunteers aged 65 and over. The results indicated that better adherence was associated with fewer medications taken, and poorer scores on measures of executive functioning ($r= -.574$, $p<.01$). Health beliefs were not predictive of adherence.

Mortimer (2003) was studied the relationship of memory to electronically monitored medication adherence. The 101 subjects and age more than 62 years were consented with a self-reported diagnosis of diabetes, hypertension, or arthritis who were being treated with an oral medication. The findings reveal modest correlations

between delayed memory and medication adherence (r=.157, $p<.05$). Using summary variables for immediate, delayed, working, and prospective memory to predict adherence using regression, the beta coefficients were small, ill fitting, and explained less than 3 percent of the variance in medication adherence.

Insel and Cole (2005) were investigation tested the effect of an intervention to improve remembering to take medications and tracking if medications were taken as intended. Twenty-seven elderly (age range 67-89 years, mean = 78 years) all self-managing prescribed medications had one medication electronically monitored for 8 weeks pre-intervention and then 8 weeks post-intervention. The percentage of days the correct number of doses was taken increased from a mean of 64.5% to that of 78%. With the use of Wilcoxon's signed ranks test, this improvement in adherence is significant. When participants with dementia or mild cognitive impairment were eliminated from the analysis (n=6), the intervention continued to improve adherence (70.6% to 86%), suggesting that many older adults have the potential to improve adherence through individualized implementation of memory strategies.

Insel et al. (2006) were investigated the association between cognitive processes and medication adherence among community-dwelling older adults. Ninety-five participants (mean 78 years) completed a battery of cognitive assessments including measures of executive function, working memory, cued recall, and recognition memory. Medication adherence was examined over 8 weeks for one prescribed medicine by use of an electronic medication-monitoring cap. In a simultaneous regression, the composite of executive function and working memory tasks was the only significant predictor (ß =.44, $p<.01$). Findings suggest that assessments of executive function and working memory can be used to identify

community-dwelling older adults who may be at risk for failure to take medicines as prescribed.

Schutte (2006) was studied medication adherence in the elderly. She examined neuropsychological functioning and task specific interviews that tapped both memory and executive functioning as predictors of medication adherence over a two week period of time as measured by electronic monitoring. Participants (n=30) were 60 years of age and older and were cognitively intact as measured by the Mini Mental State Exam (MMSE). Age, education, reading ability, total number of medication prescribed, and socio economic status were not significantly related to medication adherence. Retrospective memory was found to significantly correlate with medication adherence ($r = .415$, $p < .05$). Executive functioning and task specific measures were not significantly related to medication adherence.

Barclay et al. (2007) were studied the relationship between health beliefs, self-efficacy, neurocognitive status, and highly active antiretroviral therapy adherence. The results found the rate of poor adherence was twice as high among younger participants than with older participants (68% and 33%, respectively). Results of binary logistic regression revealed that low self-efficacy and lack of perceived treatment utility predicted poor adherence among younger individuals, whereas decreased levels of neurocognitive functioning remained the sole predictor of poor adherence among older participants. The study concluded that data support components of the health beliefs model in predicting medication adherence among younger HIV-positive individuals. However, risk of adherence failure in those ages 50 years and older appears most related to neurocognitive status.

Stoehr et al. (2008) were explored associations between two specific cognitive domains and aspects of medication management among elderly primary care patients. The analytic sample included 343 patients (mean age 77.5 years). Higher score on the verbal memory test were independently associated with successful setting up a medication schedule, after adjusting for covariates. Higher scores on the executive function test were associated with treatment adherence. In this sample of elderly patients assessed for medication management, independent cognitive processes were associated with the ability to set up a medication schedule and overall adherence to prescriptions. Better verbal memory functioning was strongly and independently associated with setting up a medication schedule, while better executive functioning was strongly and independently associated with being fully adherent to prescription instructions. Deficits in either cognitive ability could result in medication error due to nonadherence.

From literature reviews it is found that cognitive function is a significant factor positively related to medication adherence in the elderly. Therefore, cognitive function is included in the proposed model.

4.3 Social support

Social support defined as the perceived caring, esteem, and assistance that people received from others. Support can come from spouse, family members, friends, neighbors, colleagues, and health professionals (Haber, 2003). Park and Jones (1997) are systematically investigating the effects of social support in their laboratory and believed that it is more likely that it operates as a form of collaborative cognition, providing event-based prospective cues to take medication. Many studies have confirmed the relationship between social support and medication adherence in the

elderly (Starks, 1991; Anderson et al., 2000; Barat et al., 2001; Sales et al., 2001; Supaporn Naewbood, 2005).

Starks (1991) was investigated the relationship between compliance with prescribed medication regimens among elderly hypertensive clients and their social support. The sample consisted of subjects from a community health facility in the San Joaquin Valley who were 60 years of age or older. Thirty persons known to have hypertension for at least 6 months, and who had individual treatment plans were assigned to each group. The results indicated a significant relationship between social support and compliance.

Salas et al. (2001) were studied compliance with antihypertensive treatment in elderly patients with cognitive impairment. The participants were 1,979 residents ≥ 55 years old. They used pharmacy record to assess non-adherence with antihypertensive drugs. For those with cognitive impairment who lived alone, the risk for poor adherence was significantly increased (OR= 2.9, 95% CI 1.2 to 7.5). Similarly, living alone significantly predicted global self-reported medication poor adherence in women with cardiac disease who were age 60 or older (parameter estimate= -.167, p= .05)

Kitchie (2003) was tested the relationship among the variables that comprise place of resident, social network, and social support as they influence rural elder's adherence to medication regimens taken for chronic illness management. A sample of 140 older adults was chosen from three countries in New York State. The correlation between the total social network and medication adherence was statistically significant (r =-.262, p<.002). There was a statistically significant correlation between

the total medication adherence and the tangible support items of having someone to take the subject to the doctors if needed (r = -.225, *p*= 0.009).

Byrd (2004) was explored motivation to be healthy, perceived behavioral control, social support, and depressive symptoms as possible predictors of self-reported adherence. Data were collected from 97 African American (AA) and 71 Caucasian American (CA) low-income hypertensive patients recruited from a primary care clinic in Northeast Florida. The mean age for all participants was 59.59 years. The results indicated that among AA patients, levels of perceived social support from family was significantly and positively correlated with dietary adherence scores (r=.242, *p*=.017), Morisky medication adherence scores (r=.241, *p*=.017), and general medication adherence scores (r=.260, *p*=.010). Also, levels of perceived social support from significant others was significantly and positively correlated with Morisky medication adherence scores (r=.231, *p*=.023). Finally, levels of perceived social support from friends was significantly and positively correlated with exercise adherence scores (r=.266, *p*=.008). Among CA patients, levels of perceived social support from family, friends, and significant others were each significantly and positively correlated with both Morisky medication adherence scores (respectively: r=.301, *p*=.011; r=.511, *p*<.001; r=.337, *p*=.004) and general medication adherence scores (respectively: r=.410, *p*<.001; r=.507, *p*<.001; r=.439, *p*<.001).

Supaporn Naewbood (2005) was examined factors related to medication adherence among persons with hypertension. The samples were 187 patients, mean age 63.4 year. The results revealed that about 87.2% of hypertensive patients had good medication adherence (>80%) whereas 12.8% had poor medication adherence (<80%). The factors significantly related to medication adherence were gender (*p*<

.05), side effect (p<.05), knowledge of hypertension and medication use (p<.01), and social support (p<.01). The factors predicting medication adherence, with could be predicted at 19.7% were knowledge of hypertension and medication use, and education level.

Voils et al. (2005) were examined whether social support and locus of control (LOC), either individually or jointly, would be associated with subsequent self-reported medication adherence and treatment barriers in a sample of depressed elderly patients. A group of 85 elderly patients with major depression was enrolled in the Mental Health Clinical Research Center for the Study of Depression in Later Life at Duke University and treated with a standardized algorithm. The results showed that increasing subjective, instrumental social support and non-family interaction were associated with greater adherence among patients high in internal LOC but not among patients low in internal LOC. Less instrumental social support was associated with more treatment barriers among patients low in internal LOC but not among patients high in internal LOC. The relationship between social support and antidepressant medication adherence is moderated by beliefs about control over one's illness.

Johnson et al. (2009) were examined two antiretroviral medication adherence in older adults living with HIV/AIDS. Two hundred and forty-four HIV-positive adults 50-plus years of age were recruited through AIDS service organizations in Ohio and New York. Participants completed a neuropsychological battery and an audio computer-assisted self-interview. FIML SEM analyses revealed that neuropsychological functioning was not associated with adherence. Fit indices supported a stress and coping model, with negative affect mediating the effects of social support and maladaptive coping on ART adherence. Results were consistent

with stress and coping models and suggest that interventions intending to increase adherence to ART in HIV-infected older adults may be more effective if they address negative affect and enhance adaptive coping and social support.

In summary, according to Park and Jones (1997) and most literature it was found that social support has a positive direct effect on medication adherence in the elderly. Therefore, social support is included in the hypothesized model.

4.4 Regimen complexity and health beliefs

Regimen complexity can be defined by multiple characteristics of the prescribed regimen, including at least the number of different drugs in the regimen, the number of daily doses, the number of dosage units per dose, the total number of daily doses and associations between dose and diet (Stone et al., 2001). Comorbid conditions are present in as many as 60% of older populations (Van Den Akker et al., 1998; Fried et al., 1999). These comorbidities required additional medications and involve several drugs to prescribe. The elderly with multiple medications perceived that their illness is severe and that they medications will benefit for them.

Sharkness and Snow (1992) were assessed 125 veterans' understanding of hypertension, hypertension history, comorbidities, and pharmacy refills for hypertension medications. Though over 70% viewed hypertension as a symptomatic condition, symptoms were not significantly associated with pharmacy compliance. In univariate analyses, variables significantly associated with better pharmacy compliance were perceived lifetime treatment of hypertension, greater than 5-year history of medication use, perceived cause of hypertension other than diet, use of more than one hypertension drug, lack of reported departure from the prescribed medication regimen, absence of drug abuse history, and race (Caucasian). In

multivariate analyses, the best predictive model of pharmacy compliance included three variables: drug abuse history, perceived cause of hypertension, and pattern of medication use. They found that elderly patients with more than one chronic illness, requiring the use of more than one drug, were more likely to believe themselves in need of treatment, and therefore, were more adherence than those needing only one drug.

Monane et al. (1994) were studied patterns of medication compliance, they conducted a retrospective follow-up of 7247 outpatients aged 65 to 99 years newly prescribed digoxin between 1981 and 1991, with the use of the complete prescription claims file of the New Jersey Medicaid program. Noncompliance was measured in terms of the number of days during the 12-month period after an initial digoxin prescription in which no congestive heart failure medication was available to the patient. Results indicated that patients started on a regimen of digoxin were without digoxin or any other common alternative congestive heart failure drug for an average of 111 of the 365 days of follow-up. Only 10% of the population filled enough prescriptions to have daily congestive heart failure medication available for the entire year of follow-up. Compliance rates were higher in patients over 85 years of age, women, those taking multiple medications, and those with hospital or nursing home stays before the initiation of therapy.

Treharne et al. (2004) were investigated predictors of medication adherence among 85 outpatients with rheumatoid arthritis (RA) (75% women; mean age 58.88 years; mean disease duration 10.29 years). The results demonstrated that holding stronger beliefs about the necessity of medications, and believing that medications are generally not overused, predicted higher reported adherence to RA medications (over

and above relevant demographic and medical factors). Adherence was also higher in people taking higher numbers of medications, those who perceived their medications as being more necessary and those who perceived that medications are not generally overused.

Neame and Hammond (2005) were investigated beliefs about medications held by people with rheumatoid arthritis (RA), what factors are related to these specific medication beliefs, and whether these beliefs influence adherence. Questionnaires were mailed to 600 out-patients with RA. Most (74.3%) respondents agreed or strongly agreed that their arthritis medications are necessary for their health. However, 47.4% were concerned about potential adverse consequences. The overall necessity score (mean 19.2, SD 3.13) was higher than the concerns score (mean 15.84, SD 3.53; $p<0.001$). Greater disability was associated with higher necessity scores (r = .36; $p<0.001$). Greater helplessness correlated with higher concerns scores (r =.49; $p<0.001$). Concerns scores for non-adherent participants (mean 17.88, SD 3.29) were higher than for the adherent group (mean 15.64, SD 3.51; $p=0.002$). They also found the association between belief in the necessity of medications and number of medication taken (r=.17, $p=0.01$). Belief in the necessity of medication also positively correlated with the number of medication taken.

Lagi et al. (2006) were investigated pharmacological compliance in hypertensive patients recruited during a 24-month period at the Hypertension Clinic of the S. Maria Nuova Hospital. A total of 367 patients were recruited; 82 were excluded owing to changes in therapeutic schedule or medication necessitated by other medical or surgical disease. Compliance was evaluated in 285 patients, 66% were male; the mean age was 72±12 years. Compliance was evaluated at a series of

follow-ups at 3-month intervals and at 36 months of observation. Compliance at 36 months was good or sufficient in 56% of patients, but differed according to hypertensive and drug status. Compliance was better in patients with a higher level vs lower level of hypertension severity. Specifically, compliance was better in hypertensives with co-morbidity (76%) than in hypertensives without co-morbidity (37%) or hypertensives with risk factors (65%). Moreover, compliance was better in patients with a more complex therapeutic regimen (drug 1 through 3: 47, 59 and 66%). These data demonstrate a relationship between disease severity and compliance, independent of the prescribed therapeutic regimen.

Aikens and Piette (2009) were identified the demographic, psychiatric, and attitudinal predictors of treatment adherence during the maintenance phase of antidepressant treatment. They surveyed 81 primary care patients given maintenance antidepressant medications regarding general adherence, recent missed doses, depression and treatment features, medication beliefs (necessity, concerns, harmfulness, and over prescription), and other variables. Multivariate analysis adjusting for social desirability, depression severity, and treatment duration indicated that an antidepressant-specific "necessity-minus-concerns" composite was strongly associated with both adherence outcomes. Specifically, adherence was highest when necessity exceeded concerns and lowest when concerns exceeded necessity. They also found that perceived medication necessity in diabetic patients tended to be stronger among patients who prescribed a higher number of medications.

The plausible explanation for this relationship is that most of the elderly have more than one chronic disease, and they consequently have multiple medications to take; these come with the complexity of the medication prescribed. The more

complex the medications, the more likely it is for the elderly to perceive that their illness is severe and that they medications will benefits them. Beliefs in the severity of the disease and the benefits of medication make them adhere to the medication regimen. Therefore, it could be indicated that regimen complexity has a positive direct effect on health beliefs and an indirect effect on medication adherence behavior through health beliefs.

4.5 Family income and health beliefs

The Thai elderly reported that they often received income from their children (Knodel et al., 2009). Family income is one of the key influences on medication adherence in old age. Evidence from medication adherence studies indicated that income was associated with drug use (Piette et al., 2006; Rossi et al., 2007), and a significant factors affecting medication adherence in elderly with hypertension (Lin et al., 2007) The elderly with higher family income can easily access health care programs (Al-Ali and Haddad, 2004). They are able to satisfy their basic needs. They have discussions with a physician about their susceptibility to the disease and the benefits of medication. Beliefs in one's susceptibility to the disease and the benefits of medication make them adhere to the medication regimen.

Arcangelo (1991) was studied medication misuse among the elderly and factors associated with incorrect usage. This study was survey research conducted through face to face interviews of 196 subjects aged 65 and over utilizing a questionnaire developed to determine the cause of misuse of prescribed medications. The results showed statistically significant relationship with medication misuse and complexity of the medication regimen, perceived benefit, and satisfaction with the provider. Cost of the medication and knowledge about purpose of the drug were

statistically significant demographic variable. When controlling for demographic variables, the young elderly, males and females, whites, and those with low income had a statistically significant association between complexity and misuse. Young elderly, females, whites, and low income had a statistically significant association with perceived benefit and misuse. Old elderly, male, and white had a statistically significant association with satisfaction with the provider and medication misuse.

Werner (2003) was examined the factors influencing intention to seek a cognitive status evaluation in the presence of memory problems. A convenience sample of 186 community-dwelling adults (mean age=64) were interviewed face-to-face using measures derived from the Health Belief Model. Results indicated that participants' intentions to be examined were higher when presented with scenarios describing family history of Alzheimer's disease (AD). Perceived barriers and cues to action were significant predictors of intention, accounting for 24% of the variance. Greater perceived benefits were associated with younger age, high income, less memory problems, higher social influence, and higher perceived severity. These findings suggest the need to develop effective educational strategies to improve knowledge about AD and decision-making concerning cognitive status examinations.

Al-Ali and Haddad (2004) were studied the effect of health belief model (HBM) in explaining exercise participation among Jordanian myocardial infarction (MI) patients. A convenient sample of 98 MI patients was recruited from four governmental hospitals in northern Jordan. A self-reported questionnaire and structured interview were designed to obtain the needed information. Study results indicated that Jordanian MI patients had a high score in perceived severity and a low score in perceived barriers. Results also showed a significant correlation between

exercise participation and health belief variables and sociodemographics such as age, annual income, level of education, and physician recommendation.

Unson et al. (2005) were examined the effects of socioeconomic status, knowledge and Health Belief Model variables on ever use of hormone therapy and other osteoporosis medications among older African-American women. One-hundred and two African-American women, 60 years old or older, randomly selected from Registers of Voters and a list of participants in educational activities of a university hospital, were interviewed in their homes. The results found that average respondent age was 71.1 years; 47% were current or previous users (ever users) of hormone therapy, and 11% were ever users of other osteoporosis medications. Knowledge of osteoporosis, (OR=1.4), Hormone therapy benefits, (OR=1.63), a hysterectomy (OR = 4.35), and a family history of cancer (OR=4.0) increased the odds of ever using hormone therapy. Perceptions of susceptibility (OR=3.5) and discussion with a physician about osteoporosis (OR=6.4) increased odds of ever using other osteoporosis medications. Socioeconomic status mediated the effects of knowledge of osteoporosis on ever using hormone therapy. Efforts to promote bone health to older African-American women should focus primary efforts to increasing perceptions of susceptibility to fracture and persuading physicians to initiate discussions about fracture prevention with African-American patients before a fracture occurs.

Hong et al. (2007) were examined an urban population's awareness of dietary guidelines to determine whether they perceived them to be necessary, and identified the factors affecting this awareness and perceived necessity. Data were collected via physical examinations and face-to-face interviews. Health indicators were collected from health examinations, and information on individual characteristics, including

awareness, perceived necessity, and dietary status were obtained from the interviews. The subjects' socio-demographic, health and dietary status were examined as potential factors influencing awareness and perceived necessity. The result showed that subjects with lower monthly income had lower perceived necessity at a relatively attenuated significance level ($p<.01$).

Ang, Monahan, and Cronan (2008) were examined whether patients' health beliefs differ between African Americans and whites. In a primary care clinic setting, 691 African Americans and whites with at least a moderately severe degree of osteoarthritis (OA) completed the Arthritis-related Health Belief Instrument. The instrument has 4 scales: perceived benefits of total joint arthroplasty (TJA), perceived barriers to obtaining TJA, perceived severity of arthritis, and perceived susceptibility of arthritis to worsen.

The results indicated that the African American group was younger, had less men, had more participants who reported an annual income<$15,000, and had a higher body mass index than whites. After controlling for confounders, African Americans were almost 50% (OR 0.60, 95% CI 0.42-0.86, $p=.005$) as likely as whites to perceive that TJA is beneficial or helpful for their arthritis. Furthermore, African Americans were 70% (OR 1.7, 95% CI 1.18-2.44, $p=.004$) more likely than whites to recognize barriers (e.g., risky, etc.) to TJA. Race was not associated with either the perceived severity or the perceived susceptibility of arthritis to worsen. Perceived severity of arthritis was associations with annual household income ($p<.005$).

Taken together, these results suggest that family income has a positive direct effect on health beliefs and an indirect effect on medication adherence behavior through health beliefs.

4.6 Family income and cognitive function

Family income is one of the key influences on cognitive function in old age. The elderly with higher family income also have higher cognitive status because they have enough money to buy vitamin and food that is useful for cognitive function.

Perkins et al. (1999) were investigated the association between serum antioxidant (vitamins E, C, A, carotenoids, serenium) levels and poor memory performance in an elderly. The sample consisted of 4,809 non-Hispanic White, non-Hispanic Black, and Mexican-American elderly. The results indicated that decrease serum level of vitamin E per unit of cholesterol were consistently associated with increasing levels of poor memory. Non-Hispanic Blacks had the highest prevalence of poor memory, and non-Hispanic Whites had the lowest prevalence of poor memory. Increasing age, decreasing education, annual family income less than $ 20,000, self-report of previous stroke, not having enough food to eat or skipping meals because of no food or memory, and lifetime abstention from alcohol were associated with a higher prevalence of memory impairment.

Lindeman et al. (2000) were examined the associations between serum B12, C and folate concentrations compared to measures of cognitive and affective function. Equal numbers of male and female Hispanics and nonHispanic White (NHW) were randomly sampled. Results indicated that males and Hispanics had lower serum vitamin B12, C, and folate concentrations than females and NHW respectively. The mean age of the participants was 74.1 years. Participants taking a multivitamin supplement (MVT) had higher serum vitamin concentrations than those not taking MVI. There were significant associations between serum folate concentrations and measures of cognitive function, not seen with B12 nor C, nor between any of the

vitamins and affective function. Moreover, they found a significant association between serum folate and vitamin C, and annual household income with participants having an income above poverty level (greater than $ 15,000) having higher vitamin concentration.

Kim (2003) was investigated the relationship of socioeconomic status and food intake to cognitive status of the older population. The subjects of this study consisted of 214 older persons aged 60-84 years. The average cognitive function score of the subjects was 7.9±2.0 (full score was 10.0). Male had a higher cognitive status score than female. There was significant difference cognitive status score and age, education level, pocket money, physical activity and family type. Cognitive status score was positively related to education level, pocket money and physical activity. The subjects who had a higher cognitive status score ate more fish and more meats group and milk and milk products than the subjects that had a lower cognitive status score.

Yen et al. (2004) were studied cognitive impairment and associated risk factors among aged community members. The subjects were 1000 community residents aged 65-75 years in southern Taiwan. Eight hundred and ninety-four (89.4%) subjects completed the interview and questionnaires. The cognitive impairment rate among all subjects was 4.9%. Of those surveyed, 54.9% were male and 45.0% were female, and the average age was 69.37 (SD 2.73) years. Most survey respondents (72.0%) were married, and 68.90% of the subjects did not participate in any social activities in the last 6 months. Females, those who were illiterate or did not attend school, those who had an average family income below US$860 per month, and persons who did not

participate in any social activities had a significantly higher rate of cognitive impairment.

Koster et al. (2005) were examined the association between socioeconomic status and cognitive decline in a community-based cohort of well-functioning older adults and seeks to determine whether this link could be explained by biomedical factors. The subjects were 2574 men and women aged 70 to 79 years. The results showed that adjusted odds ratios were significantly higher in those with low education, low family income, and few assets. Odds ratios ranged from 1.51 to 2.16 in the lowest socioeconomic groups. Additional adjustment for biomedical factors reduced the odds ratios of cognitive decline by an average of 2% for education, 5% for income, and 8% for the number of assets.

Moore et al. (2007) were examined the utility of a self-administered cognitive screening instrument in a group of community-dwelling older adults, and we evaluated correlations of the performance on this measure with demographic variables and specific indicators of self-rated successful aging. They assessed 182 well-educated adults ages 58 to 99 with a modified version of a previously published cognitive screening instrument (Cognitive Assessment Screening Test--Revised; CAST-R), a measure of cognitive complaints (Cognitive Failures Questionnaire; CFQ), and a self-rating of successful aging. We used the SF-36 Physical and Mental Composite Scores as measures of physical and mental health-related functioning. The results indicated that most individuals performed well on the CAST-R; only 7% of participants fell below a previously established cut score for cognitive impairment. CAST-R scores were positively correlated with level of education, income. SF-36 Mental Composite Scores, and a self-rating of successful aging, and negatively

correlated with chronological age. Scores on the CAST-R were not correlated with cognitive complaints (CFQ total score) or SF-36 Physical Composite Scores.

Lee et al. (2008) were examined knowledge and health beliefs associated with cervical cancer screening among Korean American Women. A telephone survey was conducted with 189 Korean American Women in the Chicago area. Age, marital status, income, knowledge of early detection method for cervical cancer, and perceived beliefs about benefits of and barriers to receiving Pap tests were all related to outcomes of ever having a Pap test and having had one in the preceding 3 years. Variables uniquely related to having had the test checkups. Different intervention components are suggested for the groups of Korean American Women who have never had a Pap smear and for those who have not had one in the preceding 3 years, in addition to common intervention strategies that aim to increase knowledge and perceived benefit and to decrease perceived barriers to receiving Pap tests.

Loyola Filho et al. (2008) were evaluated the prevalence of polypharmacy and the influence of income on the association between medication use and cognitive impairment among elderly people. The samples were 1,606 baseline members of the Bambuí cohort of elderly people, which started in 1997, 1,554 took part in the study. The results indicated that the prevalence of polypharmacy (two or more medications consumed) was 70.4% and the number of medications used presented an independent negative association with cognitive impairment (OR=0.72; 95% CI: 0.55;0.95). When this was stratified according to personal income (<2 minimum monthly salaries versus >or= 2 minimum monthly salaries), a negative association was observed between medication use and cognitive impairment among elderly people with lower income

(OR=0.64; 95% CI: 0.48;0.86), but not among those with higher income (OR=1.74; 95% CI: 0.81;3.74).

Chaves et al. (2009) were investigated the association of successful aging with demographic, socioeconomic, and medical characteristics in healthy community-dwelling Brazilian individuals aged 60 years and older (N = 345). Participants were classified as successful (n = 214, 62%) or normal (n = 131, 38%) agers. Successful aging was who exhibit avoidance of disease and disability, maintain of high physical and cognitive function, and sustained engagement in social and productive activities (Row & Kahn, 1997, 1999). The results indicated that successful agers participated in significantly more leisure activities (34%) than did normal agers (21%). Multivariate logistic regression analysis revealed that the number of living children was a risk factor, whereas confidants and family income were protective factors for successful aging.

Badiger, Kamath and Ashalatha (2010) were studied correlates of functional ability among the elderly. The samples were 500 elderly, aged 60 and over selected from both rural and urban areas of Dharwad district. Eight independent variables namely income, marital status, place of residence, age, position of head of the family, education, family composition, gender, employment status were found to have influence on functional ability. Income level had positively significant relation with leisure time activities, physical functioning, cognitive functioning, psychomotor and sensory functioning, behavioral changes, socio-emotional functioning and functional ability. The results obtained by multiple regression revealed that combined effect of all these factors was found to be non significant while these factors found to have

significant influence on functional ability independently. This may be because, individual and combined effect may not be similar.

Lee et al. (2010) were investigated the multiple effects of socioeconomic factors on cognitive impairment in older persons. Subjects were a nationally representative sample (n = 4,155) aged >or=65 years of the Korean Longitudinal Study of Aging. Cognitive status was assessed by the Mini-Mental State Examination. Education, income, wealth and occupation were measured, with low levels on each factor combined to produce an aggregate risk score. Multiple logistic regression was used to analyze the combined effects of socioeconomic risks on cognitive impairment. Results indicated that a socioeconomic risk gradient was evident, with the combined effect being stronger than any one of the risk factors acting alone. Compared with those with no risks, the odds ratios were 2.4 (for 2 socioeconomic risks), 3.4 (3 risks) and 7.7 (4 risks) for men, and 2.8 (2 risks), 3.5 (3 risks) and 5.4 (4 risks) for women. For individual socioeconomic risks, household income and occupation were significant predictors of cognitive impairment in men, whereas in women, all 4 factors were independently associated.

The plausible for explanation of these finding were the elderly with higher income usually have enough money to buy food and vitamins from various sources. Adequate nutrient intake is essential in maintaining cognitive status among the elderly (Kim, 2003). The elderly that have adequate cognitive functioning can understand the illness, its treatment, and the purpose of taking the medication (Van Vliet et al., 2006). They then can adhere to the medication regimen. Therefore, it could be indicated that family income has a positive direct effect on cognitive function and an indirect effect on medication adherence behavior through cognitive function.

4.7 Age and cognitive function

It has been well documented that changes in cognitive functioning are normal with increasing age (Glisky and Glisky, 1999; Lezak, 1995). Change in cognitive function may contribute to forgetting to take medication as prescribed or to not understanding how to properly take medication in older adults (Salthouse, 1991). Several investigators have reported that the elderly have difficulty to understanding or recalling their medication regimen (Schlenk, Dunbar-Jacob and Engberg, 2004).

Park et al. (1992) were assessed the effects of external cognitive supports on medication adherence behaviors of 61 elderly adults by using a sensitive microelectronic monitoring device. The different subjects received (a) no intervention, (b) an organizational chart, (c) an over-the-counter medication organizer, or (d) both the chart and organizer. The young-old subjects showed a high rate of adherence (94%) and were not improved by the addition of the interventions. Old-old subjects had a lower rate of adherence (85%) than young-olds. Omission errors were the most frequent mistakes and were lower in the condition in which subjects received both chart and organizer.

Isaac and Tamblyn (1993) were assessed multiple aspects of cognitive performance, medication planning ability, and medication compliance in a convenience sample of 20 outpatients. Using a test battery that measured mental status, attention or concentration, memory function, and motor strength and dexterity, they found that age was negatively associated with performance, predominantly for test of memory function and motor ability. The average correlations between age and tests of verbal and visual memory were r=-.22 and r=-.53, respectively. The average correlation between age and test of motor ability was r=-.33, with a stronger

relationship between age and motor strength (r=-.42) than between age and dexterity (r=-.24).

Park et al. (1994) were examined the relationship between cognitive function, age, and the ability to adhere to medication regimens. The first section focuses on the effectiveness of complete, explicit instructions that emphasize the importance of organization of medication information on adherence behaviors for both younger and older adults. The second section examines the role of literal versus inferential medication information in normal elderly and in Alzheimer's patients. This research demonstrates that traditional measures of cognitive functioning are correlated with the comprehension of medication information and medication adherence. Finally, the third section presents an overview of research issues m adherence, including the relative effectiveness of two adherence measurement techniques, as well as a discussion of the effects of illness beliefs on adherence and evidence that adherence is not a global behavior but may vary within the individual as a function of certain medications. Directions for future research are suggested.

Okuno et al. (2001) were investigated the association between cognitive impairment and compliance with prescribed medications among functionally independent Japanese elderly in the community. The subjects of this study were 220 elderly persons aged 60 years and over, who lived in the community. The mean age was 75.7 (SD 6.9, range 60-92). Results showed the characteristics of the subjects with regard to intact (MMSE≥24) and impaired cognition (MMSE≤23). The subjects who were cognitive impaired (mean age 78.41 years, SD 7.7) were significant older than who were cognitive intact (mean age 74.66 years, SD 6.53) (p<.001). They also found that age had negative correlation with MMSE points (r=-.18, p<.01).

Sales et al. (2001) were studied compliance with antihypertensive treatment in elderly patients with cognitive impairment. The participants were 1,573 residents ≥ 55 years old (mean age 68 years). They used pharmacy record to assess non-adherence with antihypertensive drugs. Results showed the characteristics of the patients with regard to intact (MMSE>25) and impaired cognition (MMSE≤25). The subjects who were cognitive impaired (mean age 77 years, SD 8) were significant older than who were cognitive intact (mean age 68 years, SD 7) (p<.001).

The literature review suggested that age has a negative direct effect on cognitive function and an indirect effect on medication adherence behavior through cognitive function.

5. Statistic for causal model analysis

Structural equation modeling (SEM) is also known as analysis of covariance structure, or causal modeling (Byrne, 2001). This approach has a more powerful way which takes into account the modeling of interactions, nonlinearities, correlated independents, measurement error, correlated error terms, multiple latent independents each measured by multiple indicators, and one or more latent dependents also each with multiple indicators (Hoyle, 1995; Byrne, 2001). SEM was used to test the theoretical model against the observed dataset. SEM is a more theory-driven approach, and the resulting prediction equations are a more accurate representation of the true causes of variation in the dependent variable than standard regression method (Pedhazur, 1997; Byrne, 2001). There are several steps in structural equation modeling (Hoyle, 1995; Klien, 2005): 1) developing a model based on theory; 2) identification of unique values that can be used for the parameters to be estimated in

the theoretical model; 3) application of various estimation techniques, for example, maximum likelihood; and 4) testing the fit of the model against the data. According to the results, the researcher might 5) modify the measurement model based on theoretical justification; revise the model by adding, deleting, or modifying relationships between latent variables; or use measures indicating lack of fit for specific parts of the model when theoretically justified.

SEM encompasses two major components:1) measurement models and 2) structural path components. Although SEM is capable of testing the measurement model and structural model simultaneously, the recommendation is that the measurement model should be tested separately to detect any inadequate fits prior to testing the full model (Hoyle, 1995; Byrne, 2001; Kline, 2005). This allows the researcher to pinpoint where the model is misspecified (whether the measurement portion or the structural portion). As described by Kline (2005), there are two approaches that can be used: (1) two-step modeling as proposed by Anderson and Gerbing (1998) and (2) four-step modeling as recommended by Mulaik and Millsap (2000). The two-step approach has the advantage of simplicity and does not require at least four indicators per factor (Kline, 2005). Therefore, the two-step modeling approach was implemented for the analysis.

This study used both measurement model and structural path components to build a full latent variable model, or hybrid model. Before the full latent variable model was tested, each measurement model (e.g., health beliefs and social support) included in the full model was tested separately to ensure its fit, by using the two-step approach. This process involved an evaluation of the hypothesis that the indicated measured items or scales reflect the latent constructs. Models for each construct were

defined by permitting each of the relevant test items or scale scores to load on a single factor representing the latent construct that it was hypothesized to measure.

Goodness of fit indices was used as an indicator of model fit. Chi-square tests were used as an index of the significance of the discrepancy between the original (sample) correlation matrix and the (population) correlation matrix estimated from the model. Root Mean Square Error of Approximation (RMSEA) values help to answer the question of how well the model would fit the population covariance matrix if it were available. The lower the discrepancy measured by the RMSEA the better, with an RMSEA of 0.0 indicating a perfect fit (Byrne, 2001). An acceptable value of RMSEA is less than 0.05. For the comparison of models, we used the chi-square statistics. The other criteria for results interpretation was explained chapter 3.

LISREL, AMOS, and EQS are three popular statistical packages for doing SEM. The first two are distributed by SPSS. LISREL popularized SEM in sociology and the social sciences and is still the package of reference in most articles about structural equation modeling.

Summary

After studying previous research, published between 1991 and 2010, concerning medication adherence in the elderly with hypertension, it could be summarized that there are many significant factors (including regimen complexity, family income, age, health beliefs, cognitive function and social support) related to medication adherence behavior in the elderly with hypertension. Various evidences have indicated that health beliefs, cognitive function and social support have a positive direct effect on the medication adherence behavior in the elderly with

hypertension. Moreover, regimen complexity, family income, and age have indirect effect on medication adherence behavior through health beliefs, cognitive function. Based on the literature review, gaps of knowledge in this subject could be evaluated and summarized as shown in the following section.

The results from previous research could only partially explain factors related to medication adherence behavior in the elderly with hypertension because only a few studies have been conducted in the elderly with hypertension. Most of the studies examine the relationship between one or two selected factors and medication adherence behavior. Particularly, they emphasized only the direct effects of the factors on medication adherence behavior. There are also few studies providing an understanding of indirect effects of factors on medication adherence behavior and also few provided the interrelationship among factors related to medication adherence behavior in the elderly with hypertension. The relationship between many significantly related factors and medication adherence behavior and the interrelationship between those factors is still not established. There are problematic conclusions about the relationships and the interrelationship between significant factors and medication adherence behavior in the elderly with hypertension. There are inconsistencies in the results because of using different research methodology, conducted in different settings and populations it might be inappropriate to generalize about existing knowledge in the elderly with hypertension. Furthermore, a basic knowledge relevant to medication adherence behavior in the elderly with hypertension is still not clear. This information is essentially needed to develop the effective nursing intervention for maintaining or improving medication adherence behavior in the elderly with hypertension. The basic knowledge to established useful nursing

intervention and nursing care in order to promote or enhance medication adherence behavior in the elderly with hypertension is still required. Thus, the study of a causal model of medication adherence behavior is important and necessary.

To resolve this problem, the study on the development of a causal model of medication adherence behavior in the elderly with hypertension is organized to study and to examine the direct effects of significant factors including health beliefs, cognitive function and social support on medication adherence behavior, to examine the indirect effect regimen complexity, family income, and age on medication adherence behavior through health beliefs and cognitive function in the elderly with hypertension randomly sampled from various region in Thailand. The study has been conducted to obtain the information in order to gain a better understanding of the relationships and interrelationships between factors and medication adherence behavior in the elderly with hypertension. The findings would play a major role in the development of intervention to promote medication adherence behavior in the elderly with hypertension.

CHAPTER III

METHODOLOGY

This chapter describes the research design and methodologies used in the present study. The research design, population, sampling technique and sample selection, instrumentations, protection of human subjects, data collection, and data analysis procedure are included.

Research design

A descriptive correlational, cross-sectional design was used to test a proposed model of the factors contributing to medication adherence behavior in the elderly with hypertension and to explore the relationships among the variables, including regimen complexity, family income, age, health beliefs, cognitive function, social support, and medication adherence. According to Polit and Hungler (1995), the correlational, cross-sectional design has many advantages. It is appropriate when budgets are limited or when there is less time available. A correlational design allows the investigator to explore the relationships among variables as they naturally occur without any artificial manipulation. Further, a cross-sectional design allows the researcher to collect a large amount of data in an economical way.

However, this design is limited in its ability to explain the causal relationships among variables due to a lack of manipulation or control of the independent variables (Polit and Hungler, 1995). Several independent variables in this study were not amenable to manipulation (i.e. age, cognitive function, and family income). Therefore, a descriptive correlational design was appropriate.

Population and sample

Population of the study: The population for this study was the elderly with hypertension aged 60 years and over who visited the outpatient department of general hospitals in Thailand.

Sample size

The sample size was determined by two criteria. First, the variance of the dependent variable (medication adherence behavior) was taken into account in the following formula: $n = \frac{Z^2\alpha/2\ \sigma^2}{d^2}$ (Daniel, 1991)

where, n = sample size

$Z^2\alpha/2$ = the standard estimate under normal curve at $\alpha = .05$, $\alpha/2 = .025$, $Z = 1.96$

σ^2 = variance of medication adherence in hypertensive patient from the study of Supaporn Naewbood (2005) = 19.7^2

d^2 = error allowed for estimating health behaviors = .1x α,

= $0.1 \times 19.7 = 1.97^2$

By calculation of the following formula:

$$n = \frac{(1.96)^2 \times (19.7)^2}{(1.97)^2} = 384.16$$

The sample size was determined to be 384 persons. Second, in keeping with stringent sample estimates, the minimum sample size in this study was set to be 384. In addition, Hair et al. (1998) suggested that missing data was a common problem in multivariate analysis; the researcher should consider an estimate of the sample survey

and add 10% to arrive at a true population value. Thus, 38 cases were added, bringing the total sample size to 422.

According to Joreskog and Sorbom (1996-2001), there is no definite formula for calculating sample size for a structure equation model (SEM). However, Hair et al. (1998) have suggested that the most appropriate ratio of respondents for each estimated parameter is 10:1. The parameter refers to the relationship between two variables (Hoyle, 1995). A free parameter is a parameter with unknown value, which is to be estimated from data assumed to be non-zero, while a fixed parameter is not estimated from data, and has a value fixed at zero (Hoyle, 1995; MacCallum, 1995). Nunnally (1978) has also suggested 10-20 subjects per item for performing confirmatory factor analysis. Other suggestions exist as well. For example, a good general rule of thumb for factor analysis is 300 cases (Tabachnick and Fidell, 1996) or 50 participants per factor (Pedhazer and Schmelkin, 1991). Furthermore, Comrey and Lee (1992) gave the following guideline for sample size: 50 as very poor, 100 as poor, 300 as good, 500 as very good, and 1,000 as excellent.

In this study, the hypothesized model contained 21 free estimated parameters; thus a sample size of 210 to 420 was the minimum requirement. Therefore, a sample size of 422 elderly individuals with hypertension was appropriate for this study.

Sampling technique

In order to meet the general statistical assumption of SEM, which is a normal distribution of the sample (Munro, 2001), a multi-stage random sampling procedure was used to yield a probability sample of the elderly with hypertension, as illustrated in Figure 3.1

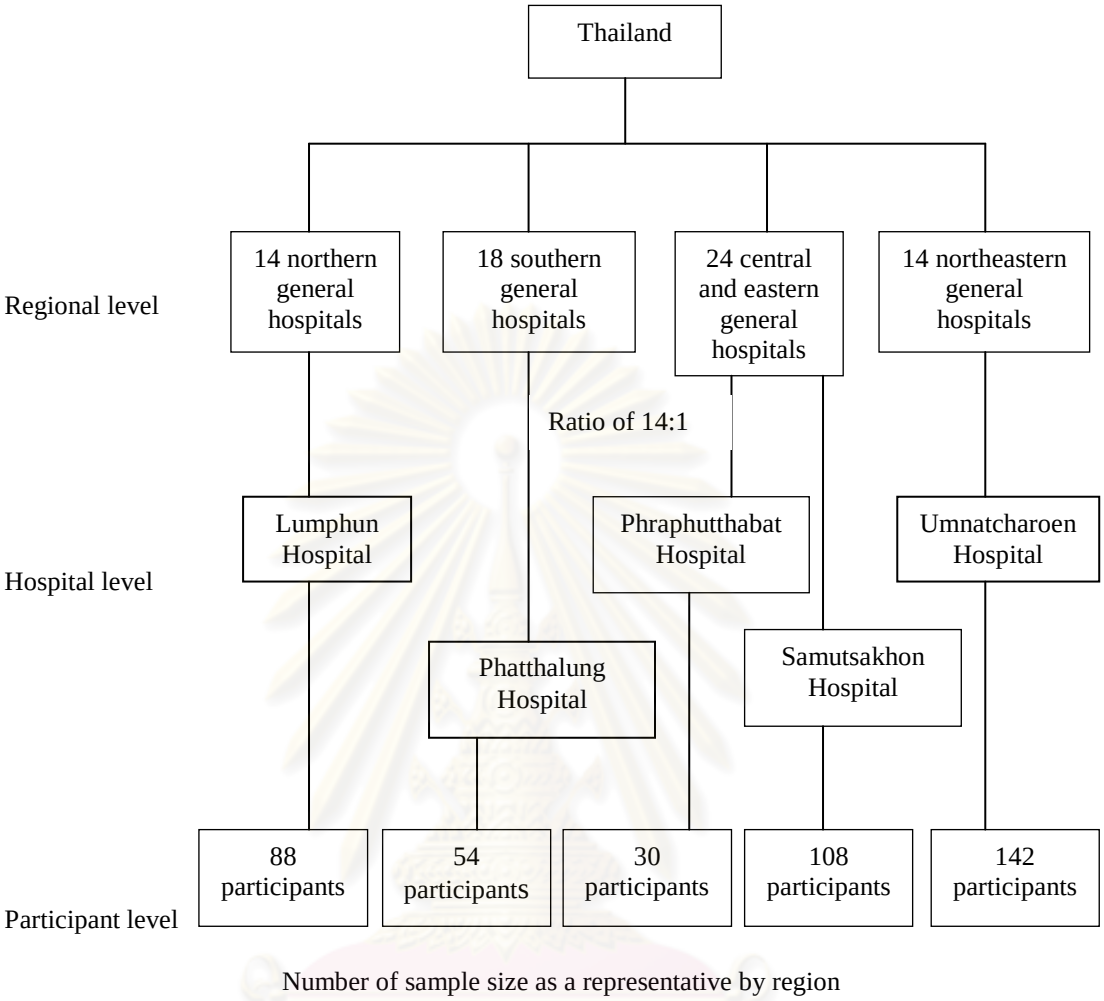


Figure 3.1 The sampling selection with multi-stage random sampling

The first step (The region level): Thailand has been divided in 5 regions by the weather (Thai Meteorological Department, 2007). There are the northern, southern, central, eastern, and northeastern areas. According to the Ministry of Public Heath (2008), there are 70 general hospitals in Thailand and these are divided in 5 regions: the northern (14), southern (18), central (21), eastern (3), and northeastern (14).

The number of the elderly with hypertension in each region was unknown. According to a report on a 2007 survey of the elderly in Thailand (National Statistical

Office, 2007), it was found that the number of the elderly in Thailand was 7,020,950 people. Further, the number of elderly in each region, including the north was 1,467,600 people; in the southern part it was 893, 420 people; in the central and eastern areas it was 2,300,836 people; and in the northeastern area it was 2,359,104 people. Furthermore, it was reported that 31.7% of the elderly have hypertension (National Statistical Office, 2007). The approximate number of elderly with hypertension in Thailand was 2,225,641. Therefore, the approximate number of elderly with hypertension in each region, including the northern part, was 465,229 people, in the south it was 283,241, in the central and eastern region it was 729,365 people, and in the northeast it was 747,835 people. The number of sample size of the elderly with hypertension in each region was calculated with following formula:

$$n_n = \frac{n \times N_n}{N}$$

where, n_n = number of sample size in each region

n = number of population in each region

N_n = total number of sample size in the study

N = total number of population in the study

The results from the calculation of each region are shown in Table 3.1.

Table 3.1 Number of the elderly with hypertension and number of participants in each region

Area of Thailand	Number of general hospitals	Number of elderly population (2007)	Number of elderly with hypertension (31.7%) (2007)	Number of participants
The Northern Region	14	1,467,600	465,229	88
The Southern Region	18	893,420	283,214	54
The Central & Eastern Region	24	2,300,836	729,365	138
The Northeastern Region	14	2,359,104	747,835	142
Total	**70**	**7,020,950**	**2,225,641**	**422**

The second step (the hospital level): The general hospital was randomly selected from each region by the proportion of 14:1. Therefore, each region has one general hospital. Except the central and eastern region have two general hospitals. As the result, the five general hospitals were selected. They were Lumphun Hospital, Phatthalung Hospital, Umnatcharoen Hospital, Phraphutthabat Hospital, and Samutsakhon Hospital. This step was using simple random sampling. The results are shown in Table 3.2

Table 3.2 Name of general hospitals and number of participants in each general hospital

Area of Thailand	Name of general hospitals /Research setting	Number of elderly with hypertension Out-patients (per-year) (2007)	Number of participants
The northern region	Lumphun Hospital	1,340	88
The southern region	Phatthalung Hospital	5,676	54
The central & eastern region	Phraphutthabat Hospital	312	30
	Samutsakhon Hospital	1,147	108
The northeastern region	Umnatcharoen Hospital	2,608	142
Total			**422**

The Third step (the participant level): The elderly with hypertension was randomly selected from each general hospital by the proportion. They were Lumphun Hospital (88), Phatthalung Hospital (54), Phraphutthabat Hospital (30), Samutsakhon Hospital (108), and Umnatcharoen Hospital (142). In each general hospital, the participants were selected by systematic sampling technique using their hospital number together with inclusion criteria as follows:

1) Age 60 years and over

2) Being diagnosed with hypertension

3) Have been treated with at least one antihypertensive medication

4) Able to perform daily activities

5) No problems with deafness, blindness or dementia

6) Willing to participate in this study

Instrumentations

Several instruments were employed to collect the data addressing the research proposes, including personal information sheet, the Chula Mental Test, the Modified Barthel ADL Index, the Health Belief Questionnaire, the Personal Resource Questionnaire 85 (PRQ85), the Medication Regimen Complexity Index, and the Morisky Medication Adherence Scale (MMAS). All questionnaires received permission from the developer for use in this study (see appendix E). The variables and their indicators or instruments are presented in Table 3.3.

Table 3.3 Variables and their indicators or instruments in the study

Variables name	Indicators or instruments
Cognitive function	Score assessed by Chula Mental Test
Health beliefs	Score assessed by Health Belief Questionnaire
Social support	Score assessed by Personal Resource Questionnaire 85 (PRQ85)
Regimen complexity	Score assessed by Medication Regimen Complexity Index (MRCI)
Medication adherence	Score assessed by Morisky Medication Adherence Scale (MMAS)

1. Personal information sheet

The purpose of the personal information sheet was to collect information regarding the subject's personal and social background. This form was comprised of items concerning age, gender, marital status, level of education, occupation, family

income, sources of medical payment, duration of illness, drug treatment, blood pressure level, and comorbidity.

2. Chula Mental Test (CMT)

The Chula Mental Test for the elderly, an interview form, was developed by Sutthichai Jitapunkul et al. (1996) to assess the cognitive function of the elderly. There are 13 items listing cognitive functions, including age, time, registration of three things, month, person, rice, do follow, proverb, speak follow, judgment, count 10 to 20, naming objects, and subtraction. The response to the items were coded on a dichotomous scale of 0 (incorrect) and 1 (correct), in which item 5 and item 12 had two sub-scales, and item 3 and item 13 had three sub- scales. Therefore, the possible summation of all items to represent cognitive function ranged from 0-19. The sum score represented the cognitive function of the elderly. The interpretation of the categorical cognitive function included scores 0-4 referring to severe cognitive impairment, scores 5-9 referring to moderate cognitive impairment, scores 10-14 referring to mild cognitive impairment, and scores 15-19 referring to normal cognitive function.

Validity

The content validity of the CMT was determined by an expert panel, including two neurologists, two psychiatrists and two psychologists. In order to conduct concurrent validity and criterion validity, the CMT was applied to 212 residents at a home for the elderly in Bangkok. The results showed that concurrent validity was indicated by the strong correlation between the Mini-Mental State Examination (MMSE) (r=.78) and the Abbreviated Mental Test (AMT) (r=.78). Criterion validity was demonstrated by the ability of the CMT to detect clinical diagnosed dementia

with a sensitivity of 100 percent and a specificity of 90 percent (Sutthichai Jitapunkul et al., 1996).

Reliability

The results of the CMT reliability using a test-retest kappa coefficient and an internal consistency coefficient (Cronbach's Alpha) were .65 and .81, respectively (Sutthichai Jitapunkul et al., 1996). Jirawan Inkoom (2006) demonstrated the reliability testing of CMT among the elderly residing in the community, the KR 20 reliability coefficient was 0.82. In the present study, the reliability testing was calculated from the trial data of 30 elderly with hypertension that came to the outpatient department at a general hospital. The KR 20 reliability coefficient obtained was .80.

3. Modified Barthel ADL Index

Daily living activities were measured by the Modified Barthel Activities of Daily Living Index (MBAI). The MBAI was developed by Sutthichai Jitapunkul, Pirom Kamolratanakul, and Ebrahim (1994) for Thai elders. It was used for measuring functional status and rating of self-care abilities in the areas of feeding, grooming (brushing teeth, combing hair, shaving, and making up), mobility (walking indoors), transferring, using the toilet, dressing, walking up and down stairs, bathing, and controlling bowel and bladder. The possible scores on the MBAI ranged from 0 to 20. The scores for each item on the MBAI were not equal depending on their importance for living as follows: (1) the activities for transferring and mobility (walking indoor) had scores on a 4-item scale (0 = total dependence, 1 = need much assistance, 2 = need little assistance, and 3 = independence). (2) the activities for feeding, using the toilet , dressing, walking up and down stairs, and controlling bowel and bladder had the

scores on a 3-item scale (0 = total dependence, 1 = need some assistance, and 2 = independence), and (3) the activities for grooming and bathing, which had the score on a 2-item scale (0 = total dependence and 1 = independence).

The total scores ranged from 0 to 20 (A score of 0-4 = total dependence, 5-8 = severe dependence, 9-11 = moderate dependence, and 12–19 = mild dependence, and 20 = independence).

Validity

The construct validity of the MBAI was tested among Thai older adults (Sutthichai Jitapunkul et al., 1994). Factor analysis with varimax rotation revealed factor loadings of .50 and over.

Reliability

Test-retest reliability, inter-rater reliability and internal consistency were conducted initially. The results showed high correlation coefficients or test-retest and inter-rater reliability of .96 and .84, respectively (Sutthichai Jitapunkul et al., 1994). From the trial data in this study, the internal consistency was established in 30 elderly individuals with hypertension. The Cronbach alpha for MBAI was .80.

4. The Health Beliefs Questionnaire

Health beliefs were measured by the Health Beliefs Questionnaire. The questionnaire was modified from Hamilton Health Belief Questionnaire (Hamilton, 1982). The health belief questionnaire consists of 18 items and four subscales, perceived susceptibility to complication of hypertension (5 items), perceived severity of hypertension (4 items), perceived benefits of taking antihypertensive drugs (5 items), and perceived barriers to taking antihypertensive drugs (4 items). The response to the item was coded on five choices and a Likirt scale ranging from

disagree (1) to very strongly agree (5). The total score was calculated by the summation for the scores of the 18 items, ranging from 18 to 90. The higher the score meant a higher level of health beliefs.

In order to produce simple cut-off points that facilitated interpretation and use for description of level of the health beliefs variable in this study sample, the researcher set up the total score into a three-interval width, using a proportional methods as follows.

Range of total scores	**Level of health beliefs**
18.0 - 42.0	Low
42.1 - 66.0	Moderate
66.1 – 90.0	High

Similarly, the level of each dimension of health beliefs was determined by dividing the summed score into a three-interval width as follows.

Range of total scores of perceived susceptibility and perceived benefits	**Level of perceived susceptibility and perceived benefits**
5.0 – 12.0	Low
12.1 – 19.0	Moderate
19.1 – 25.0	High

Range of total scores of perceived severity and perceived barrier	**Level of perceived severity and perceived barrier**
4.0 – 9.0	Low
9.1 – 14.0	Moderate
14.1 – 20.0	High

Validity

The questionnaire was validated for its content validity by 5 experts in caring for hypertensive patients (one cardiovascular clinical nurse specialist, two nurse instructors, and two physicians). The content validity index was calculated and the questionnaire was revised and verified according to the suggestions of the experts. The content validity index was .88.

In this study, the construct validity was tested by confirmatory factor analysis in 422 elderly with hypertension. The results indicated that the measurement model of health beliefs fit the data very well (Appendix H). The results revealed that four factors were observed. This means that the instrument had the construct validity. The results are presented in the table 3.4.

Table 3.4 Confirmatory factor analysis of the measurement model of health beliefs

Construct	**Loading and reliability of indicators**			
(number of indicators)	**Loading**	**T value**	**Standard error**	**R^2**
1. Susceptibility (5)	.81-1.00	12.33-15.90	.06-.07	.39-.69
2. Severity (4)	.55-.83	12.16-18.50	.04-.05	.39-.72
3. Benefits (5)	.52-.68	7.35-11.87	.05-.08	.35-.70
4. Barriers (4)	.18-1.00	5.67-17.61	.03-.06	.09-.71

$\chi 2 = 109.90$; df = 89; P-value = .065; RMSEA= .024; GFI = .97; AGFI = .95; RMR = .04

Reliability

According to the trial data in this study, the internal consistency was established in 30 elderly patients with hypertension. The Cronbach's alpha was .80. After obtaining the data for 422 elderly with hypertension, the reliability coefficient of this instrument was analyzed. The Cronbach's alpha coefficient for the total scale was 0.82.

5. The Personal Resource Questionnaire

The level of social support in this study was assessed by the Personal Resource Questionnaire (PRQ85 Part 2), developed by Brand and Weinert (1987). The authors modified this version from the older model, the PRQ 82. The PRQ85 was a self-report tool consisting of two parts. Part 1 consisted of ten life situations in which a person needed some help and information. It focused on descriptive information about the individual's social network, such as the number and type of resources, all of which strongly reflected the western culture and context and were out of the scope of this study. Therefore this part was not applied to this study. Part 2 of PRQ85 assessed the adequacy of the individual's perceived level of social support. The instrument, based on the Weiss (1974) model of relational function, included five dimensional subscales: intimacy, social integration, nurturance, worth, and assistance. The PRQ85 Part 2 consisted of 25 items, five items for each subscale on a Likert scale ranging from strongly agree (5), to agree (4), neutral or uncertain (3), disagree (2), and strongly disagree (1). The total score was calculated by the summation for the scores of the 25 items, ranging from 25 to 125. The higher the score meant a higher level of social support.

In order to produce simple cut-off points that facilitated interpretation and use for description of level of the social support variable in this study sample, the researcher set up the total score into a five-interval width (Jirawan Inkoom, 2006). The rationale was based on the equal weighting of the question items produced among the five social support dimensions. It is presented in the following.

Range of total scores	**Level of social support**
25.0 - 45.0	Low
45.1 - 65.0	Slightly low
65.1 – 85.0	Moderate
85.1 – 105.0	Slightly high
105.1 – 125.0	High

Similarly, in order to understand the data interpretation of each dimension of social support, the cutting point of the score was set up into five interval widths, as follows.

Range of total scores of each dimension	**Level of social support**
5.0 – 9.0	Low
9.1 – 13.0	Slightly low
13.1 – 17.0	Moderate
17.1 – 21.0	Slightly high
21.1 – 25.0	High

This instrument has been widely applied to numerous research studies examining social support and has demonstrated sound psychometric properties (Weinert and Tilden, 1990; Johnson, 1996; Han, Kim, and Weinert, 2002; Logsdon, 2006). The PRQ85 has been translated into several languages: Chinese, Japanese,

Spanish, Korean, and Thai (Han et al., 2002). Chommanard Wannapornsiri (1992) back translated this instrument into a Thai version and then the Thai version was applied to this study.

Validity

The convergent validity of the Personal Resource Questionnaire was conducted with a cross sectional design including 100 men and women in church groups, clubs, and through personal contacts (Brand and Weinert, 1987). The study compared PRQ85 with five other prominent measures of social support and with one measure of individual affective state in order to examine convergence across support measures and to discriminate between social support measures and individual affective states. These measures were: a) the Interpersonal Support Evaluation List, (Cohen et al., 1985); b) the Social Support Scales, (Lin, Dean, and Ensel, 1981); c) the Norbeck Social Support Questionnaire, (Norbeck, Lindsey, and Carrieri, 1981); d) the Cost and Reciprocity Index, (Tilden, personal communication, March 11, 1986); e) the Inventory of Socially Supportive Behaviors, (Berrera, 1985); g) the Profile of Mood State, (McNaire, Lorr, and Dopple, 1971). PRQ85 Part 2 was found to be significantly related to all measures. Since the PRQ85 was viewed as a construct composed of five underlying dimensions: intimacy, social integration, nurturance, worth, and assistance. There were moderate intercorrelations among the five subscales across the studies. The correlation among the subscales ranged from .52 to .73 (Weinert, 1987).

In this study, the construct validity was tested by confirmatory factor analysis among 422 elderly with hypertension. The results indicated that the measurement model of level of social support fit the data very well (appendix H). The results

revealed that five factors were observed. This means that the instrument exhibited construct validity. The results are presented in table 3.5.

Table 3.5 Confirmatory factor analysis of the measurement model of level of social support

Construct (number of indicators)	Loading and reliability of indicators			
	Loading	T value	Standard error	R^2
1. Intimacy (5)	.26-.61	4.60-9.82	.04-.09	.07-.37
2. Social integration (5)	.22-.86	4.46-11.67	.03-.05	.05-.74
3. Nurturance (5)	.50-.77	9.47-15.75	.02-.47	.25-.60
4. Worth (5)	.23-.73	3.75-5.11	.04-.93	.05-.51
5. Assistance (5)	.41-.67	7.72-12.16	.03-.07	.17-.47
$\chi 2$ = 222.52; df = 193; P-value = .071; RMSEA = .019; GFI = .96; AGFI = .93; RMR = .03				

Reliability

Initially, a cross section design in which 100 adults obtained from a university was employed for test-retest reliability and internal consistency of the scale. The test-retest reliability coefficient for PRQ85 Part 2 was r= .72, p<.001. The results suggested that there was stability in perceived support as measured by the PRQ 85 over a 4-to 6 week period. The internal consistency of total perceived support scale (PRQ part 2) was estimated using Cronbach's alpha. The reliability coefficient for the total scale was α = .93 at time 1. The subscale reliability coefficient ranged from .79-.88. At Time 2 the reliability coefficient for the total scale was α = .91. The subscale

reliability coefficients ranged from .70 to .88. These results suggested good internal consistency for the total scale and average internal consistency for the individual subscale: intimacy, social integration, nurturance, worth, and assistance (Brand and Weinert, 1987).

Concerning Thai elderly, the results of the previous studies indicated that the PRQ 85 Part 2 had strong internal consistency. Nantawon Suwannaroop (1999) and Jirawan Inkoom (2006) proposed that the alpha coefficients were .86 and .91, respectively.

According to the trial data in this study, the internal consistency was established by using Cronbach's alpha coefficient among 30 elderly with hypertension that came to the outpatient department, general hospitals. The Cronbach's alpha for the total score was .82. After obtaining the data for 422 elderly with hypertension, the reliability coefficient of this instrument was analyzed. The Cronbach's alpha coefficient for the total scale was .85.

6. Medication Regimen Complexity Index

Regimen complexity was measured by the Medication Regimen Complexity Index (MRCI) (George et al., 2004). The MRCI is a tool used to measure the complexity of the pharmacotherapy of an individual patient, which is divided into three sections: A, B and C. Section A corresponds to information on dosage forms, section B corresponds to information on dose frequency, and Section C corresponds to additional information, such as use drug at specific time and concomitant use with food, among others. The MRCI consisted of 65 items. Each section was scored based on the analysis of the patient's pharmacotherapy and the complexity index was

obtained by adding the points (scores) of the three sections. The higher the score meant the higher the regimen complexity.

Validity

From the set of 134 medication regimens among the COPD patients, 25 were randomly chosen for judging the construct validity of the new tool. The correlation between complexity scores and number of medications in the regimen was used for judging the convergent validity, while the relationships between the complexity scores and age and gender of the patients were tested to confirm the discriminant validity (George et al., 2004). The significant correlation (Spearman's Rho = .9, $p < 0.0001$) between the number of medications and the investigators' total score confirmed convergent validity of the MRCI. Four patients, each with 8 medications in their regimens, had MRCI scores of 25.5, 30, 32, and 41, while 3 patients with 9 medications in their regimens had MRCI scores of 23.5, 26.5, and 36.5. Total scores on the MRCI did not have any significant correlation with age (Spearman's Rho = .34; $p = .1$) or gender ($p = .487$) of the patients, which confirmed the discriminant validity of the MRCI (George et al., 2004).

The MRCI was originally written in the English language. Thus, a back translation process was used in this study. The process was carried out as follows:

1) The tool was submitted to two translators (Faculty of Pharmaceutical Science, Chulalongkorn University) who were fluent in the English language, who knew the underlying objectives and concepts of the study, and whose mother language was Thai. The English version of the MRCI was translated into Thai by two translators.

2) The two translations were compared, generating a consensual version, which was called “version 1.”

3) During the second phase, Version 1 of the tool was submitted to back-translation into the English language (Chulalongkorn University Language Institute). This was carried out by a translator who was fluent in the English language but did not know the underlying objectives or concepts of the study.

4) This new English version was compared to the original tool and the correction of the causal discrepancies resulted in a new version, called “Version 2.”

5) During the third phase, an evaluation committee that consisted of two advisors that were healthcare professionals and bilingual revised all parts of tool Version 2, checking for semantic, idiomatic, cultural, and conceptual equivalence. After this phase, the third version of the tool, called Version 3, was generated.

Reliability

George et al. (2004) was submitted the tool to two pharmacists (raters) that, had no involvement in the design or validation of the new tool and that scored the 25 regimens using the new tool twice with a gap of 2 weeks in order to determine inter-rater and test–retest reliability. The raters required 2–8 minutes to apply the MRCI to each regimen, depending on its complexity. The inter-rater reliability (ICC) for the total score on the MRCI between the 2 raters was .991. Sections A, B, and C yielded test–retest reliabilities of .98, .98, and .98, respectively. The ICC for the total scores on the MRCI for the raters were .99 and .99. Sections A, B, and C showed ICCs of 0.99 and .98, 0.98 and 0.99, and 0.99 and 0.99, respectively (George et al., 2004). In Thailand, Wanida Manakitjongkol (2006) found that the ICC for the total score on the

MRCI between the 2 raters was 0.99. The ICC for the total scores on the MRCI for the raters were 1.00 and 0.99.

From the trial data in this study, it can be seen that the inter-rater reliability for the total score on the MRCI between the 2 raters was 0.99. The test–retest reliabilities for the total scores on the MRCI for the raters were 1.00 and 0.99.

7. Morisky Medication Adherence Scale (MMAS)

The Morisky Medication Adherence Scale (MMAS) (Morisky, et al., 2008) is an 8-item questionnaire which was developed from a previously-validated 4-item scale (Morisky, et al., 1986) and supplemented with additional items to better capture the barriers surrounding adherence behavior. It is a screening tool in the clinic setting that to identifies patients that exhibit poor adherence and that are at risk for uncontrolled blood pressure. Each of the 8 items measures a specific medication-taking behavior and not a determinant of adherence behavior. Response categories are yes/no for each item with a dichotomous response and a 5-point Likert response for the last item. The total score was calculated by the summation for the scores of the 8 items. Highly adherent patients were identified with the score of 8 on the scale, medium adherers with a score of 6 to less than 8, and low adherers with a score less than 6.

Validity

The concurrent validity of the scale was assessed with a previously validated 4-item measure of adherence. The current 8-item scale was significantly correlated with the previously validated 4-item self-reported Medication-taking Scale (Pearson correlation of .64, $p<0.05$). Confirmatory factor analysis indicated that the eight-item scale was uni-dimensional and that the items loaded well on the single factor. The

sensitivity and specificity of the 8-item scale were 93% and 53%, respectively (Morisky et al., 2008).

Predictive validity was assessed through associations with blood pressure control, knowledge, social support, stress, and patient satisfaction with clinic visits, each of which was previously described to be associated with medication adherence. Standard procedures, including confirmatory factor analysis for assessing the dimensionality of the scale, were used to confirm a single-factor. A significant relationship between the adherence scale and blood pressure control (chi-square = 6.6; $p<.05$) was found. When all of these variables were included in the model, knowledge, patient satisfaction, coping, stress level, and medication complexity were each found to be significantly associated with adherence at the .05 level (Morisky et al., 2008).

Reliability

The internal consistency of the total medication adherence scale was estimated using Cronbach's alpha. The reliability coefficient for the total scale was $\alpha = .83$ (Morisky et al., 2008). Phantipa Sakthong, Rossamalin Chabunthom, and Rungpetch Charoenvisuthiwongs (2009) translated this instrument into a Thai version and it was used with 303 diabetes patients. The Cronbach's alpha coefficient for the total scale was .61, which is below the acceptable value of .7. However, for the test–retest reliability the MMAS showed an excellent ICC of 0.83 ($p<0.001$). According to the trial data in this study, it was seen that internal consistency was established by using Cronbach's alpha coefficient among 30 elderly patients with hypertension, which was .81. After obtaining the data from the 422 elderly with hypertension, the reliability

coefficient of this instrument was analyzed. The Cronbach's alpha coefficient for total scale was .80.

Protection of human subjects

This study was conducted with the approval of the Institutional Review Board (IRB) and Human Research Board of the hospital settings: Lumphun Hospital, Phatthalung Hospital, Phraphutthabat Hospital, Samutsakhon Hospital, and Umnatcharoen Hospital. Both written and verbal informed consents were obtained in Thai on the same date as the data collection. The informed consent form explained the purpose of the study, benefits, risks, types of questionnaires, time, and tasks to be completed.

Permission was obtained from participants before the start of the data collection. At the outpatient department, the participants were informed about the purpose of the study and their right to refuse participation. If the participants did not want to answer the questionnaires, they could withdraw from the study at any time without penalty. Their names were not used in the data; rather a code number was used to ensure confidentiality. No harm was done to the participants in this study. There was neither cost nor any payment to participants in the study.

Data collection

1) A letter asking for permission to collect the data from the Faculty of Nursing, Chulalongkorn University, was sent to the directors and the Institutional Review Board (IRB) and Human Research Board committee of the five general hospitals (research settings).

2) After permission from the IRB was approved, the researcher made appointments with doctors and nurses of the outpatient departments in each hospital and informed them about the objectives and process of the study and asked for their cooperation.

3) The research assistants were doctoral students of nursing science at Chulalongkorn University. They were trained to complete the questionnaires for the elderly with hypertension that met the criteria. They were also examined to confirm their understanding of the sample criteria and the clearly defined definitions and concepts based on each instrument and the overall questionnaire.

4) The researcher and research assistants studied the personal records of the elderly with hypertension that, had appointments with physicians in the outpatient department each day. There were about 50 to 100 elderly patients with hypertension each day in each setting. Then, the researcher and research assistants studied the patients' medical diagnoses and medical records regarding drug treatment, blood pressure level, and comorbidity.

5) The researcher and research assistants selected the participants via systematic random sampling and congruence with the inclusion criteria. Patients who met the study criteria were given one of a continuous set of number, such as 1,2,3…, when they arrived at the outpatient department. The patients who had odd numbers (i.e. 1,3,5,…) were asked for their permission to participate in this study. All selected participants were willing to be sampled of this study.

6) The participants were given clear explanations about the study objectives, the process of the study, and their right to participate in the study.

7) The participants were asked to sign an informed consent form before data collection.

8) The participants were asked to complete the questionnaires. It took about 35 minutes for participants to complete the entire questionnaire. The interview technique was used in this study because this method is appropriate for Thai elderly who illiterate and/or visually impaired and reduce ambiguity and confusion among them.

9) The researcher and research assistants examined the questionnaires for completeness of the data. Participants were asked to complete any missing items. Thus, there was no missing data in this study.

Data analysis

Data analysis included the application of descriptive and inferential statistics. Descriptive statistics (i.e. frequency, percentage, range, mean, and standard deviation) were applied to delineate the characteristics of the sample and to examine the distribution of the demographic variables and the variables of interest in this study using the Statistical Package of the Social Science for Personal Computer (SPSS/PC) version 15. LISREL 8.52, a structural equation modeling program, was used to answer the research questions. An alpha level of .05 was selected as the accepted level of significance for this study. The processes used for data analysis are described in the following section.

1. Preparation of data for analysis: Missing data and outliers were determined to prevent compromised analytic power and a non-response bias by the researcher. The data were cleansed to prevent random and systematic errors (e.g. typing or coding

the wrong value) using descriptive statistics (Roberts et al., 1997). A total of 422 questionnaires were selected for the accuracy of data entry.

2. The sample characteristics of the sample were analyzed by descriptive statistics.

3. The assumptions underlying the multivariate analysis for the structural equation modeling were tested, including normality, homocedasticity, the linearity of relationship and multicollinearity.

4. The measurement model was evaluated to verify that the theoretical constructs were accurately represented by the observed variables using confirmatory factor analysis. Separate measurement models were tested for each latent variable. According to Joreskog and Sorbom (1996-2001), there are two methods that can be used to assess a measurement model: overall fit and measurement model fit. The overall model fit is indicated by chi-square value (χ^2), relative or normed χ^2 (χ^2/df), and goodness of fit indices. The nonsignificant χ^2 means that there is no difference between the observed matrix and that predicted by the proposed model. If the goodness of fit index (GFI) and adjusted goodness of fit index (AGFI) are greater than 0.9, the root mean square residual (RMR) is close to zero (Hair et al., 1998) and the normed χ^2 is less than 2 (Pedhazur and Schmelkin, 1991), indicating a good fit. For measurement model fit, the observed variable loading related to the construct and the relationships among indicators and the construct were examined. The square multiple correlation (R^2), which is the proportion of variance in the observed variable that is accounted for by the latent variables for which it is an indicator, were examined.

5. Once it was determined that the measurement model fit the data, the hypothesized model was then analyzed. In the proposed model there were four

exogenous variables (regimen complexity, family income, age, and social support) and three endogenous variables (cognitive function, health beliefs, and medication adherence). In this step, the path coefficient and R^2 were estimated and the effects of the independent variable on the dependent variables were determined in order to answer the research questions and to test the hypotheses. The goodness-fit-indices were used to determine whether the model adequately fit the data.

Summary

A descriptive correlational, cross-sectional design was used to test the proposed model of medication adherence behavior among the elderly with hypertension and to examine the relationships among variables, including regimen complexity, family income, age, health beliefs, cognitive function, social support, and medication adherence behavior. The population of this study included the elderly with hypertension aged 60 years and over that attended the outpatient department of general hospitals in Thailand. Multi-stage random sampling was employed to obtain a sample of 422 subjects. Seven instruments were used to collect the data. The results from trial data indicated that the instruments were culturally appropriate for elderly with hypertension, no problems were found during data collection, and the psychometric properties of the instrument were acceptable. The data were analyzed by using the Statistical Package of the Social Science for Personal Computer (SPSS/PC) version 15 and LISREL 8.52. The results of this investigation are reported in the following chapter.

CHAPTER IV

RESULTS

This chapter presents the finding of the study. The descriptive statistics for the demographic characteristics of the study sample and for the characteristics of the major study variables are presented. The structural equation modeling analysis explaining the relationships between regimen complexity, family income, age, health beliefs, cognitive function, social support and medication adherence behavior in the elderly with hypertension is reported. The results of the preliminary analyses including the test of the assumptions underlying the statistical analysis and the findings for each hypothesis are presented.

Characteristics of the study sample

Description of the study sample

The subjects of the study were 422 elderly patients with hypertension aged 60 years and over who received at least one antihypertensive medication at the outpatient department of the general hospital in each part of Thailand, including northern, southern, northeastern, central and eastern parts. The data analysis showed no missing data for the variables. The following discussion presents the demographic characteristics of the study sample and the medical characteristics of the study sample.

Demographic characteristics of the study sample

The characteristics of the sample are shown in Table 4.1. The age range of the elderly was 60 to 85 years with a mean of 69.54 years (SD = 6.61). Most of the elderly were age 60-69 years (51.9%) and female (77.5%). Fifty-five percent of the

elderly were married and 41.2 % were widowed. Most of the elderly had completed primary school (81.0%) and 10.9% had no formal education. Concerning working status, most of the elderly were not working (64.4%), and their family income was lower than 10,000 baht/ month (59.7%). Fifty-seven percent of them reported that their income was believed to be sufficient for living and that they had sources of medical payment from the universal coverage heath care scheme (71.6%).

Table 4.1 Demographic characteristics of the sample (n = 422)

Demographic characteristics	Number	Percentage
Age		
Young-old (60-69 years)	219	51.9
Old-old (70-79 years)	165	39.1
Oldest-old (80 years and over)	38	9.0
Gender		
Male	95	22.5
Female	327	77.5
Marital status		
Single	8	1.9
Married	234	55.5
Widowed	174	41.2
Separated, Divorced	6	1.4
Education level		
No formal education	46	10.9
Elementary education	342	81.0
Secondary education	29	6.9
Diploma degree	1	0.2
Bachelor degree	4	1.0

Table 4.1 Demographic characteristics of the sample (n = 422) (continued)

Demographic characteristics	Number	Percentage
Work status		
Working	135	32.0
Not working	287	68.0
Family income (baht/month**)**		
≤ 10,000	252	59.7
> 10,001-20,000	70	16.6
> 20,001-30,000	56	13.3
> 30,001	44	10.4
Income sufficiency		
Sufficiency	244	57.8
Insufficiency	178	42.2
Sources of medical payment		
Medical welfare for government officer	115	27.3
Universal Coverage	302	71.6
Social Security Insurance	4	0.9
Self	1	0.2

Medical characteristics of the sample

The elderly with hypertension had a duration of sickness that ranged from 3 months to 35 years, with a mean of 7.7 years (SD= 6.9). Most of the elderly were able to control their blood pressure (60.4%), whereas 39.6% could not control their blood pressure. In terms of antihypertensive drugs, more than half of them (56.4%) were receiving more than one antihypertensive drug: while 43.6% received only one antihypertensive drug. By types of antihypertensive drug, nearly half of the elderly (46.2%) received calcium channel blocker, followed by diuretic (37.9%), beta adrenergic blocker (36.0%), and angiotensin coverting enzyme inhibitor (35.1%).

Sixty-six percents of the elderly had comorbidity, while 23.0% of the elderly had only hypertension disease. The most frequent comorbidities were diabetes mellitus (44.1%), hyperlipidemia (30.6%), heart disease (14.9%), musculoskeletal disease (11.6%), and kidney disease (5.7%).

Table 4.2 Medical characteristics of the sample (n = 422)

Medical characteristics	Number	Percentage
Blood pressure control (mmHg)		
Control (<140/90 both)	255	60.4
Uncontrolled (≥140/90 either)	167	39.6
Types of antihypertensive drug*		
Diuretic	160	37.9
Alpha adrenergic blocker	11	2.6
Beta adrenergic blocker	152	36.0
Calcium channel blocker	195	46.2
Angiotensin receptor blocker	52	12.3
Angiotensin coverting enzyme inhibitor	148	35.1
Vasodilator	23	5.5
Number of antihypertensive drugs		
1	184	43.6
2	175	41.5
3	48	11.4
4	12	2.8
5	3	0.7
Duration of illness Min= 3 month, Max = 35 years	Mean 7.7	SD = 6.9
1-10	336	79.6
11-20	70	16.5
20-30	11	2.7
>30	5	1.2

*Some patients received multiple medications

Table 4.2 Medical characteristics of the sample (n = 422) (continued)

Medical characteristics	Number	Percentage
Comorbidity		
No	97	23.0
Yes*	325	77.0
Diabetes mellitus	186	44.1
Hyperlipidemia	129	30.6
Heart disease	63	14.9
Musculoskeletal disease	49	11.6
Kidney disease	24	5.7

*Some patients had multiple comorbidity

Characteristics of the study variables

Description of the study variables

The study variables in this study included age, family income, cognitive function, regimen complexity, health beliefs, social support, and medication adherence behavior. The descriptive statistics are presented in this section. Mean, standard deviation, range, skewness, and kurtosis are shown in table 4.3 in order to describe the distribution of the study variables.

The age range of the elderly was 60 to 85 years of age with a mean of 69.54 years (SD = 6.6). The skewness value of age appeared to be .47, indicating that most of the elderly had younger age. According to Jacobsen (1997), a skewness value above .2 or below -.2 indicates severe skewness. Additionally, if the skewness was negative, this indicated that most of the elderly had a higher score. If the skewness was positive, this indicated that most of the elderly had a lower score. Regarding kurtosis, Jacobsen (1997) noted that if the value is not beyond ± 1.96, the distribution

has a normal curve. If the value is below -1.96, it indicates platykurtic. If the value is higher than 1.96, it is leptokurtic. In this study, the kurtosis value of the age was normal (-.63).

Family income ranged from 1,000 to 40,000 baht per month, with a mean of 1.74 (SD=1.04). The skewness value of family income was positive (1.09), indicating that most of the elderly had a low family income. The kurtosis value of family income was normal as well (-.24).

The cognitive function score of the elderly ranged from 15 to 19, with a mean of 17.82 (SD=1.19). The skewness value of the cognitive function score was negative (-0.70), indicating that most of the elderly had a high cognitive function. The kurtosis value of the cognitive function score was also normal (-.48).

The scores for regimen complexity ranged from 11 to 49.50, with a mean of 24.09 (SD=9.61). The distribution of the score for regimen complexity was positively skewed (.54), indicating that most of the elderly had a low regimen complexity. The kurtosis value of the regimen complexity score was normal (-.61).

The total sum scores for health beliefs ranged from 34 to 88, with a mean of 65.55 (SD=11.11). The distribution of the score for health belief was negatively skewed (-.53), indicating that most of the elderly had high health beliefs. The kurtosis value of the health beliefs score was normal (-.25).

The scores for perceived susceptibility ranged from 5 to 25, with a mean of 19.35 (SD=5.12). The distribution of the score for perceived susceptibility was negatively skewed (-.87), indicating that most of the elderly had high perceived susceptibility. The kurtosis value of the perceived susceptibility score was normal (.25).

The score for perceived severity ranged from 4 to 20, with a mean of 16.59 (SD=3.37). The distribution of the score for perceived severity was negatively skewed (-1.14), indicating that most of the elderly had high perceived severity. The kurtosis value of the perceived severity score was normal (1.16).

The scores for perceived benefits ranged from 5 to 25, with a mean of 22.11 (SD=3.37). The distribution of the score for perceived benefits was negatively skewed (-1.16), indicating that most of the elderly had high perceived benefits. The kurtosis value of the perceived benefits score was normal (1.25).

The score for perceived barriers ranged from 4 to 20, with a mean of 7.49 (SD=3.66). The distribution of the score for perceived barriers was positively (.83) indicating that most of the elderly had low perceived barriers. The kurtosis value of the perceived barriers score was normal (-.23).

The total sum scores for social support ranged from 67 to 125, with a mean of 107.11 (SD = 11.98). The distribution of the score for the social support score was negatively skewed (-.18), indicating that most of the elderly had high social support. The kurtosis value of the social support score was normal (-.80).

The intimacy score ranged from 13 to 25, with a mean of 21.59 (SD=2.74). The skewness value of the intimacy score was negative (-.35), indicating that most of the elderly had high intimacy. The kurtosis value of the intimacy score was normal (-.77).

The assistance score ranged from 8 to 25, with a mean of 20.79 (SD=3.39). The skewness value of the assistance score was negative (-.55), indicating that most of the elderly had high assistance. The kurtosis value of the assistance score was normal (-.05).

The nurturance score ranged from 12 to 25, with a mean of 22.07 (SD=2.75). The skewness value of the nurturance score was negative (-.55), indicating that most of the elderly had high nurturance. The kurtosis value of the nurturance score was normal (-.40).

The worth score ranged from 12 to 25, with a mean of 21.16 (SD=2.88). The skewness value of the worth score was negative (-.28), indicating that most of the elderly had high worth. The kurtosis value of the worth score was normal (-.86).

The social integration score ranged from 13 to 25, with a mean of 21.50 (SD=2.68). The skewness value of social integration was negative (-.47), indicating that most of the elderly had high social integration. The kurtosis value of social integration was normal (-.33).

Lastly, the scores for medication adherence behavior ranged from 1.50 to 8, with a mean of 6.17 (SD=1.81). The skewness value of the medication adherence behavior score was negative (-.80), indicating that most of the elderly exhibited high medication adherence behavior. The kurtosis value of the medication adherence behavior score was also normal (-.45).

An assessment of the skewness and kurtosis value are important for futher analyses because when the measured variables are “highly non-normal” (e.g., skewness = 3, kurtosis = 21), the standard error of parameter estimates are underestimated, resulting in untrustworthy output (West, Finch, and Curran, 1995). Overall, the skewness and kurtosis value of the study variables in table 4.3 were not “highly non-normal.”

Table 4.3 Descriptive statistics for the study variables (n=422)

Variables	Possible range	Actual range	Mean	SD	Skewness	Kurtosis
Age	-	60-85	69.54	6.61	.47	-.06
Family income	-	1,000-40,000	13,625.59	11,234.37	1.09	-.24
Regimen complexity	-	11 - 49.50	24.09	9.61	.54	-.61
Social support	25-125	67-125	107.11	11.80	-.18	-.80
- Intimacy	5-25	13-25	21.59	2.74	-.35	-.77
- Assistance	5-25	8-25	20.79	3.39	-.55	-.05
- Nurturance	5-25	12-25	22.07	2.75	-.55	-.40
- Worth	5-25	12-25	21.16	2.88	-.28	-.86
- Social integration	5-25	13-25	21.50	2.68	-.47	-.33
Health beliefs	18-90	34-88	65.55	11.11	-.53	-.25
- Perceived susceptibility	5-25	5-25	19.35	5.12	-.87	.25
- Perceived severity	4-20	4-20	16.59	3.37	-1.14	1.16
- Perceived benefits	5-25	5-25	22.11	3.37	-1.16	1.25
- Perceived barriers	4-20	4-20	7.49	3.66	.83	-.23
Cognitive function	0-19	15-19	17.82	1.19	-.70	-.48
Medication adherence behavior	0-8	1.5-8.0	6.17	1.81	-.80	-.45

Preliminary analyses

Prior to further analysis, all study variables including cognitive function, health belief, social support, regimen complexity, family income, age, and medication adherence behavior were examined under the general statistic assumption for multivariate analysis, including normality, homoscedasticity, linearity, and multicollinearity (Tabachnick and Fidell, 1996).

Normality testing of the variables

Multivariate normality was tested in all variables by statistical and graphical methods. Two components of normality, skewness and kurtosis, were explored. The skewness values of all variables in this study ranged from -1.16 to 1.09, and the kurtosis of all variables ranged from -.86 to 1.25 (Table 4.3). According to West, Finch and Curran, (1995), the high of non-normal are 3.00 for skewness and 21.00 for kurtosis. Hair et al. (2006) have suggested that the skewness and kurtosis values above $\pm$2.58 provide non-normal distributions, which would underestimate the standard error and result in untrustworthy data output. Thus, the value of skewness and kurtosis of this study were not “highly non normal”. Furthermore, the normal probability data plot indicated normal distribution. Therefore, it was acceptable for SEM analysis.

Multicollinearity

Three measures were used for detecting multicollinearity: the simple correlation among the predictors, the tolerance value, and the variance inflation factors (VIF). Bivariate multicollinearity occurs when correlations of any variables are greater than ± .85 (Munro and Page, 1993: 215). In addition, multivariate

multicollinearity occurs when the tolerance values are less than .01, and the variance inflation factor (VIF) values are greater than 5.3 (Hair et al., 2006: 227). Evidence of multicollinearity was not found, with correlations coefficients among the predictor variables ranging from – .62 to .58 (Table 4.4), tolerance values from .37 to .81, and VIF values ranging from 1.23 to 2.71 (Table 4.5). The tolerance and VIF values indicated no evidence of multicollinearity.

Homoscedasticity and linearity.

Residual scatter plots were evaluated to assess homoscedasticity and linearity (Munro and Page, 1993; 216). The residual pattern did not deviate from a horizontal band; the spread was equivalent across the zero axis within $\pm$2 standard deviations, which indicated a homoscedasticity and linear relationship. This assumption was therefore reasonably accepted (Appendix. G)

Table 4.4 Correlations matrix among the study variables (n = 422)

	MMAS	CMT	SUS	SEV	BEN	BAR	INTIM	ASSIST	NURTU	WORTH	INTEG	MRCI	BATH	YEAR
MMAS	1													
CMT	.529**	1												
SUS	.376**	.142**	1											
SEV	.402**	.220**	.727**	1										
BEN	.376**	.250**	.381**	.494**	1									
BAR	-.330*	-.234**	.225**	.169**	-.048	1								
INTIM	.404**	.293**	.224**	.242**	.246**	-.088	1							
ASSIST	.498**	.328**	.205**	.197**	.221**	.171**	.664**	1						
NURTU	.395**	.268**	.257**	.237**	.257**	.071	.615**	.702**	1					
WORTH	.586**	.327**	.203**	.258**	.267**	-.137**	.557**	.633**	.579**	1				
INTEG	.488**	.349**	.216**	.311**	.201**	-.139**	.501**	.555**	.598**	.626**	1			
MRCI	-.254**	.209**	.277**	.302**	.265**	.220**	.185**	.221**	.174**	.218**	.257**	1		
BATH	.274**	.287**	.236**	.220**	.181**	-.096*	.247**	.222**	.244**	.236**	.203**	.308**	1	
YEAR	-.388**	-.625**	-.185**	-.221**	-.192**	1.00*	-.232**	-.206**	-.164**	-.208**	-.245**	-.130**	-.206**	1

*p<.05, **p<.01

Note:

MMAS = Medication adherence behavior
CMT = Cognitive function
SUS = Perceived susceptibility
SEV = Perceived severity
BEN = Perceived benefits
BAR = Perceived barrier
INTIM = Intimacy
ASSIST = Assistance
NURTU = Nurturance
WORTH = Worth
INTEG = Social integration
MRCI = Regimen complexity
BATH = Family income
YEAR = Age

Table 4.5 Assessment for multicollinearity among the predicting variables (n=422)

Variables	Tolerance	Variance Inflation Factor (VIF)
Cognitive function	.52	1.94
Perceive susceptibility	.43	2.31
Perceived severity	.38	2.61
Perceived benefits	.69	1.44
Perceived barrier	.78	1.28
Intimacy	.49	2.06
Assistance	.37	2.71
Nurturance	.40	2.49
Worth	.46	2.15
Social integration	.46	2.10
Regimen complexity	.76	1.32
Family income	.81	1.23
Age	.59	1.69

Principal analysis

The following section illustrates the data analysis procedures. LISREL 8.52 was used to perform the structural equation modeling (SEM) analysis and the findings of this analysis were used to test the studied hypotheses. This analysis consists of two steps: measurement model testing and structural or theoretical model testing; the model and hypotheses testing are described below.

1) Measurement model testing

The measurement model determines how latent variables or constructs are indicated by the observed variables or indicators. In this study, two concept constructs were evaluated, health beliefs and social support, in order to specify reliability and construct validity using confirmatory factor analysis (CFA). This section presents the fit indices of the measurement models along with the reliability (R^2) and standardized validity coefficient (λ^s) using confirmation factor analysis.

The results of the CFA revealed that the two measurement models had good overall model fit (Table 4.6). The second-order CFA showed that all measurements had low Chi-square values resulting in a non-significant difference level of 0.05. The χ^2/df ratio fell within the recommended level of 2, with both GFI and AGFI values close to 1.00 and equal to 1.00, respectively. The RMSEA values ranged from .02 to .02, indicating a validity of measurement constructs (confirmatory factor analysis of the measurement models are presented in Appendix H).

Table 4.6 Statistical overall fitted index values of measurement models (n=422)

Construct	χ^2	df	χ^2/df	P value	GFI	AGFI	RMSEA
Health beliefs							
Original model	475.50	131	3.62	.00	.89	.85	.07
Revised model	109.90	89	1.23	.07	.97	.95	.02
Social support							
Original model	1088.25	270	4.03	.00	.83	.79	.09
Revised model	222.52	193	1.15	.07	.96	.93	.02

Note: χ^2 = Chi-square
df = Degree of freedom
GFI = Goodness of fit index
AGFI = Adjusted goodness of fit index
RMSEA = Root mean square error of approximation

Table 4.7 illustrates the loading with t-values and squared multiple correlations among each observed variable for medication adherence behavior. Based on an accepted level of .05, the t-value test statistic needed to be $>\pm 1.96$ before the hypothesis could be rejected. The results revealed that most of the sub-scales of the measurement had significant low to high parameter estimates, which were related to their specific constructs and validated the relationships among observed variables and their constructs (confirmatory factor analysis of the measurement models are presented in Appendix H).

Furthermore, the squared multiple correlations (R^2) for the observed variables of the latent variables ranged from .05 to .74 (Table 4.9). Some indicators had low factor loading (the correlation between an indicator on a factor) and R^2 (the proportion of variance between an indicator on a factor) less than .40 (Munro, 2001). In sum, however, the measurement model fit the data.

Table 4.7 Loading and reliability of indicators

Construct and Indicators	Standardized Factor loading	t-value	Standard error	R^2
Health beliefs				
Perceived susceptibility	.81-1.00	12.33-15.90	.06-.07	.39-.69
Perceive severity	.55-.83	12.16-18.50	.04-.05	.39-.72
Perceived benefits	.52-.68	7.35-11.87	.05-.08	.35-.70
Perceived barriers	.18-1.00	5.67-17.61	.03-.06	.09-.71
Social support				
Intimacy	.26-.61	4.60-9.82	.04-.09	.07-.37
Assistance	.41-.67	7.72-12.16	.03-.07	.17-.47
Nurturance	.50-.77	9.47-15.75	.02-.47	.25-.60
Worth	.23-.73	3.75-5.11	.04-.93	.05-.51
Social integration	.22-.86	4.46-11.67	.03-.05	.05-.74

Note: R^2 = Square multiple correlation

In summary, these findings revealed that all measurement models fit the empirical data. Chi-square tests showed low values with non-significant levels. Both GFI and AFI values were close to or equal to 1.0, and RMSEA values less than .05. All measured model indices were acceptable. The classical approach testing reliability and validity provided adequate support for the five measures. Therefore, a structural equation analysis was conducted to estimate the hypothesis model of medication adherence behavior in the following steps.

2) Structural model testing

Once the acceptable measurement models were determined, the SEM was analyzed and the hypothesized model was tested. The model had four exogenous variables (social support, regimen complexity, family income, and age), with eight observed variables (intimacy, assistance, nurturance, worth, social integration, medication regimen complexity index, baht, and year) and three endogenous variables (medication adherence behavior, cognitive function, and health belief). Also included were six observed variables (morisky medication adherence score, Chula mental test, perceived susceptibility, perceived severity, perceived benefits, and perceived barrier). The equation of SEM is:

$$\eta = \beta\eta + \gamma\xi + \zeta$$

Where η = an m x 1 random vector of the endogenous variable

β = an m x m matrix of coefficient of the endogenous variable

γ = an m x m matrix of coefficient of the exogenous variable

ξ = an n x 1 vector of the exogenous variable and

ζ = an m x vector of equation errors in the structure relationship between η and ξ (Joreskog and Sorborn, 1996-2001:2)

Model identification

According to Tabachnick and Fidell (2007), the overidentified model is one with more data points than free parameters. The number of data points is {p (p+1)}/2, where p equals the number of observed variables (Tabachnick and Fidell, 2007: 695). In the hypothesized model, there are 14 observed variables with a total of 105 data points: 14(14+1)/2= 105 and 21 free parameters. The hypothesized model has more

data points than free parameters thus the model was over-identified which means that it could be identified.

Hypothesized model testing

The proposed model tested is shown in Figure 4.1 and table 4.8. Path coefficients were standardized because it is easier to compare the model coefficient in this way (Hair et al., 1998). The results revealed that the hypothesized model did not fit the data using the following values χ^2 = 371.23, *df*= 69, p-value = .00, GFI=.89, AGFI=.83, and RMSEA= .10 The hypothesized model accounted for 42% of variance in medication adherence behavior among the study sample. However, the RMSEA values in the current study were above what was expected. The AGFI values were less than the acceptable value of .90. These diagnostics suggested that the hypothesized model provided a bad fit. In order to decrease χ^2 values, the modification indices, standardized residuals, and expected value suggested through freed the Theta-Epsilon metric (TE) and Theta-Delta (TD) was used . Therefore, the proposed model was refitted in order to obtain a suitable model that fit the data.

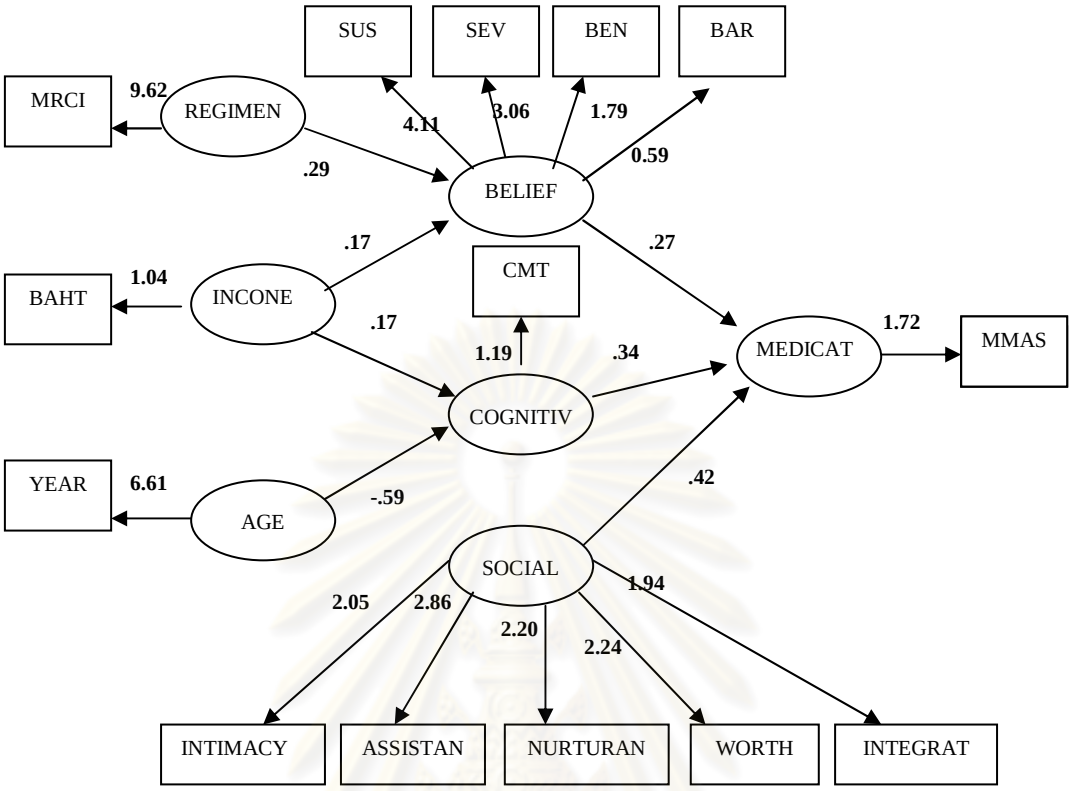


Figure 4.1 The proposed model of medication adherence behavior among the elderly with hypertension

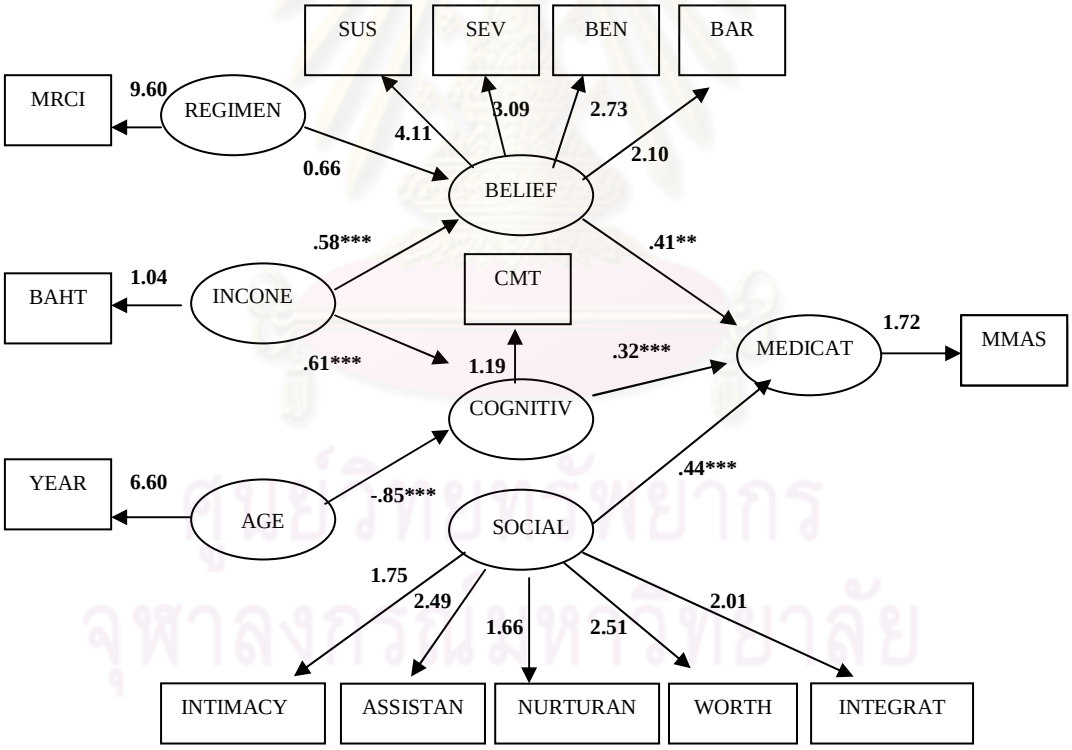
Note

MEDICAT = Medication adherence behavior
-MMAS = Morisky Medication Adherence Scale
BELIEF = Health beliefs
-SUS = Perceived susceptibility
-SEV = Perceived severity
- BEN = Perceived benefits
-BAR = Perceived barriers
COGNITIV = Cognitive function
-CMT = Chula Mental Test
SOCIAL = Social support
REGIMEN = Regimen complexity
-MRCI = Medication Regimen Complexity Index

Model modification

The modified model (Figure 4.2 and Table 4.8) had a better fit than the hypothesized model. The χ^2 estimate was non-significant (χ^2 = 57.77, *df*= 42, p-

value = .053), indicating a good fit. The model exhibiting GFI and AGFI indices were greater than 0.90 (GFI=.98, AGFI=.95) and the RMSEA was less than .05 (RMSEA= .03) meanwhile the χ^2 per degree of freedom was 1.37. It can be seen that the p-value and goodness of fit indices have shown an improvement by adding the relationship of the errors of medication adherence behavior, health belief, cognitive function, social support, regimen complexity, family income, and age. Furthermore, the difference in χ^2 was greater than that of *df* (χ^2 1- χ^2 2 = 313.46, *df*1-*df*2= 27), meaning that the modified model had a better fit to the empirical data.



*p<.05, ** p<.01, *** p<.001

Figure 4.2 The modified model of medication adherence behavior in the elderly with hypertension

Table 4.8 Comparison of the hypothesized and revised structural model

Goodness of Fit indices	Hypothesized model	Revised model
Chi-square	371.33	57.77
Degree of freedom	69	42
p-value	.000	.053
Goodness of fit index (GFI)	.89	.98
Adjusted goodness-of fit- index (AGFI)	.83	.95
Comparative Fit Index (CFI)	.93	1.00
Root mean square error of approximate (RMSEA)	.10	.03
Normed fit index (NFI)	.91	.99
R^2 for structural equations	.42	.70

Evaluation of goodness of fit criteria is presented as follows:

1. Offending estimates

The modified model had no negative error variance, with standardized coefficient close to 1, or very large standard errors, indicating that there were no offending estimates.

2. Overall fit index

The absolute fit measures showed that elements of the covariance matrix reproduced by the parameter estimates of the hypothesized model were not significantly different from the covariance of empirical data (p-value = .053), and the RMSEA was small (.03), indicating an empirical data fit. The GFI and AGFI were above .90 and close to 1 (.98 and .95), respectively. The ratio of χ^2 to the degree of freedom was less than 2 as an indication of information on the relative efficiency of the competing model in accounting for the data.

3. Measurement of model fit

Most indicators loading were statistically significant at the level .05. The reliability of indicators ranged from .22 to 1.00, suggesting that most indicators were sufficient in representing the constructs.

4. Structural model fit

All path coefficients were statistically significant. The correlations between the constructs were not high. The R^2 for the structural equation was .70, meaning that the revised model could account for 70% of the variance in medication adherence behavior among the elderly with hypertension. For other predictors, the model accounted for 71% of the variance in cognitive function and 36% of variance in health beliefs. In conclusion, the statistics confirmed that the hypothesized structural equation model fit the structural equation model derived from the empirical data.

Hypothesis testing

In order to test the seven hypotheses, the direct and indirect effects were estimated. A summary of the effects of the causal variables on the affected variables is presented in table 4.9. The hypotheses of the proposed causal model of medication adherence behavior were examined and the findings are as follows.

Hypothesis 1: *Health beliefs have a positive direct effect on medication adherence behavior*.

The statistical analysis in Table 4.9 and Figure 4.2 illustrates that health belief had a significant positive direct effect on medication adherence behavior (β = .41, p<.01). Therefore, this hypothesis was supported.

Hypothesis 2: *Cognitive function has a positive direct effect on medication adherence behavior.*

According to the modified model (Table 4.9, Figure 4.2), cognitive function has a positive direct effect on medication adherence behavior (β = .32, p<.001). Thus, hypothesis two was supported.

Hypothesis 3: *Social support has a positive direct effect on medication adherence behavior.*

The parameter estimates in table 4.9 and figure 4.2 demonstrated that following model modification, social support was still reported as statistically significant, with a strong positive direct effect on medication adherence behavior (γ=-.44, p<.001). Therefore, the hypothesis was supported.

Hypothesis 4: *Regimen complexity has a positive direct effect on health beliefs and an indirect effect on medication adherence behavior through health beliefs.*

The findings in Table 4.9 and Figure 4.2 demonstrates that regimen complexity had a significant positive direct effect on health beliefs (γ= .66, p<.001), and a positive indirect effect on medication adherence behavior (γ= .27, p<.01) through health beliefs. Therefore, hypothesis four was supported.

Hypothesis 5: *Family income has a positive direct effect on health beliefs and indirect effect on medication adherence behavior through health beliefs.*

The findings in Table 4.9 and Figure 4.2 show that family income had a significant positive direct effect on health beliefs (γ=.58, p<.001) and a significant positive indirect effect on medication adherence behavior through health beliefs (γ=.43, p<.001). Thus, this hypothesis was supported.

Hypothesis 6: *Family income has a positive direct effect on cognitive function and an indirect effect on medication adherence behavior through cognitive function.*

As demonstrated in Table 4.9 and Figure 4.2, family income had a significant positive direct effect on cognitive function (γ= .61, p<.001) and a significant positive indirect effect on medication adherence behavior through cognitive function (γ=.43, p<.001). Thus, this hypothesis was supported.

Hypothesis 7: *Age has a negative direct effect on cognitive function and an indirect effect on medication adherence behavior through cognitive function.*

As demonstrated in Table 4.9 and Figure 4.2, age had a significant negative direct effect on cognitive function (γ= -.85, p<.001) and a significant negative indirect effect on medication adherence behavior through cognitive function (γ= -.27, p<0.001). Thus, this hypothesis was supported.

Table 4.9 Summary of the effects of causal variables on the affected variables (n=422)

Causal variables	**Affected variables**								
	Health belief			**Cognitive function**			**Medication adherence behavior**		
	DE	IE	TE	DE	IE	TE	DE	IE	TE
Age	-	-	-	-.85***	-	-.85***	-	-.27***	-.27***
Family income	.58***	-	.58***	.61***	-	.61***	-	.43***	.43***
Regimen complexity	.66***	-	.66***	-	-	-	-	.27**	.27**
Social support	-	-	-	-	-	-	.44***	-	.44***
Health beliefs	-	-	-	-	-	-	.41**	-	.41**
Cognitive function	-	-	-	-	-	-	.32***	-	.32***

*p<.05, ** p<.01, *** p<.001

Note:

DE = Direct effect

IE = Indirect effect

TE = Total effect

Summary

In summary, this chapter explained the demographic characteristics of the study sample and the study variables. The preliminary analysis demonstrated that the assumptions for the SEM analysis were not violated. Each of the measurement models was examined and confirmed the construct validity. The hypothesized causal model of medication adherence behavior among the elderly with hypertension was analyzed and modified. The modified causal model fit well with the empirical data. Moreover, the research hypotheses were fully supported and all of the variables in the modified model explained approximately 70 % of the variance in overall medication adherence behavior among the elderly with hypertension.

CHAPTER V

DISCUSSION, IMPLICATIONS AND RECOMMENDATIONS

This chapter focuses on a discussion of the findings, including characteristics of the study sample, medical characteristics of the sample, characteristics of the study variables, and the model and hypothesis testing results. Consequently, the obtained results are interpreted and evaluated in the terms of nursing implications. The latter section in this chapter provides a conclusion of the study and recommendations for future research.

Characteristics of the study sample

The results of the previous chapter showed that the age of the study sample was in the range of 60 to 85 years. The mean value of the age was 69.54 years, with a Standard Deviation of 6.61. The National Statistical Office (2007) and recent trends in gerontology have classified the chronological age of the elderly into three groups: the elderly aged 60-69 years are considered as young old, 70-79 years are considered as old-old, and those 80 years of age or over are considered as the oldest old. Therefore, most of the samples (51.9%) were considered as younger old adults.

The statistical analyses presented in the previous chapter demonstrated that the characteristics of the study sample were similar to previous study. The majority of the obtained study sample was female (77.5%). The sample group consisted of the married elderly 55.5% and 41.2% who were widowed. This is similar to a report of the National Statistical Office (2007): most Thai elderly are female (55.4%), 62.5% are married, and 32.4% widowed.

With regard to education in the study sample, the findings indicated that approximately 81.0% completed primary school and 10.9% had no formal education. Few participants completed higher than high school. About 68% of the elderly were not working, while 32% were working. This is similar to a report of the National Statistical Office (2007): most of them (68.9%) graduated from primary school or had no formal education (21.6%). Only 9.5% graduated higher than primary school. Most of the elderly were not working (64.3%), while 35.7% still worked.

Considering income, the findings indicated that 60.0% of the sample reported that their income was enough to live on. More than half of their family income (59.7%) was ≤10,000 baht per month and 16.6% was >10,000-20,000 baht per month. These statistics were similar to previous study. Wasana Khrutmuang (2004) reported that the family income of the elderly with hypertension was≤10,000 baht per month (87.5%), while 12.5% reported that their family income was >10,000. They reported that their income was enough to live (63.5%). Vishuda Charoenkitkarn (2000) reported that the family income of the elderly with hypertension was≤10,000 baht per month (88.3%), and 9.2% was >10,000-20,000 baht per month. And they reported that their income was enough to live (82.5%). This is similar to a report of the National Statistical Office (2007) that indicated that 56.5 reported that their income was enough to live on, 20.7% reported that their income was enough sometimes, and 21.2% reported their income was not enough, while 1.6% reported that their income was more than enough.

Health welfare is a kind of health security for the elderly which is provided by the public or private sector. The findings indicated that the types of welfare in every age group were comprised of the universal coverage heath care scheme (71.6%). This

is similar to a Survey of Health and Welfare 2007 by the National Statistical Office, which found that most populations of the country access such welfare at 96.3%, where the elderly are found to access such welfare at the biggest rate: 97.6%. The type of welfare that most elderly in every age group have is the health security card. Next is the type of civil servants' medical benefit security, while the welfare provided by employers was found to be used in the smallest number, i.e. less than 0.1% in all age groups (National Statistical Office, 2007).

Medical Characteristics of the sample

The results of the previous chapter showed that most of the subjects (65.2%) could control their blood pressure and 34.8% could not. These statistics were similar to previous study. Napaporn Limpiyakorn (2008) reported that the elderly that can control their blood pressure (systolic blood pressure <140 mmHg and diastolic blood pressure < 90 mmHg) was 70.6%, and 29.4% could not control their blood pressure. Mallian et al. (2001) found that the proportion of the elderly with controlled blood pressure decreased with age from 26% (60-69 years) to 21% (> or =80 years). Most of the elderly were younger old (51.9%) and they exhibited more blood pressure control than other age groups.

In terms of antihypertensive medication, nearly half of the patients (46.2%) received calcium channel, follow by diuretics (37.9%), beta-adrenergic (36.0%), and angiotensin coverting enzyme (35.1%). This result was similar to the study of Napaporn Limpiyakorn (2008), which reported that most of the elderly with hypertension received calcium channel blockers both patients that could control their blood pressure (66.2%) and that could not control their blood pressure (85.2%).

Calcium channel blockers decreased vascular resistance and had no significant effects on serum lipid levels or the central nervous system; therefore, they are theoretically ideal antihypertensive agents for the elderly (Applegate, 1989). Calcium channel blocker is effective in decreasing blood pressure and had no effects on blood glucose levels (Leonetti et al, 2002; Ralph and Johnson, 2004).

With reference to the number of antihypertensive drugs, more than half of the elderly (56.4%) were receiving more than one antihypertensive drug, while 43.6% received only one antihypertensive drug. This result was similar to the study of Napaporn Limpiyakorn (2008), which reported that most of the elderly with hypertension received more than one antihypertensive drug both patients that could control their blood pressure (78.5%) and those that could not (80.2%).

About 79.6% of patients had duration of sickness of 1-10 years, and 16.5% of the patients had duration of sickness of 11-20 years. Boonsri Nugate (1998) reported that the elderly with hypertension have duration of illness of 1-10 years (76.7%), 11-20 years (11.67%), and > 20 years (11.67%). This result was similar to previous study. Wasana Khrutmuang (2004) reported that the elderly with hypertension have a duration of illness of <5 year (35.0%), 5-10 years (46.5%) and > 10 years (18.5%). Vishuda Charoenkitkarn (2000) reported that elderly with hypertension have duration of illness of 1-10 years (90%), while 5.8 % of the patients had duration of sickness of 11-20 years.

Sixty-six percent of the subjects had comorbidity, while 23.0% of the subjects had only hypertension. Their comorbidities were diabetes mellitus (44.1%), hyperlipidemia (30.6%), heart disease (14.9%), musculoskeletal disease (11.6%), kidney disease (5.7%), and eye disease (4.5%). This result was similar to previous

study. Wasana Khrutmuang (2004) reported that most of the elderly with hypertension (71.5%) had comordidity, while 28.5% had only hypertension. Prasert Assantachai et al. (1998) reported the medical conditions among the elderly with hypertension were diabetes mellitus (22.9%), hypertlipidemia (13.9%), hyperuricemia (33.9%), and heart disease (18.0%).

Characteristics of the study variables

The variables examined in this study include age, family income, cognitive function, regimen complexity, health beliefs, social support, and medication adherence behavior. Age and family income were described in the characteristics of the study sample.

Medication adherence behavior

It was found that the statistical means of the medication adherence behavior score in the study sample was 6.17 (SD = 1.81), while the collected medication adherence behavior ranged from 1.50 to 8.00. About 31.5% exhibited high adherence behavior and 40.8% had medium adherence behavior, whereas 27.7% had low adherence behavior. Most of study sample adhered to taking medication at a moderate to high level. More than half of the elderly were married (55.5%). The reason may possibly be because the treatment was covered by the universal coverage heath care scheme (71.6%); thus it could help the subjects achieve better medication adherence. Most of samples (51.9%) were young elderly who had the ability to take medication. The research suggests that the young old (ages 60 to 75) tend to have relatively high rates of medication adherence, but that the older-old (older than age 75) are more likely to forget their medications (Insel et al., 2006).

Cognitive function

The findings of the present study demonstrated that the cognitive function of the study sample ranged from 15 to 19 (mean = 17.82, SD= 1.19). This means that all of the elderly exhibited high cognitive function. The reason may possibly due to the fact that most of the elderly were younger old (60-69 years) (51.9%). Vichai Aekplakorn (2010: 258) found that the prevalence of cognitive impairment among the Thai elderly increased with advancing age and that the younger old (60-69 years) represented lowest group. The elderly that had adequate cognitive functioning and received information about their medication could understand the illness, its treatment, and the purpose of taking the medication. They also comprehended, organized and remember the medication regimen requirements, when to take the medication, what kind of side effects could be expected, and how to deal with them, (Van Vliet et al., 2006).

Health beliefs

The findings of the present study demonstrated that the health beliefs of the study sample ranged from 34 to 88 (mean = 65.55, SD= 11.11). This means that all of the elderly perceived health beliefs at a high level. Considering the dimensions of health beliefs, the elderly reported that they perceived susceptibility (mean = 19.35 from range 5 to 25, SD= 5.12), perceived severity (mean = 16.59 from range 4 to 20, SD= 3.37), and perceived benefits (mean = 22.11 from range 5 to 25, SD= 3.37) were at a high level too, and perceived barriers were at a low level (mean = 7.49 from range 4 to 20, SD= 3.66). The reason may possibly be due to the fact that the duration of the disease or sickness among the samples was 1-10 years (79.6%) and 11-20 (16.5%). The elderly have experience with the disease and obtain information about their

disease from healthcare providers and other sources. The National Statistical Office (2007) reported that most of the elderly (81.0%) receive information that is useful for them, information from other sources such as leaders of the community, family and friends (60%), television (57.4%), community radio (35.6%), own radio (32.8%), and the news paper (14.4%). The elderly perceived that the low barriers might have been because they did not have difficulty in getting to the hospital, which was nearby, and that the treatment was covered by the universal coverage health care scheme.

Social support

The findings of the present study demonstrated that the social support of the study sample ranged from 67 to 125 (mean = 107.11, SD= 11.97). This means that all of the elderly perceived social support at a high level. Considering the dimensions of social support, the elderly reported that they received intimacy (mean = 21.59 from range 13 to 25, SD=2.74), assistance (mean =20.79 from range 8 to 25, SD=3.39), nurturance (mean = 22.07 from range 12 to 25, SD= 2.75), worth (mean = 21.16 from range 12 to 25, SD= 2.88), and social integration (mean = 21.50 from range 13 to 25, SD= 2.68) at a high level also.

This study was similar to a study of Piyathida Kuhirunyaratn et al. (2007) and Jirawan Inkoom (2006), which indicated that the level of social support among the Thai elderly was high. The reason may possibly be because most of the elderly were married (55.5%) and stayed with their families. With respect to the number of family members who live with the elderly, it was found that most of the elderly (92.3%) lived with many family members in their home and 7.7% of the elderly lived alone. Most (60.2%) of the elderly lived with their children (either their single or married children, including their sons or daughter–in-law) (National Statistical Office, 2007).

Family has been identified as the significant resource of social support for Thai elderly (Prapaporn Chinuntuya, 2001; Jirawan Inkoom, 2006). Significant social support provided by the families, including intimacy, assistance, nurturance, worth, and social integration, led to the elderly reporting that they received social support at a high level. The findings of the present study coincide with the results of a previous study by Prapaporn Chinuntuya (2001). Here it was reported that the elderly that lived with their families were given a high level of social support because their families were the most important resources of social support, providing tangible, emotional support and assistance for them. Social support was seen in activities such as reminding patients to take antihypertensive medication and accompanying patients to the physician. Many studies showed that the elderly that had emotional support and help from family members, friends or health care providers, were more likely to adhere to treatment (DiMatteo, 2004; Volis et al., 2005).

Regimen complexity

The findings of the present study demonstrated that the regimen complexity score ranged from 11–49.50 (mean = 24.09, SD= 9.61). This means that all of the study sample exhibited low regimen complexity. The use of multiple medications is often required and beneficial in helping patients with multiple chronic diseases and related to regimen complexity. The elderly prescribed multiple drugs often have to take medications at several different times, use multiple dose forms, and multiple routes of administration (Elliott, 2006). The more number of medications indicated the more complexity of the medication regimen. Most of elderly in the studied sample were taking 1-2 antihypertensive drugs. Therefore, they exhibited low regimen complexity.

Model and hypothesis testing results

The findings reveal that seven hypotheses were fully supported by the empirical data.

1. Health beliefs have a positive direct effect on medication adherence behavior.

The results of the study demonstrated that health beliefs have a positive direct effect on medication adherence behavior (β = .41, p<.01). This means that this hypothesis was supported by the results of the study. It also means that the elderly with good health beliefs can adhere to their medication regimen.

The results confirm the hypotheses of the medication adherence model by Park and Johns (1997), who stated that health beliefs have a direct effect on medication adherence among the elderly. The elderly that perceive that their diseases are serious and that perceive that they are susceptible to complications are more likely to adhere to therapy (Dazii, 2000; Tan, 2004). A study of Lagi et al. (2006) found that patients with high cardiovascular risk exhibit better pharmacological adherence. This observation is in line with findings reported for patients suffering from life threatening or invalidating diseases, such as stroke or myocardial infarction. There are fewer dropouts (approximately 4%) and excellent pharmacological adherence (rate between 85 and 87%) among those that are in secondary prevention (Sappok et al., 2001). These results are also supported by a comparison study of adherence among hypertensive patients with and without diabetes (Egede, 2003). Consciousness of the disease, awareness of its effects, and the experience of being an invalid seem to be the best deterrents to good or sufficient adherence. The findings demonstrated that the key reason for respondents' need for antihypertensive was based upon their perceived risk of having a heart attack or stroke (Lehane and MaCarthy, 2007). This

corresponds with the findings of Sharkness and Snow, (1992) and Svensson et al. (2000), where the majority of participants reported complications as the main reason for adhering to prescribed medication. Park et al. (2010) found that adherence was significantly high in patients that considered complications more seriously. Additionally, the elderly that felt less burdened by taking medications, perceived fewer adverse medication effects, and perceived more health benefits were significantly more likely to adhere to their prescribed medication regimen (Brown and Segal, 1996; Arnstern et al., 1997). Additionally, Pattama Surit (2001) found that the Thai elderly that had a high level of health beliefs exhibited higher self-care (i.e., diet, exercise, medication).

2. Cognitive function has a positive direct effect on medication adherence behavior.

The findings of the study revealed that cognitive function has a positive direct effect on medication adherence behavior (β = .32, p<.001). This means that this hypothesis was supported by the results of the study. The elderly with good cognitive function can adhere to the medication regimen.

The results confirm the hypotheses of medication adherence model by Park and Johns (1997), who stated that cognitive function has a positive direct effect on medication adherence among the elderly. The amount of cognitive resources available to an individual, in some circumstances, will determine whether he or she is able to comprehend and remember a complex medication regimen. An individual that does not understand or remember a medication regimen cannot adhere to it. Park and Johns (1997) have identifies elements of cognitive function including comprehension, working memory, long-term-memory, and prospective memory. Accurate adherence to a complex medication regimen involves these cognitive elements. First, older

adults have to comprehend the instructions for each medication (comprehension). Second, they have to organize and integrate the instructions for multiple medications (working memory) and dose into a daily medication schedule, and then remember the medication schedule (long-term-memory). Finally, older adults must remember to actually take the medications at the appropriate time (prospective memory) (Park, 1992). The elderly that have adequate cognitive functioning and received information about their medication can understand the illness, its treatment, and the purpose of taking the medication. They also comprehend, organize and remember the medication regimen requirements, when to take the medication, what kind of side effects can be expected, and how to deal with them, (Van Vliet et al., 2006). Then they can adhere to the medication regimen. Impaired cognitive function in the elderly patients may be a risk factor for nonadherence because these patients may have problems remembering to take their medications or remembering the adequate dose or because they do not know how to handle the number of medications that they have been prescribed (Morell et al., 1997; Cramer, 1998).

3. Social support has a positive direct effect on medication adherence behavior.

The results of the study indicated that social support has a positive direct effect on medication adherence behavior (γ=.44, p<.001). Therefore, the hypothesis of the study was supported. This means that the elderly with good social support can adhere to the medication regimen.

The results confirm the hypotheses of the medication adherence model of Park and Johns (1997), who stated that social support has a positive direct effect on medication adherence among the elderly. Social support is seen in activities such as reminding patients to take antihypertensive medication and accompanying patients to

the physician. Many studies have shown that the elderly that had emotional support and help from family members, friends or health care providers are more likely to adhere to the treatment (DiMatteo, 2004; Volis et al; 2005). This social support helps patients to reduce negative attitudes to treatment, and to have motivation and remember to implement the treatment as well (Jin et al., 2008). Social support involves the help that family members, friends, or caregivers provide to help patients adhere to their medication regimens. Patients that believe that they have social support demonstrate greater treatment adherence. Family cohesion and the stability of home life is an important predictor of adherence (Krueger et al., 2005).

4. *Regimen complexity has a positive direct effect on health beliefs and an indirect effect on medication adherence behavior through health beliefs.*

The findings of the study indicated that regimen complexity had a significant positive direct effect on health beliefs (γ= .66, p<.001) and had a significant indirect effect on medication adherence through health beliefs (γ= .27, p<.01). Therefore the hypothesis of the study was supported.

The results confirm the hypotheses of the medication adherence model by Park and Johns (1997), who stated that medication and disease variables have an indirect effect on medication adherence through illness representation. Most of the elderly sample had more than one disease (77%) and had more than one antihypertensive medication prescribed (56.4%). The use of multiple medications is often required and beneficial in helping patients with multiple chronic diseases and is related to regimen complexity, and regimen complexity consists of multiple different characteristics of the prescribed regimen. These include the dosage forms, dosage frequency, and additional instructions for drug administration (George et al., 2004).

The elderly prescribed multiple drugs often have to take medications at several different times of the day, some before meal, some after meal, and they sometimes need to halve tablets, and often use multiple dose forms and multiple routes of administration (Elliott, 2006).

The rationale for discussing these finding is given herein. Most of the elderly have more than one chronic disease, and they consequently have multiple medications to take; these come with the complexity of the medication prescribed. The more complex the medications, the more likely it is for the elderly to perceive that their illness is severe and that they medications will benefits them. Beliefs in the severity of the disease and the benefits of medication make them adhere to the medication regimen. According to Sharkness and Snow (1992) and Monane et al. (1994), elderly patients with more than one chronic illness, requiring the use of more than one drug, were more likely to believe themselves in need of treatment, and therefore were more likely to exhibit adherence than those needing only one drug. This is similar to the study of Lagi et al. (2006), where it was found that patients that prescribed drugs ≥3 pills per day, and that were hypertensive with risk factors and hypertension with comorbidity showed greater compliance than patients that prescribed drugs 1-2 pill per day that were hypertensive. The results imply that patients may perceive the severity of disease and then adhere to the medication (Lagi et al., 2006). Adherence was also higher among people taking higher numbers of medications, and among those that perceived their medications as being more necessary (Treharne et al., 2004; Neame and Hammond, 2005; Aikens and Piette, 2009).

5. *Family income has a positive direct effect on health beliefs and an indirect effect on medication adherence behavior through health beliefs.*

The findings of the study support the hypothesis that family income had a significant positive direct effect on health beliefs (γ=.58, p<.001) and a significant positive indirect effect on medication adherence behavior through health beliefs (γ=.43, p<.001).

The results confirm the hypotheses of the medication adherence model of Park and Johns (1997), who stated that individual difference variables, such as socioeconomic status, have an indirect effect on medication adherence through illness representation. The elderly with higher family income also have higher health beliefs. The Thai elderly reported that they often received income from their family (Knodel et al., 2009). Income had the greatest impact on the health belief model variables and health behaviors among the elderly (Wacker, 1990). A possible reason is that high income is related to high education and opportunities to access the facilities to improve health such as healthful nutrition or good healthcare utilization. Their family members frequently completed high education, and then they access of information about hypertension disease and hypertensive medication. They can take care of their parent by translated this information to their parents. Higher family income can easily access health care programs (Al-Ali and Haddad, 2004). They have discussions with a physician about their susceptibility to the disease and the benefits of medication. Beliefs in one's susceptibility to the complication of hypertension, severity of hypertension, benefits of taking antihypertensive medication, and barriers of taking hypertensive medication make them adhere to the medication regimen. Unson et al. (2005) have described the mechanism through which family income affects use of

osteoporosis medications and hormone therapy by increasing knowledge about osteoporosis and hormone therapy. Another possible link between family income and medication use is through perceived susceptibility. Having a discussion with a physician about disease was associated with increased perceptions of susceptibility. Arcangelo (1991) found that the elderly with a lower income and felt that medications had a poor benefit misused medications more frequently than those with a higher income and that felt that the medications worked well.

6. *Family income has a positive direct effect on cognitive function and an indirect effect on medication adherence behavior through cognitive function.*

The findings of the study showed that family income had a significant positive direct effect on cognitive function ($\gamma = .61$, $p < .001$) and a significant positive indirect effect on medication adherence behavior through cognitive function ($\gamma = .43$, $p < .001$). This means that the results of present study were supported.

The results confirm the hypotheses of the medication adherence model by Park and Johns (1997), who stated that individual difference variables have an indirect effect on medication adherence through cognitive function. The elderly with higher family income also have higher cognitive status because they have enough money to buy vitamin, food, radio, video, and television that is useful for cognitive function. The radio, video, and television give the elderly about information and entertainment. These are materials that can stimuli the brain and maintain cognitive status of the elderly. Lindeman et al. (2000) found a significant association between serum folate and vitamin C, and annual family income. The elderly that have a family income above the poverty level (greater than $15,000) have higher vitamin concentration in their food. The cognitive status score was positively related to education level, pocket

money, and physical activity (Kim, 2003). The elderly that had a higher cognitive status score ate more meat/poultry/fish/eggs and milk or milk products than the subjects that had a lower cognitive status score (Kim, 2003). Kim et al. (1998) have revealed that the cognitive function score had a strong relationship with food intake, such as total amounts of foods, fish and shellfish, milk and dairy products, total animal food, fruit, bread and sugar. Energy, protein, Ca, P, riboflavin, and niacin were also shown to have positive relationships with cognitive function scores.

Family income indirectly affects medication adherence behavior through cognitive function. The rationale for discussion of this finding is given below. The elderly with higher income usually have enough money to buy food, vitamins, radio, video, and television from various sources. Adequate nutrient intake is essential in maintaining cognitive status among the elderly (Kim, 2003). The stimuli from radio, video, and television can maintain cognitive status of the elderly. The elderly that have adequate cognitive functioning can understand the illness, its treatment, and the purpose of taking the medication. They also comprehend, organize, and remember the medication regimen requirements, when to take the medication, what kind of side effects can be expected, and how to deal with them, (Van Vliet et al., 2006). They then can adhere to the medication regimen.

7. Age has a negative direct effect on cognitive function and an indirect effect on medication adherence behavior through cognitive function.

The findings of the study revealed that age had a significant negative direct effect on cognitive function (γ= -.85, p<.001) and a significant negative indirect effect on medication adherence behavior through cognitive function (γ= -.27, p<.001). Thus,

this hypothesis was supported. The study indicated that cognitive impairment occurs with advanced age.

The results confirm the hypotheses of the medication adherence model of Park and Johns (1997), who stated that age has an indirect effect on medication adherence through cognitive function. It has been well documented that changes in cognitive functioning are normal with increasing age (Tuokko and Hadjistavropoulos, 1998; Glisky and Glisky, 1999). Much of the age related variance that occurs in medication adherence is likely mediated through cognitive function. Considerable evidence shows that comprehension declines with age, particularly information that is inferential in nature (Cohen, 1981). This is an important issue with respect to medication adherence since that failure to understand what one is to do with medications preclude accurate adherence (Blackwell, 1979). It is well documented that many aspects of memory declines with age (Salthouse, 1991). Deficits in working memory function (the ability to simultaneously store and process information on-line) may contribute to problems in organizing complex medication information, resulting in what is apparently poor comprehension of a regimen (Park, 1992; Park and Kidder, 1996). Declines in long-term memory may affect the elderly ability to remember what they are to do with a medication plan once they have developed one.

Another type of memory that has a critical impact on medication adherence is prospective memory; that is, remembering to perform planned actions in the future. Remembering to take medication at the appropriate time is an example of a prospective memory task. Prospective memory tied to a contextual cue or an event (such as taking medication with breakfast) does not appear to decline as much with age when compared to prospective memory that is time based, when a response must

occur at a specific time, but is not cued by an event (Einstein and MaDaniel, 1990; Park et al, 1992). Park and Kidder (1996) discuss the prospective aspects of medication-taking behavior in detail. They conclude that the retrospective aspects of taking medication (understanding and remembering the regimen) may influence subjects' prospective performance with respect to medication-taking. Because of the time-based nature of medication adherence, this aspect of adherence may be a particularly difficult task for the elderly that can be mitigated to some extent by typing the time based task to an event. They also note that there is evidence that more salient prospective tasks are more likely to be remembered than less salient task.

Overall, there is substantial reason to believe that the cognitive aspects of medication adherence are important element of this complex behavior. Given that the elderly do evidence decline in a number of cognitive domains and that they do appear to comprehend and remember less about medication information than young adults. Park and Jones (1997) conclude that the oldest old were the most nonadherence subject.

Conclusions

There is reliable evidence indicating that a significant number of the elderly with hypertension are faced with poor medication adherence and cannot control their blood pressure. In 2009-2010, a report of the Thailand population health examination survey IV found that incidence of blood pressure control among the elderly was only 22-25% (Vichai Aekplakorn, 2010). Moreover, among 45.7% of hypertensive patients that had poor adherence with antihypertensive medication, 60 % of them were elderly (Amphai Auksornsiri, 2002). Poor medication adherence causes serious impact on

health and the healthcare system (including poor blood pressure control and increasing of hospital admission). The poor medication adherence of the elderly with hypertension is a crucial public health concern. This phenomenon impacts not only as health, but also as a cost burden for the government budget. Therefore, understanding the factors influencing medication adherence behavior among the elderly with hypertension to a significant degree is necessary and needed in order to develop effective intervention programs for promoting medication adherence.

Therefore, this study has been set up and performed to investigate and develop a causal model for explaining medication adherence behavior among the elderly with hypertension. The study includes an examination of the causal relationships between the significant factors such as regimen complexity, family income, age, health beliefs, cognitive function, social support, and medication adherence behavior among this group. The work has been carried out using a conceptual framework of the medication adherence model developed by Park and Johns (1997) and available supporting literature.

The samples of 422 elderly with hypertension aged 60 to 85 years (mean 69.54 years old) that visited the outpatient department of general hospitals in different regions of Thailand were randomly recruited for this study. The majority of the elderly were female (77.5%) and married (55.5%). Most of them had completed primary school (81.0%), while 10.9% had no formal education. Concerning working status, most of the elderly were not working (64.4%), and their family income was lower than 10,000 baht/month (59.7%). The duration of their sickness ranged from 3 months to 35 years with a mean of 7.66 years (SD= 6.92). Most of them were able to control their blood pressure (65.2%), whereas 34.8% could not control their blood

pressure. In terms of antihypertensive drugs, more than half of them (56.4%) were receiving more than one antihypertensive drug. Regarding types of antihypertensive drugs, nearly half of the elderly (46.2%) received calcium channel, followed by diuretic (37.9%). Sixty-six percent of the elderly had comorbidity, while 23.0% of the elderly had only hypertension disease. The most frequent comorbidities were diabetes mellitus (44.1%) and hyperlipidemia (30.6%).

According to the data evaluation, it was found that most of the elderly had normal cognitive functions, were younger-old, had a low family income, low regimen complexity, high health beliefs, high social support, and exhibited moderate to high medication adherence behavior.

The structure Equation Modeling (SEM) analysis was performed using LISREL 8.52 software. The permanent findings for each research question investigated in this study are as follows:

1. Does the hypothesized causal model that explains the medication adherence behavior among the elderly with hypertension, including regimen complexity, family income, age, health beliefs, cognitive function and social support, adequately fit the data?

The SEM analysis results indicated that the proposed model fit the empirical data well (χ^2 = 57.77, *df*= 42, p value= .053, GFI=.98, AGFI=.95, RMSEA= .03) and accounted for 70% of the variance in medication adherence in the elderly with hypertension. The findings depicted that the strong predictors were included in the model and that the model was parsimonious (χ^2 < 2.df).

2. Do health beliefs, cognition function, and social support have direct effects

on medication adherence behavior?

The results of the study demonstrated that health beliefs had a significant positive direct effect on medication adherence (β = .41, p<.01). The findings of the study also revealed that cognitive function had a significant positive direct effect on medication adherence (β = .32, p<.001). Further, the findings of the study confirm the hypothesis that the level of social support has a significant positive direct effect on medication adherence (γ=.44, p<.001).

3. Does regimen complexity have an indirect effect on medication adherence behavior through health beliefs?

The findings showed that regimen complexity has an indirect effect on medication adherence behavior through health beliefs (γ= .27, p<.01).

4. Does family income have an indirect effect on medication adherence behavior through health beliefs and cognitive function?

The findings showed that family income has an indirect effect on medication adherence behavior through health beliefs (γ=.43, p<.001) and cognitive function (γ=.43, p<.001).

5. Does age have an indirect effect on medication adherence behavior through cognitive function?

The findings indicated that age has an indirect effect on medication adherence behavior through cognitive function (γ= -.27, p<.001).

The research hypotheses were fully supported by the data. Among the predictors, social support is the strongest predictor, followed by health beliefs and cognitive function. The model was similar to the medication adherence model in that social support, cognitive function, and health beliefs have direct effects on medication

adherence. Regimen complexity and family income have an indirect effect on medication adherence through health beliefs. Age has an indirect effect on medication adherence through cognitive function. Additionally, this study contributes to the medication adherence model literature by demonstrating that cognitive function explained 71% of variance in family income and age, and health beliefs explained 36% of variance in regimen complexity and income.

Implications for nursing

Since little is known about determinants for medication adherence behavior among the elderly with hypertension, this study proposed a causal model which explained 70% of the variance in medication adherence behavior of this group. The results of this study contributes to nursing knowledge by explaining the important effects of regimen complexity, health beliefs, family income, age, cognitive function, and medication adherence behavior among the elderly with hypertension.

Social support is the strongest influencing factor, had a significant positive direct effect on medication adherence behavior. An evaluation of patients' social support is recommended in order to help nurses identify a level of social support the patients perceived and what types of social support the patients need. Family members play an important role to promote medication adherence behavior of hypertensive elderly, nurses should involve family member in the nursing interventions, such as hypertension education program and support programs. Such programs can help family member better understanding the disease and its complications, what hypertensive patients need, and know how to help the patient adherence to medication.

Regarding cognitive function, it had a significant positive direct effect on medication adherence behavior. An evaluation of patients' cognitive function is recommended in order to help nurses identify a level of cognitive function and needs. Especially in patients with low income and advancing age, those have risk for nonadherence. Nurses not only provide knowledge to the patients but also should evaluate how much understanding the patients have after teaching. Especially in elderly patients, an evaluation should be performed over time because they may forget what they already learned. It is possible that patients may need to repeat the hypertension knowledge after long period of time. Moreover, nurses should conduct individualized care plan to improve adherence, for example: (1) involve a restructuring of medication information to make it easier to process, (2) take the form of a device that reorganizes the medications themselves, or (3) serve some type of reminder function to take medication such as voice mail, digital caps, and beeping caps.

Health beliefs had a significant positive direct effect on medication adherence behavior. An evaluation of patients' perception toward their health and disease is recommended in order to help nurses identify patients' health problem and needs. Especially in patients with low income and have more medications to prescribed, those have risk for nonadherence. The elderly who have more complexity of medication regimen are likely to be adherence when they perceive severity of disease and benefits of medication prescribed. Nurses should take an active role in assessment regimen complexity and promote health beliefs in the patients who have more complexity of medication prescribed, by educating about susceptibility to

complication of hypertension, severity of hypertension, benefits of taking antihypertensive drugs, and barriers to taking antihypertensive drugs.

Limitations

This study is cross-sectional that suffered from not having recorded the longitudinal impact of putative associations on study variables at different time points. Since the study assessed constructs concomitantly, the causal path in the model was based on the hypothesized relationship that has been assessed in the medication adherence model and has accumulated in literature reviews. It is possible that the effects may occur in other directions.

Recommendations for future research

1. This investigation is an exploratory study conducted with the elderly with hypertension that visited general hospitals. Therefore, future studies should be conducted to validate the medication adherence behavior among the elderly with a hypertension model in other areas such as tertiary hospitals or community healthcare centers, and with other populations, age groups, and people of different socioeconomic status.

2. For model stability analysis, study a causal model of medication adherence behavior in the elderly with hypertension in each part of Thailand.

3. Since this is a cross-sectional study, longitudinal or quasi experimental study is needed in order to replicate these findings.

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APPENDICES

APPENDIX A

APPROVAL OF DISSERTATION PROPOSAL

ประกาศ คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

เรื่อง การอนุมัติหัวข้อดุษฎีนิพนธ์ ครั้งที่ 1/2552 ประจำปีการศึกษา 2552

ตามที่คณะพยาบาลศาสตร์ ได้มีประกาศ เรื่อง การอนุมัติหัวข้อดุษฎีนิพนธ์ ครั้งที่ 2/2551 ประจำปีการศึกษา 2551 ประกาศ ณ วันที่ 12 พฤษภาคม 2552 แล้วนั้น เนื่องจากมีการเปลี่ยนแปลงคณะกรรมการสอบฯ **จึงขอยกเลิกประกาศ เรื่อง การอนุมัติหัวข้อดุษฎีนิพนธ์ ครั้งที่ 2/2551 ประจำปีการศึกษา 2551 และใช้ประกาศฉบับนี้แทนดังนี้**

นิสิตผู้ทำวิจัยและอาจารย์ที่ปรึกษาดุษฎีนิพนธ์

รหัสนิสิต	4977975636
ชื่อ-นามสกุล	นางสาวสมลักษณ์ เทพสุริยานนท์
สาขาวิชา	พยาบาลศาสตร์ (นานาชาติ)
อาจารย์ที่ปรึกษา	ศาสตราจารย์ ดร. วีณา จีระแพทย์
อาจารย์ที่ปรึกษาร่วม	รองศาสตราจารย์ ดร. สุจิตรา เหลืองอมรเลิศ
ประธานกรรมการสอบฯ	รองศาสตราจารย์ ร.ต.อ.หญิง ดร. ยุพิน อังสุโรจน์
กรรมการสอบฯ	**รองศาสตราจารย์ ดร. จิราพร เกศพิชญวัฒนา**
กรรมการสอบฯ	รองศาสตราจารย์ ดร. รัชนีกร วิชาการ
กรรมการสอบฯ	ศาสตราจารย์ ดร. ศิริชัย กาญจนวาสี
ชื่อหัวข้อดุษฎีนิพนธ์	แบบจำลองเชิงสาเหตุของพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง A CAUSAL MODEL OF MEDICATION ADHERENCE BEHAVIOR IN THE ELDERLY WITH HYPERTENSION
ครั้งที่อนุมัติ	1/2552
ระดับ	ปริญญาเอก

ประกาศ ณ วันที่ 27 พฤษภาคม พ.ศ. 2553

(รองศาสตราจารย์ ร.ต.อ.หญิง ดร. ยุพิน อังสุโรจน์)
คณบดีคณะพยาบาลศาสตร์

APPENDIX B

APPROVAL OF THE IRB

ที่ อจ ๐๐๒๗.๒๐๓/๒๔๐๕

โรงพยาบาลอำนาจเจริญ
ถนนอรุณประเสริฐ อำเภอเมือง
จังหวัดอำนาจเจริญ ๓๗๐๐๐

๒๐ สิงหาคม ๒๕๕๓

เรื่อง ตอบรับการดำเนินการโครงการวิจัย

เรียน คณบดีคณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

อ้างถึง หนังสือที่ ศธ ๐๕๑๒.๑๑/๐๔๔๑ ลงวันที่ ๑๕ มีนาคม ๒๕๕๓

ตามที่หนังสืออ้างถึง นางสาวสมลักษณ์ เทพสุริยานนท์ นิสิตชั้นปริญญาดุษฎีบัณฑิต คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย กำลังดำเนินการวิจัยเพื่อเสนอเป็นดุษฎีนิพนธ์ เรื่อง แบบจำลองเชิงสาเหตุของพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง โดยมีศาสตราจารย์ ดร.วิฒา จีระแพทย์ เป็นอาจารย์ที่ปรึกษาดุษฎีนิพนธ์ และประสงค์จะขอเสนอรับการพิจารณาจริยธรรมการวิจัย ทั้งนี้โครงการวิจัยได้ผ่านการคัดกรองการวิจัยเพื่อเข้ารับการพิจารณาจริยธรรมโดยกลไกที่เกี่ยวข้องระดับคณะแล้วนั้น

ในการนี้ โรงพยาบาลอำนาจเจริญ ได้พิจารณาโครงการวิจัยดังกล่าวแล้ว เห็นควรให้ดำเนินการได้

จึงเรียนมาเพื่อโปรดทราบ

ขอแสดงความนับถือ

(นายชวฉัตร ลิมปวิทยาคุณ)
ผู้อำนวยการโรงพยาบาลอำนาจเจริญ

กลุ่มการพยาบาล
โทร (๐๔๕) ๕๕๑๑๕๔๐-๘ ต่อ ๑๒๔๑,๑๒๔๒
โทรสาร (๐๔๕) ๕๑๑๕๔๖

ที่ สบ ๐๐๒๗.๒๐๓ /2294

โรงพยาบาลพระพุทธบาท
จังหวัดสระบุรี ๑๘๑๒๐

7 มิถุนายน ๒๕๕๓

เรื่อง ตอบรับการดำเนินการโครงการวิจัย

เรียน คณะบดีคณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

ตามหนังสือที่ ศธ.๐๕๑๒.๑๑/๐๔๔๑ เนื่องด้วย นางสาวสมลักษณ์ เทพสุริยานนท์ นิสิตชั้นปริญญาดุษฎีบัณฑิต คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย กำลังดำเนินการวิจัยเพื่อเสนอเป็นดุษฎีนิพนธ์ เรื่อง แบบจำลองเชิงสาเหตุของพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง โดยมีศาสตราจารย์ ดร.วีณา จีระแพทย์ เป็นอาจารย์ที่ปรึกษาดุษฎีนิพนธ์ และประสงค์จะขอเสนอรับการพิจารณาจริยธรรมการวิจัย ทั้งนี้โครงการวิจัยได้ผ่านการคัดกรองการวิจัยเพื่อเข้ารับการพิจารณาจริยธรรมโดยกลไกที่เกี่ยวข้องระดับคณะแล้วนั้น

ในการนี้ โรงพยาบาลพระพุทธบาท ได้พิจารณาโครงการวิจัยดังกล่าวแล้ว เห็นควรให้ดำเนินการได้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายดนัย ทุริยานนท์)
ผู้อำนวยการโรงพยาบาลพระพุทธบาท

กลุ่มภารกิจด้านการพยาบาล โรงพยาบาลพระพุทธบาท
โทร ๐-๓๖๒-๖๖๑-๑๑ ต่อ ๕๓๓๑-๕๓๓๒
โทรสาร ๐-๓๖๒-๖๖๑-๑๒

ที่ ลพ๐๐๒๗.๒/๓๔๕

โรงพยาบาลลำพูน
๑๗๗ ถนนจามเทวี
อ.เมือง ลำพูน ๕๑๐๐๐

๒๑ มิถุนายน ๒๕๕๓

เรื่อง อนุญาตให้เก็บข้อมูล

เรียน คณบดีคณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

อ้างถึง หนังสือที่ ศธ ๐๕๑๒.๑๑/๐๔๔๐ ลงวันที่ ๑๙ มีนาคม ๒๕๕๓

ตามหนังสืออ้างถึง น.ส.สมลักษณ์ เทพสุริยานนท์ นิสิตชั้นปริญญาดุษฎีบัณฑิต คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ได้ขอความอนุเคราะห์เก็บรวบรวมข้อมูลการวิจัยจากกลุ่มตัวอย่างผู้สูงอายุโรคความดันโลหิตสูง จำนวนน ๘๘ คน ณ กลุ่มงานผู้ป่วยนอก โรงพยาบาลลำพูน นั้น

ในการนี้ โรงพยาบาลลำพูน พิจารณาแล้วไม่ขัดข้อง อนุญาตให้ น.ส.สมลักษณ์ เทพสุริยานนท์ เก็บข้อมูลดังกล่าวได้

จึงเรียนมาเพื่อโปรดทราบ

ขอแสดงความนับถือ

(นางพรพรรณ วรรณฤทธิ์)
หัวหน้ากลุ่มภารกิจด้านพัฒนาระบบบริการสุขภาพ
ปฏิบัติราชการแทน ผู้อำนวยการโรงพยาบาลลำพูน

กลุ่มพัฒนาระบบบริการสุขภาพ
โทร. ๐ ๕๓๕๖ ๙๑๐๐ ต่อ ๑๓๕๑-๒
โทรสาร ๐ ๕๓๕๖ ๙๑๔๒
ไปรษณีย์อิเล็กทรอนิกส์ mail@lpnh.go.th

ที่ สค ๐๐๒๗.๒/๔๙๑๖

โรงพยาบาลสมุทรสาคร
ถนนเอกชัย สค ๗๔๐๐๐

๘ กรกฎาคม ๒๕๕๓

เรื่อง ตอบรับนักศึกษาเก็บข้อมูลวิจัย

เรียน คณบดีฝ่ายวิชาการ

อ้างถึง หนังสือคณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ที่ ศธ. ๐๕๑๒.๑๑/๐๔๔๐
ลงวันที่ ๑๙ มีนาคม ๒๕๕๓

ตามหนังสือที่อ้างถึงคณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ได้ขอความอนุเคราะห์ให้นิสิตเก็บรวบรวมข้อมูลการวิจัย เรื่อง แบบจำลองเชิงสาเหตุของพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง ความละเอียดแจ้งแล้วนั้น

โรงพยาบาลสมุทรสาครได้พิจารณาแล้ว ยินดีให้นางสาวสมลักษณ์ เทพสุริยานนท์ เข้าเก็บรวบรวมข้อมูลได้

จึงเรียนมาเพื่อโปรดทราบ

ขอแสดงความนับถือ

(นายบุญรักษ์ พึ่งเจษฎา)
นายแพทย์ชำนาญการพิเศษ (ด้านเวชกรรม สาขาศัลยกรรม)
ปฏิบัติราชการแทนผู้อำนวยการโรงพยาบาลสมุทรสาคร

กลุ่มพัฒนาระบบบริการสุขภาพ
โทร. ๐ ๓๔๔๒ ๗๐๙๙ ต่อ ๒๑๐๗ - ๘
โทรสาร. ๐ ๓๔๔๒ ๗๐๙๙ ต่อ ๒๑๐๙

โรงพยาบาลพัทลุง
เลขที่ 3345
5 เม.ย. 53
เวลา 13.44 น.

ที่ ศธ 0512.11/ 0441

คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
อาคารวิทยกิตติ์ ชั้น 12 ซอยพญาไท 64
เขตปทุมวัน กรุงเทพฯ 10330

กลุ่มการพยาบาล
เลขที่ 378
วันที่ 5 เม.ย. 2553
เวลา

19 มีนาคม 2553

เรื่อง ขอเสนอโครงการวิจัยเพื่อขอรับการพิจารณาจริยธรรม

เรียน ผู้อำนวยการโรงพยาบาลพัทลุง

สิ่งที่ส่งมาด้วย
1. โครงร่างการวิจัยฉบับสมบูรณ์ จำนวน 1 ชุด
2. สรุปย่อโครงการวิจัย จำนวน 1 ชุด
3. เอกสารชี้แจงผู้เข้าร่วมการวิจัย จำนวน 1 ชุด
4. ใบยินยอมของผู้เข้าร่วมการวิจัย จำนวน 1 ชุด
5. แบบสอบถามที่ใช้ในการวิจัย จำนวน 1 ชุด

เนื่องด้วย นางสาวสมลักษณ์ เทพสุริยานนท์ นิสิตชั้นปริญญาคุษฎีบัณฑิต คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย กำลังดำเนินการวิจัยเพื่อเสนอเป็นดุษฎีนิพนธ์ เรื่อง "แบบจำลองเชิงสาเหตุของพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง" โดยมี ศาสตราจารย์ ดร. วิณา จีระแพทย์ เป็นอาจารย์ที่ปรึกษาดุษฎีนิพนธ์ และประสงค์จะขอเสนอรับการพิจารณาจริยธรรมการวิจัย ทั้งนี้โครงการวิจัยได้ผ่านการคัดกรองการวิจัย เพื่อเข้ารับการพิจารณาจริยธรรมโดยกลไกที่เกี่ยวข้องระดับคณะแล้ว

จึงเรียนมาเพื่อโปรดพิจารณาดำเนินการด้วย จักเป็นพระคุณยิ่ง

เรียน ผู้อำนวยการฯ
- เพื่อโปรดพิจารณาดำเนินการ
- เสนอรองฯ ให้ลงนามด้วย

ขอแสดงความนับถือ

(ผู้ช่วยศาสตราจารย์ ดร. ชนกพร จิตปัญญา)
รองคณบดีฝ่ายวิชาการ
ปฏิบัติการแทนคณบดีคณะพยาบาลศาสตร์

งานบริการการศึกษา โทร. 0-2218-9825 โทรสาร. 0-2218-9806
อาจารย์ที่ปรึกษา ศาสตราจารย์ ดร. วิณา จีระแพทย์ โทร. 0-2218-9822
ชื่อนิสิต นางสาวสมลักษณ์ เทพสุริยานนท์ โทร 08-6874-7238

(นางดวงใจ ดุกสุขแก้ว)
รักษาการในตำแหน่งหัวหน้าพยาบาล

APPENDIX C

LIST OF THE EXPERTS

LIST OF EXPERTS

1. **Associate Professor Dr. Wantana Maneesriwongkul**

   Department of Nursing, Faculty of Medicine Ramathibodi Hospital,

   Mahidol University

2. **Associate Professor Dr. Orasa Panpakdee**

   Department of Nursing, Faculty of Medicine Ramathibodi Hospital,

   Mahidol University

3. **Assistant Professor Somkiat Sangwatanaroj, MD.**

   Department of Medicine, Faculty of Medicine, Chulalongkorn University

4. **Associate Professor Supot Srimahachota, MD.**

   Department of Medicine, Faculty of Medicine, Chulalongkorn University

5. **Miss Sumol Kasornwanitwatana,** APN (Medical-Surgical)

   King Chulalongkorn Memorial Hospital

6. **Associate Professor Sarinee Krittiyanunt**

   Faculty of Phamaceutical Sciences, Chulalongkorn University

7. **Assistant Professor Dr. Phantipa Sakthong**

   Faculty of Phamaceutical Sciences, Chulalongkorn University

APPENDIX D

INFORMED CONSENT FORM AND

PARTICIPANTS INFORMATION SHEET

Patient/participant information sheet

1. Title: A causal model of medication adherence behavior in the elderly with hypertension

2. Researcher Name: Miss Somluk Tepsuriyanont

3. Office: Faculty of Nursing, Naresuan University, Phitsanulok, Thailand

Office: 055-261-108 Home: 045-322-439

Mobile Phone**:** 086-874-7238 E-mail: tepsuriyanont@yahoo.com

4. Information relevant to informed consent form of this study

I am a graduate student in nursing science at Chulalongkorn University, doing a doctoral dissertation on medication adherence behavior in the elderly with hypertension. The purpose of this information is to tell you about the researcher and to allow you to make a clear decision about whether you would like to participate or not.

4.1 The objectives of this study are to develop and examine the causal model used to explain trends associated with medication adherence behavior in the elderly with hypertension.

4.2 The benefits of the conducting this study will help nurses, health care providers and policy makers to understand the direct and indirect affect of select factors on participation in medication adherence behavior in the elderly with hypertension.

4.3 The participants are the elderly with hypertension age 60 years and over who received at least one antihypertensive medication at outpatient department, general hospital. A multi- stage sampling technique will use to indentify the samples.

4.4 Participants will participate in the study. After that they will have suggested the details and the method of the study. Participants will have been asked to answer questionnaires dealing with personal data, regimen complexity, health beliefs, cognitive function, social support, and medication adherence behavior. It will take about 35 minutes for participants to answer questionnaires.

4.5 The possibility of suffering chances such as fatigue and tiredness may occur. Participants will be asked to take a rest after filling out each questionnaire, and they will be informed that they can take a break whenever they feel tried or uncomfortable. The researcher will observe the participants and checks for tiredness and fatigue.

4.6 Participation in the study will be strictly voluntary and participants may drop out of the study at any time, without penalty. This study will not impact participants' health and expenditure, if they are not participating in the study.

4.7 Participants can contact the researcher Somluk Tepsuriyanont, at the Faculty of Nursing, Naresuan University by calling 055-261-108, at home by calling 045-322439, and via cell phone by calling 08-6874-7238.

4.8 The information of the study will be presented the summary of findings as a whole. Each participant will be assigned a number and his or her name will not be connected with this study in any way when the results are reported. The researcher will make every effort to keep the participants' identities confidential. Only the researcher will have accessed to the participants' information. However, this information will be disclosed upon court order.

4.9 The total number of participants in this study will be around 422.

ข้อมูลสำหรับประชากรตัวอย่างหรือผู้มีส่วนร่วมในการวิจัย

(Participant information sheet)

1. ชื่อโครงการวิจัย แบบจำลองเชิงสาเหตุของพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง

2. ชื่อผู้วิจัย นางสาวสมลักษณ์ เทพสุริยานนท์ นิสิตคณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

3. สถานที่ปฏิบัติงาน คณะพยาบาลศาสตร์ มหาวิทยาลัยนเรศวร

ต.ท่าโพธิ์ อ. เมือง จ. พิษณุโลก 65000 โทรศัพท์ที่ทำงาน 055-261-108

โทรศัพท์ที่บ้าน 045-322-439 โทรศัพท์เคลื่อนที่ 086-874-7238

E-mail: tepsuriyanont@yahoo.com

4. คำชี้แจงของผู้วิจัย

ข้าพเจ้าชื่อนางสาวสมลักษณ์ เทพสุริยานนท์ นักศึกษาปริญญาเอก สาขาพยาบาลศาสตร์ คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย กำลังสนใจและทำการวิจัยเกี่ยวกับพฤติกรรมการรับประทานยาอย่างสม่ำเสมอของผู้สูงอายุโรคความดันโลหิตสูง อนึ่ง วัตถุประสงค์ของเอกสารฉบับนี้จัดทำเพื่อบอกเล่าเกี่ยวกับข้อมูลของผู้ทำวิจัยและการดำเนินการวิจัย ซึ่งท่านจะสามารถเข้าใจและตัดสินใจแสดงความประสงค์ในการเข้าร่วมหรือไม่เข้าร่วมในการวิจัยครั้งนี้ได้

4.1 วัตถุประสงค์ของการวิจัยครั้งนี้ เพื่อศึกษาความสัมพันธ์ของปัจจัยกับพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง และ เพื่อศึกษาโมเดลเชิงสาเหตุกับการอธิบายพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง

4.2. ประโยชน์ของงานวิจัยครั้งนี้ ทำให้พยาบาลและผู้เกี่ยวข้องเข้าใจถึงปัจจัยต่างๆ ที่มีผลทั้งทางตรงและทางอ้อมต่อพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง โดยสามารถนำผลการศึกษาไปพัฒนาทั้งทางด้านนโยบาย และด้านการปฏิบัติ เพื่อคงไว้ซึ่งพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง อันจะส่งผลให้ผู้สูงอายุโรคความดันโลหิตสูงมีสุขภาวะที่ดี ทั้งทางด้านร่างกาย จิตใจ และสังคม อีกทั้งยังเป็นการลดค่าใช้จ่ายทางด้านการรักษาพยาบาลของรัฐบาลด้วย

4.3 ในงานวิจัยครั้งนี้ผู้มีส่วนร่วมในงานวิจัยเป็นผู้สูงอายุโรคความดันโลหิตสูง ที่มีอายุ 60 ปีขึ้นไป ได้รับยารักษาโรคความดันโลหิตสูงอย่างน้อย 1 ชนิดขึ้นไป มารับการรักษาที่แผนกผู้ป่วย

นอก โรงพยาบาลทั่วไป ผู้มีส่วนร่วมในการศึกษาได้มาได้มาโดยวิธีการสุ่มอย่างมีขั้นตอน ผู้ร่วมการวิจัยจะได้รับเชิญเข้าร่วมโดยการสุ่มจากแผนกผู้ป่วยนอกในแต่ละโรงพยาบาล

4.4 ผู้ร่วมวิจัยจะได้รับการชี้แจงจากผู้วิจัยถึงวัตถุประสงค์ และกระบวนการเก็บข้อมูล ซึ่งผู้ร่วมจะได้รับการสัมภาษณ์เกี่ยวกับข้อมูลส่วนบุคคล ความซับซ้อนของแผนกำหนดการใช้ยา ความเชื่อด้านสุขภาพ ระดับการรู้คิดและสติปัญญา แรงสนับสนุนทางสังคม และพฤติกรรมความสม่ำเสมอในการรับประทานยา ซึ่งรวมระยะเวลาในการตอบแบบสอบถามดังกล่าวใช้เวลาประมาณ 35 นาที

4.2 ความไม่สะดวกหรือความเสี่ยงที่อาจเกิดขึ้น เช่น อาการเหนื่อย หรืออ่อนเพลีย ขณะร่วมการวิจัย ผู้มีส่วนร่วมสามารถพักเมื่อจบการสัมภาษณ์ในแต่ละแบบสอบถาม นอกจากนี้ผู้มีส่วนร่วมสามารถหยุดการให้สัมภาษณ์ได้ทุกเวลาที่รู้สึกเหนื่อย หรือไม่สะดวกในการให้สัมภาษณ์ โดยมีผู้วิจัยจะคอยช่วยเหลือเมื่อมีอาการผิดปกติ และอำนวยความสะดวก

4.6 ผู้มีส่วนร่วมในการวิจัย มีสิทธิในการปฏิเสธการเข้าร่วมหรือสามารถถอนตัวจากการศึกษา ได้ตลอดเวลา ทั้งนี้การปฏิเสธจะไม่ก่อให้เกิดอันตราย หรือผลกระทบใดต่อผู้มีส่วนร่วมในการวิจัย และจะไม่มีผลรบกวนต่อการได้รับการบริการต่างๆที่จะได้รับตามปกติ ตลอดจนไม่มีค่าใช้จ่ายใดๆ

4.7 หากผู้มีส่วนร่วมในการวิจัยมีข้อสงสัยให้สอบถามเพิ่มเติมได้จากผู้วิจัย โดยสามารถติดต่อผู้วิจัยได้ตลอดเวลาที่ สมลักษณ์ เทพสุริยานนท์ คณะพยาบาลศาสตร์ มหาวิทยาลัยนเรศวร หรือทางโทรศัพท์ที่ทำงาน 055-261-108 หรือมือถือ 08-6874-7238 และหากผู้วิจัยมีข้อมูลเพิ่มเติมที่เป็นประโยชน์หรือโทษเกี่ยวกับการวิจัย ผู้วิจัยจะแจ้งให้ผู้เข้าร่วมวิจัยทราบอย่างรวดเร็ว เพื่อให้ผู้เข้าร่วมวิจัยทบทวนว่ายังสมัครใจจะอยู่ในงานวิจัยหรือไม่

4.8 ข้อมูลที่ได้จากการสัมภาษณ์ของเข้าร่วมวิจัยจะถูกนำไปรวมกับข้อมูลของผู้เข้าร่วมคนอื่นๆ ที่เข้าร่วมในการศึกษา โดยข้อมูลจะถูกเก็บเป็นความลับและผู้วิจัยใช้รหัสแทนชื่อนามสกุลของผู้เข้าร่วมในแบบบันทึกข้อมูล หากผู้วิจัยตีพิมพ์ผลการศึกษา ผู้วิจัยจะไม่มีการระบุชื่อของผู้เข้าร่วมไม่ว่ากรณีใดๆ

4.9 จำนวนของผู้มีส่วนร่วมในการวิจัยโดยประมาณ 422 คน

Informed Consent Form

Title: A causal model of medication adherence behavior in the elderly with hypertension

Code number: Population or participant…….

I was informed by the nurses researcher namely Somluk Tepsuriyanont, Ph.D. student, Doctor of Philosophy in Nursing Science Program, Faculty of Nursing, Chulalongkorn University.

I am willing to take part in a researcher study, which helps nurses, health care provider and policy maker understand the direct and indirect effect factor on medication adherence behavior in the elderly with hypertension. This study aims to develop and examine the causal model for explaining medication adherence behavior in the elderly with hypertension.

I know that I will be one out of 422 elderly who asked to answer some questions about personal data, regimen complexity, health beliefs, cognitive function, social support and medication adherence behavior. These takes will be taken around 35 minute.

I have been told that some possible risks such as fatigue or uncomfortable could be occur. I have been told that I will be asked to take a rest after each questionnaire and I can stop the task, whenever I feel fatigue or uncomfortable. In addition, the nurse researcher will support and check for tiredness and fatigue.

I know that I am strictly voluntary in the study, or I can drop out of the study at any time without penalty. Whether I am in the study or not, there will be no affected on health, or expenditure.

I have been told about the reason for the study and about my part in it, and I have been able to ask question. I will be assigned a number and name will not be connected with the study in any way when the results are reported. The nurse researcher will make every effort to keep my identity confidential. Only the nurse researcher will have accessed to any my information. However, there is no guarantee that this information cannot be obtained by court order.

I understand that during the study I can contact the researcher by calling Somluk Tepsuriyanont at the Faculty of Nursing, Naresuan University by calling 055-261-108, at home by calling 045-322-439, and via cell phone by calling 08-6874-7238.

I have read the information above. I am willing to be in this study and participation is voluntary. After I sign on this form, I understand I will receive a copy of this consent form.

....

Place/Date Name of participant

....

Place/Date Main researcher signature

....

Place/Date Witness signature

ใบยินยอมของผู้มีส่วนร่วมในการวิจัย
(Informed Consent Form)

ชื่อโครงการ แบบจำลองเชิงสาเหตุของพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง

เลขที่ประชากรตัวอย่างผู้มีส่วนร่วมในการทำวิจัย.....

ข้าพเจ้า ได้รับทราบข้อมูลจากผู้วิจัยชื่อ นางสาวสมลักษณ์ เทพสุริยานนท์ นิสิตปริญญาเอก หลักสูตรพยาบาลศาสตรดุษฎีบัณฑิต คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

ข้าพเจ้ายินดีเข้าร่วมการศึกษาวิจัยครั้งนี้โดยความสมัครใจ งานวิจัยนี้ศึกษาเกี่ยวกับความสัมพันธ์ของปัจจัยกับพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง และศึกษาโมเดลเชิงสาเหตุกับการอธิบายพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง ซึ่งประโยชน์ของงานวิจัยครั้งนี้จะทำให้พยาบาลและผู้เกี่ยวข้องเข้าใจถึงปัจจัยต่างๆ ที่มีผลทั้งทางตรงและทางอ้อมต่อพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง โดยสามารถนำผลการศึกษาไปพัฒนาทั้งทางด้านนโยบาย และด้านการปฏิบัติ เพื่อคงไว้ซึ่งพฤติกรรมความสม่ำเสมอในการรับประทานยาอย่างต่อเนื่องของผู้สูงอายุโรคความดันโลหิตสูง อันจะส่งผลให้ผู้สูงอายุโรคความดันโลหิตสูงมีสุขภาวะที่ดี ทั้งทางด้านร่างกาย จิตใจ และสังคม

ข้าพเจ้า ได้รับทราบว่า ข้าพเจ้าคือผู้เข้าร่วมวิจัยคนหนึ่งใน 422 คน ที่ต้องได้รับการสัมภาษณ์เกี่ยวกับข้อมูลส่วนตัว ระดับการรู้คิดและสติปัญญา ความซับซ้อนของแผนกำหนดการใช้ยา ความเชื่อด้านสุขภาพ ระดับการสนับสนุนทางสังคม และพฤติกรรมความสม่ำเสมอในการรับประทานยา รวมเวลาในการสัมภาษณ์ทั้งหมดประมาณ 35 นาที

ข้าพเจ้า ได้รับทราบว่า อาจจะมีอาการอาการเหนื่อย หรืออ่อนเพลียเกิดขึ้นได้ในระหว่างการเข้าร่วมการวิจัย ข้าพเจ้าสามารถพักเมื่อจบการการสัมภาษณ์แต่ละอย่าง หรือหยุดการสัมภาษณ์ได้ทุกเวลาเมื่อรู้สึกเหนื่อยหรือไม่สบาย ข้าพเจ้าสามารถถอนตัวจากการเข้าร่วมการวิจัยเมื่อใดก็ได้ โดยไม่มีผลกระทบต่อการรักษาพยาบาลที่ได้รับ

ข้าพเจ้าสามารถซักถามข้อสงสัยจากผู้วิจัย และเข้าใจว่าข้อมูลของข้าพเจ้าจะนำมาศึกษาวิจัยในภาพรวมโดยใช้รหัสตัวเลข ไม่มีการระบุชื่อและนามสกุลของข้าพเจ้าในผลการวิจัย ผู้วิจัยจะรักษาข้อมูลที่แสดงว่าเป็นข้าพเจ้าอย่างเป็นความลับ ไม่มีใครเข้าถึงข้อมูลของข้าพเจ้าได้ ยกเว้นผู้วิจัยและเป็นไปตามคำสั่งศาล

ข้าพเจ้าได้รับทราบว่าขณะเข้าร่วมการวิจัย ข้าพเจ้าสามารถติดต่อกับผู้วิจัย นางสาวสมลักษณ์ เทพสุริยานนท์ ได้ทางโทรศัพท์ที่ทำงาน 055-261-108 (คณะพยาบาลศาสตร์ มหาวิทยาลัยนเรศวร) หรือมือถือ 08-6874-7238

ข้าพเจ้าได้อ่านข้อความข้างต้นทั้งหมด และยินดีที่จะเข้าร่วมการศึกษาวิจัยนี้โดยความสมัครใจ และลงนามในท้ายเอกสารนี้

.....	.....
สถานที่/วันที่	ลงนามผู้มีส่วนร่วมในการวิจัย
.....	.....
สถานที่/วันที่	ลงนามผู้วิจัยหลัก
.....	.....
สถานที่/วันที่	ลงนามพยาน

APPENDIX E

INTERVIEWING FORMS FOR DATA COLLECTION

เลขที่ผู้มีส่วนร่วมในการวิจัย……..

แบบสอบถามที่ใช้ในการวิจัย

เรื่อง แบบจำลองเชิงสาเหตุของพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง

ของ

นางสาวสมลักษณ์ เทพสุริยานนท์

นิสิตหลักสูตรพยาบาลศาตรดุษฎีบัณฑิต (นานาชาติ) คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

คำชี้แจง

แบบสอบถามฉบับนี้จัดทำขึ้นเพื่อใช้ในการเก็บรวบรวมข้อมูลเกี่ยวกับปัจจัยเชิงสาเหตุของพฤติกรรมความสม่ำเสมอในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง โดยแบ่งเป็น 7 ส่วน ดังนี้

เครื่องมือที่ใช้สอบถามผู้สูงอายุ

ส่วนที่ 1 แบบบันทึกข้อมูลส่วนบุคคล จำนวน 11 ข้อ

ส่วนที่ 2 แบบทดสอบสุขภาพจิตจุฬา จำนวน 13 ข้อ

ส่วนที่ 3 แบบประเมินความสามารถในการปฏิบัติกิจกรรมประจำวันของผู้สูงอายุ จำนวน 10 ข้อ

ส่วนที่ 4 แบบสอบถามความเชื่อด้านสุขภาพ จำนวน 18 ข้อ

ส่วนที่ 5 แบบสอบถามแรงสนับสนุนทางสังคม จำนวน 25 ข้อ

ส่วนที่ 6 แบบสอบถามความร่วมมือในการใช้ยา จำนวน 8 ข้อ

เครื่องมือประเมินโดยพยาบาล

ส่วนที่ 7 ดัชนีชี้วัดความซับซ้อนของแผนกำหนดการใช้ยา จำนวน 65 ข้อ

ส่วนที่ 1 แบบบันทึกข้อมูลส่วนบุคคล

แบบบันทึกข้อมูลส่วนบุคคล ประกอบด้วย 2 ส่วน

ส่วนที่ 1.1: แบบบันทึกข้อมูลเกี่ยวกับการเจ็บป่วยด้วยโรคความดันโลหิตสูง

คำชี้แจง ให้ผู้วิจัยบันทึกข้อมูลจาก OPD card และเติมคำในช่องว่างให้สมบูรณ์

1. ระดับความดันโลหิตครั้งล่าสุด...../.....mmHg
2. ยาที่ได้รับการรักษาจำนวนครั้งล่าสุด (ระบุชื่อยา ขนาดยา เวลา และวิธีใช้ยา)
   - ☐ ยารักษาความดันโลหิตสูง .....
   - ☐ ยาอื่น ๆ .....
3. โรคแทรกซ้อนหรือโรคประจำตัวอื่นๆ (ตอบได้มากกว่า 1 ข้อ)
   - ☐ ไม่มี
   - ☐ โรคเบาหวาน
   - ☐ โรคหัวใจ
   - ☐ โรคข้อ
   - ☐ โรคไต
   - ☐ โรคอื่นๆ ระบุ.....

ส่วนที่ 1.2: แบบสอบถามข้อมูลส่วนบุคคล

คำชี้แจง ให้ผู้สัมภาษณ์ถามผู้สูงอายุ แต่ละข้อเกี่ยวกับข้อมูลส่วนบุคคล และโปรดทำเครื่องหมาย √ ลงในช่อง ☐ หน้าข้อความหรือเติมคำในช่องว่างตามที่ผู้สูงอายุตอบแบบสอบถามตามความเป็นจริง

1. อายุ..... ปี
2. เพศ ☐ ชาย ☐ หญิง
3. สถานภาพสมรส
   - ☐ โสด ☐ สมรส ☐ หม้าย ☐ หย่า/แยก
4. ระดับการศึกษา
   - ☐ ไม่ได้เรียน ☐ ประถมศึกษา
   - ☐ มัธยมศึกษาหรือปวช. ☐ อนุปริญญา หรือปวส.
   - ☐ ปริญญาตรี ☐ สูงกว่าปริญญาตรี
5. อาชีพ
   - ☐ ข้าราชการเกษียณอายุ ☐ รับจ้าง
   - ☐ ค้าขายหรือประกอบธุรกิจส่วนตัว ☐ เกษตรกรรม
   - ☐ ไม่ได้ประกอบอาชีพ ☐ อื่นๆ โปรดระบุ.....
6. รายได้ของครอบครัว.....บาท ต่อเดือน (โดยประมาณ)
   - ☐ พอใช้ ☐ ไม่พอใช้
7. สิทธิในการรักษา
   - ☐ บัตรทอง ☐ บัตรผู้สูงอายุ
   - ☐ ข้าราชการหรือรัฐวิสาหกิจ ☐ จ่ายเอง

   ระยะเวลาที่ได้การวินิจฉัยด้วยโรคความดันโลหิตสูง.....ปี.....เดือน

ส่วนที่ 2 แบบทดสอบสุขภาพจิตจุฬา (Chula Mental test: CMT)

คำชี้แจง ก. ผู้สอบถามอ่านข้อความ

ข. ให้คะแนน 1 เมื่อผู้สูงอายุตอบถูกต้อง

ให้คะแนน 0 เมื่อผู้สูงอายุตอบไม่ถูกต้อง

ค. สรุปตีความระดับความรู้คิดและสติปัญญาของผู้สูงอายุตามเกณฑ์ที่กำหนดให้

ข้อ	คำถาม	คำตอบ	คะแนน
1	ปีนี้คุณอายุเท่าไร?		**1 / 0**
2	ขณะนี้กี่โมง (อาจตอบคลาดเคลื่อนได้ 1 ชั่วโมง)		**1 / 0**
3	……		
4	เดือนนี้เดือนอะไร? (อาจตอบเป็นเดือนไทย / เดือนสากลก็ได้)		**1 / 0**
5	……		
6	ข้าว 1 ถังมีกี่ลิตร / กิโลกรัม	20 ลิตร/ 15 กก.	**1 / 0**
.			
.			
.			
.			
11	บอกให้ผู้ทดสอบนับเลขจาก 10-20 (ให้ 1 คะแนน ถ้าสามารถนับได้ถูกต้องตามลำดับทั้งหมด)		**1 / 0**
12	ชี้ไปที่นาฬิกา แล้วถามว่าคืออะไร / เรียกว่าอะไร? ชี้ไปที่ปากกา แล้วถามว่าคืออะไร / เรียกว่าอะไร?		**1 / 0** **1 / 0**
13	บอกให้ผู้ทดลองลบเลขทีละ 3 จาก 20 ทั้งหมด 3 ครั้ง 20-3 = a 17-3 = b 14-3 = c (ให้คะแนนตามจำนวนเลขที่ลบได้ถูกต้องครั้งละ 1 คะแนน)	 a= 17 b=14 c=11	 **1 / 0** **1 / 0** **1 / 0**
	<u>รวมคะแนน</u>		

ส่วนที่ 3 แบบประเมินความสามารถในการปฏิบัติกิจกรรมประจำวันของผู้สูงอายุ

(Modified Barthel ADL Index)

คำชี้แจง: ให้ผู้สัมภาษณ์ถามผู้สูงอายุแต่ละข้อเกี่ยวกับกิจกรรมที่ผู้สูงอายุทำได้จริงและโปรดทำเครื่องหมาย √ หน้าข้อความตามที่ผู้สูงอายุทำได้จริง

1. ผู้สูงอายุรับประทานอาหาร ด้วยตนเองหรือไม่
   0 ( ) ไม่สามารถตักอาหารเข้าปากได้ต้องมีคนป้อนให้
   1 ( ) ตักอาหารเองได้ แต่ต้องมีคนช่วยตัดอาหารให้เป็นชิ้นเล็ก
   2 ( ) ตักอาหารและช่วยตนเองได้เป็นปกติ
2. ผู้สูงอายุล้างหน้า หวีผม แปรงฟัน โกนหนวด ด้วยตนเองหรือไม่
   0 ( ) ทำไม่ได้ ต้องมีคนช่วย
   1 ( ) ทำได้เอง
3. ผู้สูงอายุลุกจากที่นอนหรือจากเตียงไปยังเก้าอี้ ด้วยตนเอง หรือไม่
   0 ( ) ลุกไม่ได้ (นอนอยู่ตลอดหรือต้องใช้คนอุ้มเพื่อเคลื่อนย้าย)
   1 ( ) ลุก แต่ต้องมีคนคอยดูแลหรือช่วยพยุง 2 คน
   2 ( ) ลุก แต่ต้องมีคนคอยดูแลเพื่อความปลอดภัย
   3 ( ) ลุก ได้ด้วยตนเองและไม่ต้องมีคนคอยดูแลหรือช่วยพยุง
4. ……
5. ……
6. ……..
7. ……..
8. ……
9. ผู้สูงอายุกลั้นการถ่ายอุจจาระได้หรือไม่ (1 สัปดาห์ที่ผ่านมา)
   0 ( ) กลั้นไม่ได้ หรือต้องการสวนอุจจาระอยู่เสมอ
   1 ( ) กลั้นไม่ได้เป็นบางครั้ง (เป็นน้อยกว่า 1 ครั้ง/สัปดาห์)
   2 ( ) กลั้นได้เป็นปกติ
10. ผู้สูงอายุกลั้นปัสสาวะได้หรือไม่ (1 สัปดาห์ที่ผ่านมา)
    0 ( ) กลั้นไม่ได้ หรือใช้สายสวนปัสสาวะ แต่ไม่สามารถดูแลตนเองได้
    1 ( ) กลั้นไม่ได้เบางครั้ง (เป็นน้อยกว่า 1 ครั้ง/สัปดาห์)
    2 ( ) กลั้นได้เป็นปกติ

คะแนนรวม Basic ADL = …….คะแนน (คะแนนเต็มเท่ากับ 20 คะแนน)

ส่วนที่ 4 แบบสอบถามความเชื่อด้านสุขภาพ

(Health Belies Questionnaire)

คำชี้แจง แบบสอบถามนี้มีวัตถุประสงค์เพื่อสอบถามความเชื่อด้านสุขภาพของผู้สูงอายุโรคความดันโลหิตสูง ประกอบด้วย 4 ด้าน คือ การรับรู้โอกาสเสี่ยงต่อการเกิดภาวะแทรกซ้อนจากความดันโลหิตสูง การรับรู้ความรุนแรงของการเกิดภาวะแทรกซ้อนของความดันโลหิตสูง การรับรู้ประโยชน์ของการรับประทานยาลดความดันโลหิต และการรับรู้อุปสรรคของการรับประทานยาลดความดันโลหิต
โปรดทำเครื่องหมาย √ ในช่องที่ตรงกับความคิดเห็นของผู้สูงอายุมากที่สุดพียงคำตอบเดียว

ข้อคำถาม	ไม่เห็นด้วย	เห็นด้วยเล็กน้อย	เห็นด้วยปานกลาง	เห็นด้วยมาก	เห็นด้วยมากที่สุด
1. ท่านเชื่อว่าตัวท่านมีโอกาสที่จะเกิดปัญหาสุขภาพอย่างอื่นตามมาเนื่องจากท่านเป็นโรคความดันโลหิตสูง					
2. ท่านเชื่อว่าตัวท่านมีโอกาสที่จะหัวใจล้มเหลวหรือหัวใจวาย ถ้าท่านควบคุมความดันโลหิตไม่ได้					
3. ท่านเชื่อว่าตัวท่านมีโอกาสที่จะเป็นโรคไตวาย ถ้าท่านควบคุมความดันโลหิตไม่ได้					
4. ……					
5……..					
6. ท่านเชื่อว่าโรคความดันโลหิตสูงที่มีความรุนแรงมาก อาจทำให้เสียชีวิตได้					
7. ท่านคิดว่าการเป็นโรคความดันโลหิตสูง ทำให้รบกวนหรือกระทบต่อการทำกิจวัตรประจำวันของท่าน เช่น การทำงานหรือการเดินทาง					
8. ……..					
9. ……..					
10. ……					
11. การรับประทานยาลดความดันโลหิตอย่างสม่ำเสมอและต่อเนื่องจะทำให้ท่านควบคุมระดับความดันโลหิตได้					
……					
……					
17. การรับประทานยาหลายชนิด ทำให้ท่านไม่อยากรับประทานยา					
18……					

ส่วนที่ 5 แบบสอบถามแรงสนับสนุนทางสังคม
โดยใช้ แบบสอบถามแหล่งประโยชน์ส่วนบุคคลส่วนที่ 2
(Personal Resource Questionnaire 85, Part 2)

คำชี้แจง แบบสอบถามนี้มีวัตถุประสงค์เพื่อประเมินการรับรู้ถึงแหล่งประโยชน์ส่วนบุคคลที่ผู้สูงอายุโรคความดันโลหิตสูงได้รับการสนับสนุน ในการทำกิจกรรมต่างๆที่เกี่ยวข้องกับการดูแลโรคความดันโลหิตสูง จากคนรอบข้างได้แก่ สมาชิกในครอบครัว ญาติ และเพื่อนๆ ของผู้สูงอายุ
โปรดทำเครื่องหมาย √ ในช่องที่ตรงกับการสนับสนุนที่ผู้สูงอายุได้รับเพียงคำตอบเดียว

ข้อคำถาม	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	ไม่แน่ใจหรือเฉยๆ	เห็นด้วย	เห็นด้วยอย่างยิ่ง
1. ฉันมีใครคนหนึ่งที่เมื่อได้อยู่ใกล้ชิดแล้ว ฉันรู้สึกว่ามีความปลอดภัย					
2. ฉันรู้สึกเป็นคนสำคัญในกลุ่มที่ฉันอยู่					
3. คนรอบข้างหรือเพื่อนร่วมงานมักจะบอก หรือแสดงให้เห็นว่าฉันทำกิจกรรม (งานบ้าน หรือที่ทำงาน การดูแลตนเอง) ได้ดี					
4. เมื่อฉันมีปัญหาฉันไม่สามารถที่จะพึ่งพาญาติพี่น้องหรือเพื่อนฝูงให้ช่วยเหลือได้					
5. ฉันมีโอกาสมากเพียงพอในการพบปะกับญาติหรือเพื่อนที่ทำให้ฉันมีความรู้สึกว่าฉันเป็นคนพิเศษ					
.....					
.....					
.....					
10. ฉันไม่รู้จะระบายความรู้สึกกับใคร เมื่อฉันมีปัญหาในการทำกิจกรรม หรือไม่สบายใจ					
.....					
.....					
25. ถ้าฉันไม่สบายจะมีคนมาแนะนำฉันเกี่ยวกับการดูแลตนเอง					

ส่วนที่ 6 แบบสอบถามความร่วมมือในการใช้ยา

(Morisky Medication Adherence Scale: MMAS)

คำชี้แจง : แบบสอบถามนี้มีวัตถุประสงค์เพื่อสอบถามความร่วมมือในการรับประทานยาของผู้สูงอายุโรคความดันโลหิตสูง โปรดทำเครื่องหมาย ✓ลงใน ❒ ที่ตรงกับผู้สูงอายุมากที่สุด เพียงข้อละ 1 คำตอบ

1. มีบางครั้งที่คุณลืมรับประทานยาใช่หรือไม่	❒ ใช่	❒ ไม่ใช่
2. บางคนไม่ได้รับประทานยาด้วยเหตุผลต่างๆนอกเหนือจากลืม คุณคิดทบทวนว่าในช่วง 2 สัปดาห์ที่ผ่านมา มีบางวันที่คุณไม่ได้รับประทานยา	❒ ใช่	❒ ไม่ใช่
3. ……	❒ ใช่	❒ ไม่ใช่
4. ……	❒ ใช่	❒ ไม่ใช่
5. ……	❒ ใช่	❒ ไม่ใช่
6. ……	❒ ใช่	❒ ไม่ใช่
7. ……	❒ ใช่	❒ ไม่ใช่
8. คุณรู้สึกว่ามีความยุ่งยากบ่อยเพียงใด ในการจดจำยาทั้งหมดที่ต้องรับประทาน (กาเครื่องหมาย ✓ลงในกล่อง ❒ **โดยเลือกเพียง 1 ข้อเท่านั้น**)		
❒8.1) ไม่รู้สึกหรือแทบจะไม่รู้สึกว่ามีความยุ่งยากในการจดจำยาที่ใช้ (หรือมี 0 ถึง 1 ครั้งต่อสัปดาห์ที่จำไม่ได้ว่ายาตัวไหนทานอย่างไร)		
❒ 8.2)		
❒ 8.3)		
❒ 8.4) รู้สึกว่ายุ่งยากเป็นประจำ ในการจดจำวิธีทานยาแต่ละอย่างให้ถูกต้อง (หรือมี 5 ถึง 6 ครั้งต่อสัปดาห์ที่จำไม่ได้ว่ายาตัวไหนทานอย่างไร)		
❒ 8.5)		

ส่วนที่ 7 ดัชนีชี้วัดความซับซ้อนของแผนกำหนดการใช้ยา

จำนวนรายการยาทั้งหมด (รวมถึงยาที่ใช้เมื่อมีอาการ/ ยาใช้ช่วยชีวิต) .....รายการ

คำชี้แจง : แบบบันทึกข้อมูลนี้ มีวัตถุประสงค์เพื่อให้พยาบาลวัดความซับซ้อนของแผนกำหนดการใช้ยาของผู้สูงอายุโรคความดันโลหิตสูง โดยให้ท่านบันทึกข้อมูลยาทั้งหมดที่ผู้สูงอายุโรคความดันโลหิตสูงได้รับ และให้คะแนนตามคำแนะนำดังนี้

1. ดัชนีชี้วัดความซับซ้อนของแผนกำหนดการใช้ยาใช้กับยาที่แพทย์สั่งจ่ายเท่านั้น การบันทึกข้อมูลทั้งหมดจะยึดตามข้อมูลบนฉลากยาหรือบันทึกการใช้ยา ที่ผู้สูงอายุโรคความดันโลหิตสูงได้รับตามคำสั่งการรักษาของแพทย์ จากการมาพบแพทย์ครั้งล่าสุด
2. แบบวัดนี้มี 3 ส่วนโดยให้เป็นคะแนน ให้ทำเสร็จสมบูรณ์ทีละส่วน จึงจะทำส่วนต่อไป เมื่อทำครบทั้งหมดแล้วให้นำคะแนนของทั้ง 3 ส่วนรวมกันเพื่อให้ได้ดัชนีชี้วัดความซับซ้อนของแผนกำหนดการใช้ยา
3. ถ้ามีการใช้ยาชนิดเดียวกัน (ชื่อการค้าเดียวกันและรูปแบบเดียวกัน) มากกว่า 1 ครั้งในความแรงที่ต่างกัน ในแผนกำหนดการใช้ยา (เช่น Marevan 5 มิลลิกรัม, 3 มิลลิกรัม, และ 1 มิลลิกรัม) ให้นับเป็นยา 1 รายการ
4. ในกรณีที่ให้เลือกขนาดใช้ยาได้ ให้เลือกขนาดใช้ยาที่ต่ำสุด/ความถี่ต่ำสุด เช่น ให้สูดยาเวนโทลินแบบมิเตอร์โด๊ส ครั้งละ 1-2 ที, วันละ 2-3 ครั้ง (Ventolin MDI 1-2 puffs, 2-3 time daily) จะได้น้ำหนักคะแนนช่องสำหรับรูปแบบยาสูดแบบมิเตอร์โด๊ส, ขนาดยาไม่แน่นอน, และ วันละ 2 ครั้ง ไม่ใช่ช่องใช้มากกว่าหนึ่งหน่วยต่อครั้ง ถ้าให้พาราเซตามอล 2 เม็ด ทุก 4-6 ชั่วโมง เวลาปวดหรือมีไข้ (Paracetamol 2 tab prn q 4-6 hr) จะให้คะแนนใช้มากกว่าหนึ่งหน่วยต่อครั้ง และทุก 4 ชั่วโมงเมื่อมีอาการ
5. ในบางกรณีจำเป็นต้องให้คะแนนความถี่ของการใช้ยา เช่น รานิทิดีน 1 เม็ดตอนเช้า และ 1 เม็ดก่อนนอน (Ranitidine 1 mane and 1 nocte) ให้คะแนนความถี่ของการใช้ยาเป็น 1 เม็ดวันละ 2 ครั้ง ถ้าให้ยาแก้ไอ (M.tussis) จิบเวลาไอ ให้คะแนนความถี่ของการใช้ยาเป็นเมื่อมีอาการ
6. คำแนะนำบางอย่าง เช่น "ใช้ยาตามแพทย์สั่ง" จะไม่ได้คะแนนในหัวข้อ ความถี่ของการใช้ยา เช่น ให้ยาเพรดนิโซโลน 5 มิลลิกรัม ตามแพทย์สั่ง (Prednisolone 5 mg as directed) แต่จะได้คะแนนในหัวข้อคำแนะนำวิธีการใช้ยาเพิ่มเติม
7. ถ้ายาหนึ่งชนิดมีคำแนะนำให้ใช้ยาความถี่มากกว่า 1 อย่าง ควรให้คะแนนความถี่ของการใช้ยาทั้งหมด เช่น ให้สูดยาเวนโทลินแบบมิเตอร์โด๊ส ครั้งละ 2 ทีวันละ 2 ครั้ง และเมื่อมีอาการ (Ventolin MDI 2 puffs bd and prn) จะได้คะแนนสำหรับ ยาสูดรูปแบบมิเตอร์โด๊ส, ใช้มากกว่าหนึ่งหน่วยต่อครั้ง วันละ 2 ครั้ง และ เมื่อมีอาการ
8. ในกรณีที่มีการใช้ยาชื่อเดียวกันตั้งแต่ 2 รูปแบบหรือมากกว่า 2 รูปแบบ และต่างมีความสำคัญร่วมกัน ต้องให้คะแนน 2 ครั้งหรือมากกว่าตามจำนวนรูปแบบยาที่ใช้ เช่น ให้สูดยาเวนโทลินแบบมิเตอร์โด๊ส หรือสูดยาเวนโทลินแบบเครื่องพ่นฝอยละออง วันละ 2 ครั้ง (Ventolin MDI or Ventolin nebulizer twice daily) จะได้คะแนนรูปแบบยาทั้งยาสูดรูปแบบมิเตอร์โด๊ส และ ยาสูดรูปแบบเครื่องพ่นละออง และต้องให้คะแนนความถี่ของการใช้ยา 2 ครั้งสำหรับหัวข้อความถี่ของการใช้ยา
8. ในกรณีที่ไม่มีตัวเลือกที่ตรงกับที่ต้องการ ให้เลือกข้อที่ใกล้เคียงที่สุด เช่น ความถี่ของการใช้ยาวันละหกครั้งก็ให้เลือก ทุก 4 ชั่วโมง

ส่วน ก: การให้คะแนนรูปแบบยา ที่ผู้สูงอายุโรคความดันโลหิตสูงได้รับตามคำสั่งการรักษาของแพทย์ จากการมาพบแพทย์ครั้งล่าสุด ที่ปรากฏในแผนกำหนดการใช้ยา (รวมถึงยาที่ใช้เมื่อมีอาการ/ยาใช้ช่วยชีวิต)
คำชี้แจง: วงกลมน้ำหนักคะแนนที่ตรงกับรูปแบบยาที่ผู้สูงอายุโรคความดันโลหิตสูงแต่ละรายได้รับข้างล่างนี้ โดยให้วงกลมน้ำหนักคะแนนได้มากกว่า 1 รูปแบบยาและแต่ละรูปแบบยาเลือกได้เพียงครั้งเดียว

วิธีการให้ยา	รูปแบบยา	น้ำหนักคะแนน
ยาให้ทางปาก	ยาแคปซูล/ยาเม็ด	1
	ยากลั้วคอ/ยาบ้วนปาก	2
	ยาหมากฝรั่ง/ยาอม	2
	……	2
	……	2
		2
ยาใช้เฉพาะที่	ยาครีม/เจล/ขี้ผึ้ง	2
	ยาทำแผล	3
	……	2
	……...	3
ยาหู ตา จมูก	ยาหยอดหู/ครีม/ขี้ผึ้ง	3
	ยาหยอดตา	3
	เจล/ขี้ผึ้งป้ายตา	3
	……	3
ยาสูด	ยาสูดรูปแบบแอคคิวเฮเลอร์ (accuhaler)	3
	ยาสูดรูปแบบแอโรไลเซอร์ (aerolizer)	3
	ยาสูดรูปแบบมิเตอร์โด๊ส (metered dose)	4
	……	5
ยาฉีด	ยาฉีด แบบบรรจุพร้อมใช้ (prefilled)	3
	……	4
ยาสวน ยาเหน็บ	ยาสวนทวาร (enemas)	2
	ยาเหน็บช่องคลอด (pessaries)	3
	……	2
	……..	2
อื่นๆ	……..	5
	……..	2
	คะแนนรวมของส่วน ก	

ส่วน ข: การให้คะแนนความถี่ของการใช้ยา ที่ผู้สูงอายุโรคความดันโลหิตสูงได้รับตามคำสั่งการรักษาของแพทย์จากการมาพบแพทย์ครั้งล่าสุด

คำชี้แจง: ทำเครื่องหมาย √ ในช่อง [ ] ที่ตรงกับความถี่ของการใช้ยาแต่ละชนิดที่ผู้สูงอายุโรคความดันโลหิตสูงแต่ละรายได้รับ ลงในแผนกำหนดการใช้ยาล่างนี้ จากนั้นรวมจำนวน [√] ในแต่ละหัวข้อความถี่แล้วคูณด้วยน้ำหนักคะแนนที่กำหนด ในกรณีไม่มีคำตอบที่ตรงกับความต้องการ ให้เลือกคำตอบที่ใกล้เคียงที่สุด

ความถี่ของการใช้ยา	ชื่อยาทั้งหมดที่ใช้ (รวมยาที่ใช้เมื่อมีอาการ/ยาใช้ช่วยชีวิต) (ระบุชื่อยา ขนาดยา เวลา และวิธีใช้ยา)							จำนวนความถี่ของการใช้ยา ในแต่ละหัวข้อ	น้ำหนักคะแนน	คะแนนรวมของความถี่ของการใช้ยาแต่ละหัวข้อ ***สูตร =*** *(จำนวนความถี่ของการใช้ยาในแต่ละหัวข้อ)* x *(น้ำหนักคะแนน)*
วันละครั้ง									1	
วันละครั้งเมื่อมีอาการ									0.5	
วันละสองครั้ง									2	
วันละสองครั้งเมื่อมีอาการ									1	
……									3	
……									1.5	
……									4	
……										
……										
……										
วันเว้นวัน ***หรือความถี่น้อยกว่านั้น***									2	
ให้ออกซิเจน เมื่อมีอาการ									1	
ให้ออกซิเจน น้อยกว่า 15 ชั่วโมง									2	
ให้ออกซิเจน มากกว่า 15 ชั่วโมง									3	
คะแนนรวมของส่วน ข										

ส่วน ค: การให้คะแนนคำแนะนำวิธีการใช้ยาเพิ่มเติม (ถ้ามี) ที่ผู้สูงอายุโรคความดันโลหิตสูงได้รับตามคำสั่งการรักษาของแพทย์ จากการมาพบแพทย์ครั้งล่าสุด

คำชี้แจง: ทำเครื่องหมาย √ ในช่อง [ ] ที่ตรงกับคำแนะนำวิธีการใช้ยาเพิ่มเติมของยาแต่ละชนิด ที่ผู้สูงอายุโรคความดันโลหิตสูงแต่ละรายได้รับ ลงในแผนกำหนดการใช้ยาล่างนี้ หลังจากนั้นรวมจำนวนของ [√] ในแต่ละหัวข้อคำแนะนำวิธีการใช้ยาเพิ่มเติม แล้วคูณด้วยน้ำหนักคะแนนที่กำหนด

คำแนะนำวิธีการใช้ยาเพิ่มเติม	ชื่อยาทั้งหมดที่ใช้ (รวมยาที่ใช้เมื่อมีอาการ/ยาใช้ช่วยชีวิต) (ระบุชื่อยา ขนาดยา เวลา และวิธีใช้ยา)								จำนวนคำแนะนำวิธีการใช้ยาเพิ่มเติมในแต่ละหัวข้อ	น้ำหนักคะแนน	คะแนนรวมของคำแนะนำวิธีการใช้ยาเพิ่มเติมแต่ละหัวข้อ ***สูตร*** = ***(****จำนวนคำแนะนำวิธีการใช้ยาเพิ่มเติมในแต่ละหัวข้อ****) x*** *(น้ำหนักคะแนน)*
หักหรือบดเม็ดยา										1	
ละลายเม็ดยา/ผงยา										1	
……										1	
……										1	
……										1	
……										1	
ให้ยาขนาดไม่เท่ากันในแต่ละมื้อ(เช่น 1 เม็ดเช้า และ 2 เม็ดก่อนนอน วันละ1 เม็ด/ 2เม็ด สลับกัน										2	
คะแนนรวมของส่วน ค											

ดัชนีชี้วัดความซับซ้อนของแผนกำหนดการใช้ยา = คะแนนรวมของส่วน ก + คะแนนรวมของส่วน ข + คะแนนรวมของส่วน ค

=……

APPENDIX F:

PERMISSION DOCUMENT FOR USING THE INSTRUMENTS

บันทึกข้อความ

ส่วนราชการ สาขาวิชาเวชศาสตร์ผู้สูงอายุฯ ภาควิชาอายุรศาสตร์ คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

ที่ วส.020/2552 วันที่ 16 ธันวาคม 2552

เรื่อง อนุญาตให้ใช้เครื่องมือวิจัย

เรียน คณบดีคณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

อ้างถึง หนังสือที่ ศธ.0512.11/2327 ลงวันที่ 2 ธันวาคม 2552

ตามหนังสือที่อ้างถึง นางสาวสมลักษณ์ เทพสุริยานนท์ นิสิตชั้นปริญญาดุษฎีบัณฑิต คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ขออนุญาตใช้เครื่องมือวิจัย Chula Mental Test เพื่อใช้ในการทำวิทยานิพนธ์นั้น

กระผมยินดีอนุญาตให้ใช้เครื่องมือวิจัยดังกล่าวได้

ขอแสดงความนับถือ

(ศ.นพ.สุทธิชัย จิตะพันธ์กุล)
หัวหน้าสาขาวิชาเวชศาสตร์ผู้สูงอายุ

โทร.02-2564449, 02-6524232
โทรสาร. 02-2511296

YAHOO! ASIA MAIL Classic

RE: Permission to translate the tool Monday, 9 November, 2009 06:25

From: "Johnson George" <Johnson.George@pharm.monash.edu.au>
To: "tepsuriyanont somluk" <tepsuriyanont@yahoo.com>
1 File (137KB)

MRCI in ...

Dear Somluk
Thank you for your interest in the MRCI. What you are proposing sounds very promising. I am happy for you to use the MRCI in your research project. Attached is a copy of the MRCI paper.
If you have any questions, feel free to contact me.
Good luck with your research.
Kind regards
Johnson

Dr Johnson George
Lecturer
Department of Pharmacy Practice
Centre for Medicine Use and Safety
Faculty of Pharmacy and Pharmaceutical Sciences
Monash University (Parkville campus)
381 Royal Parade
Parkville
VIC 3052
Australia

Tel: +61-(0)3-9903 9178
Fax: +61-(0)3-9903 9629
E-mail: Johnson.George@pharm.monash.edu.au

From: tepsuriyanont somluk [mailto:tepsuriyanont@yahoo.com]
Sent: Sunday, 8 November 2009 2:35 AM
To: Johnson George
Cc: somluck tepsuriyanont
Subject: Permission to translate the tool

Dear Dr. Johnson George,

I hope this mail finds you well. My name is Somluk Tepsuriyanont, a doctoral student of Faculty of Nursing, Chulalongkorn University, Thailand. I am developing the dissertation proposal entitled "A causal model of medication adherence behavior in the elderly with hypertension" The objectives in this study are (1) to develop the causal model for explaining medication adherence behavior in the elderly with hypertension including regimen complexity,

YAHOO! ASIA MAIL Classic

Re: Letter for asking permission to use the tool Monday, 28 February, 2011, 11:52 AM

From: "Donald E. Morisky" <dmorisky@ucla.edu>
To: "tepsuriyanont somluk" <tepsuriyanont@yahoo.com>
4 Files (430KB)

Thai_MM... 001. MM... AJMC_09... Thai versi...

Kob kun krap Somlukk for your note regarding the use of the copyrighted MMAS-8. Since you are a student, I will waive the license fee, provided you agree to cite our research and send me a brief report of your findings upon completing your study. I have attached an article by one of my Thai colleagues who has translated the scale and assessed the validity of the Thai translation of the MMAS-8. I also am attaching a copy of her translation for your use....

Best wishes and please keep me informed on your progress.

Sincerely,

dmorisky

Donald E. Morisky, Sc.D., M.S.P.H., S
Professor and Program Director, Doctoral Training in the Social and Behavioral Determinants of HIV/AIDS Prevention
Department of Community Health Sciences
UCLA School of Public Health
650 Charles E. Young Drive South
Box 951772
46-071 CHS
Los Angeles, CA 90095-1772

email: dmorisky@ucla.edu
Phone: (310) 825-8508
Fax: (310) 794-1805
At 07:45 AM 2/27/2011, you wrote:

> Faculty of Nursing, Chulalongkorn University,<?xml:namespace prefix = o ns = "urn:schemas-microsoft-com:office:office" />
>
> Borommaratchachonnani Srisataphat Building
>
> Patumwan District, Bangkok 10330, Thailand
>
> February 27, 2011
>
> Dear Prof. Dr. Donald E. Morisky,
>
> I hope this mail finds you well. My name is Somluk Tepsuriyanont, a doctoral student of Faculty of Nursing, Chulalongkorn University, Thailand. I am developing the dissertation entitled "A causal model of medication adherence behavior in the elderly with hypertension" The objectives in this study are (1) to develop the causal model for explaining medication

YAHOO! ASIA MAIL Classic

Re: Letter for asking permission to use the tool Monday, 28 February, 2011, 6:40 AM

From: "Glenys Hamilton" <glenys@mac.com>
To: "tepsuriyanont somluk" <tepsuriyanont@yahoo.com>
1 File (23KB)

The Hami...

Dear Somluk:
Thank you for your inquiry. It is good to know that you are concerned about adherence in the elderly. Non-adherence to prescribed medications is a world-wide problem. I wish you every success in your doctoral dissertation. I have attached the questionnaire and scoring guidelines for the Hamilton Hypertension Health Belief Model Instrument. If you do use the instrument the permission to use it is found at the end of the document. I do not know if it will be culturally relevant and if you you have to change or delete items you need to write this up in the section on instruments and carry out your own validity and reliability testing as if it is changed the instrument will not be the same as the original.

All the very best,
Sincerely,
Glenys Hamilton
--

EU
Glenys A. Hamilton, DNSc, DHL (Hon.)
Consultant in Nursing Education and Cardiovascular Research
Arnulf Øverlandsvn. 268
0763 Oslo, Norway
cell phone +47 92-42-34-40
email address glenys@mac.com

USA
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April 1, 2011

Somluk Tepsuriyanont
562/11 Rama V Road
Nakhonchai Sri
Dusit, Bangkok, Thailand 10300

Dear Somluk,

Thank you for requesting the PRQ85. Any changes to question stems or answer sets must be approved in advance. Translation of the PRQ into other languages is acceptable and encouraged. A copy of the translated version of the PRQ should be sent to us.

If you have not already done so, please send us a brief abstract of your proposed study, the population that you plan to sample in your research, and which version of the PRQ you intend to use. We will include this information in our database. If you are a student please send us the name of your university and the name of your advisor. If you do, in fact, use the PRQ for data collection in your study, we ask that you send us an abstract of your findings, PRQ results, and conclusions whenever they are available.

Should you have any questions or need clarification, kindly write or e-mail cweinert@montana.edu. We will try to respond in a timely manner. Our web site is www.montana.edu/cweinert.

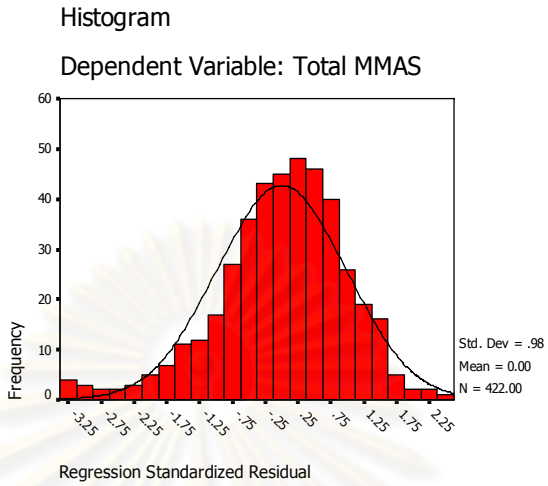
Thank you for your interest in the PRQ. We hope that this tool will help you in your research.

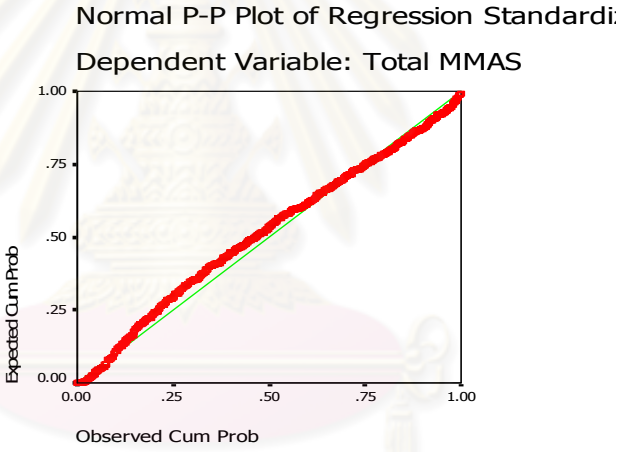
Sincerely,

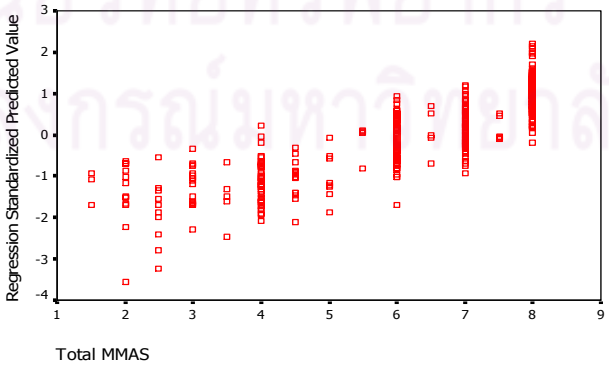
Clarann Weinert, SC,PhD,RN,FAAN
Professor

APPENDIX G:

PRELIMINARY ANALYSIS: NORMALITY, LINEARLITY, AND HOMOSCEDASTICITY



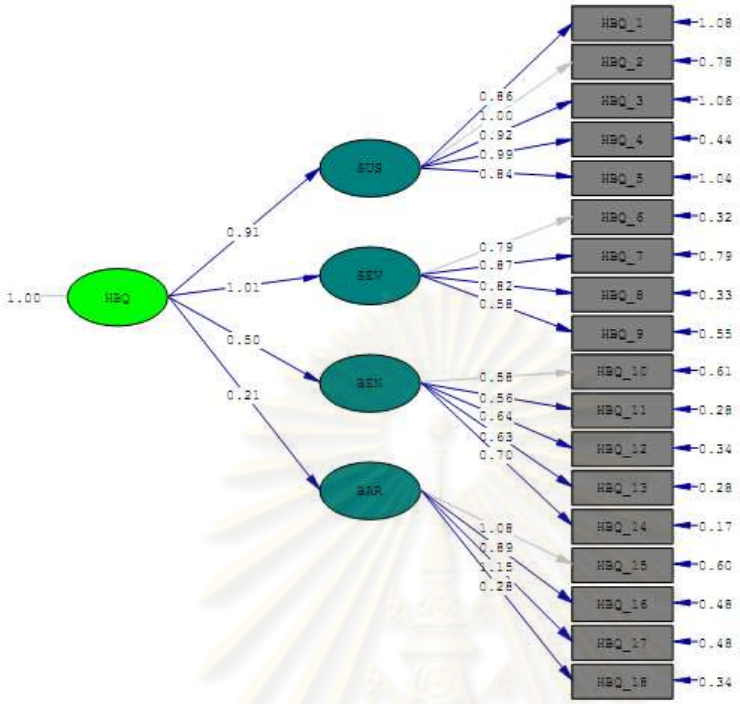




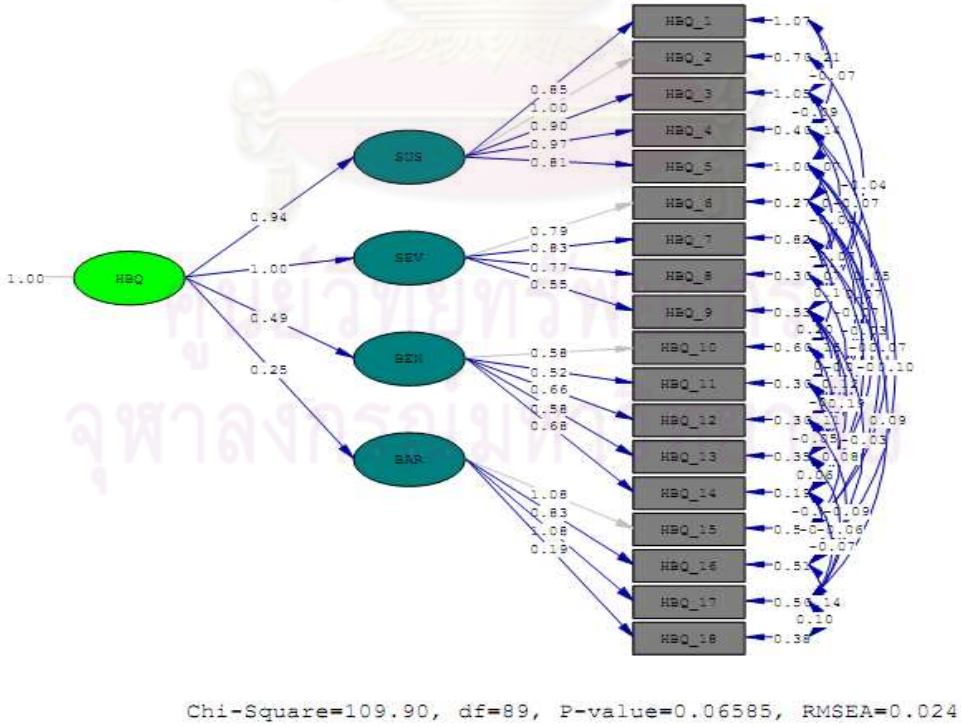
Assumption testing: normality,linearity, and homoscedasticity

APPENDIX H:

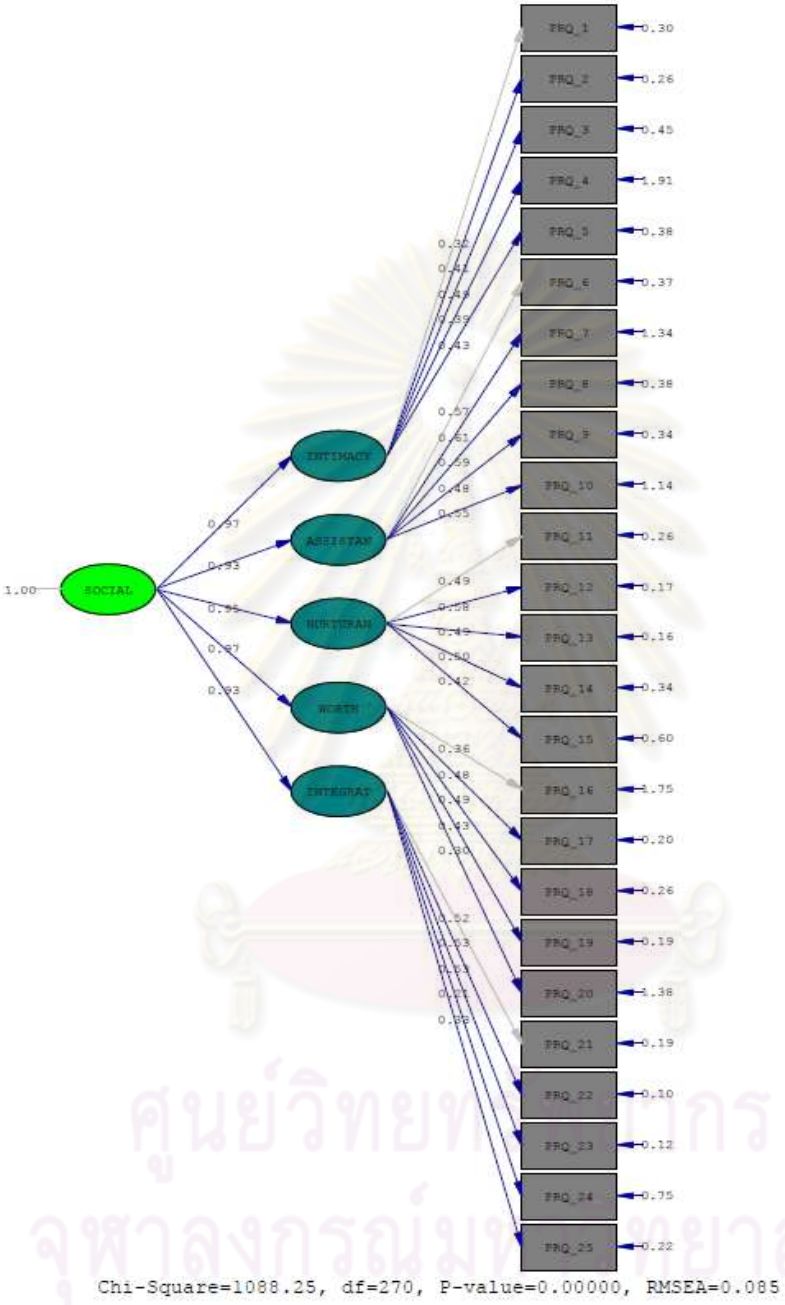
MEASUREMENT MODEL OF THE STUDY VARIABLES



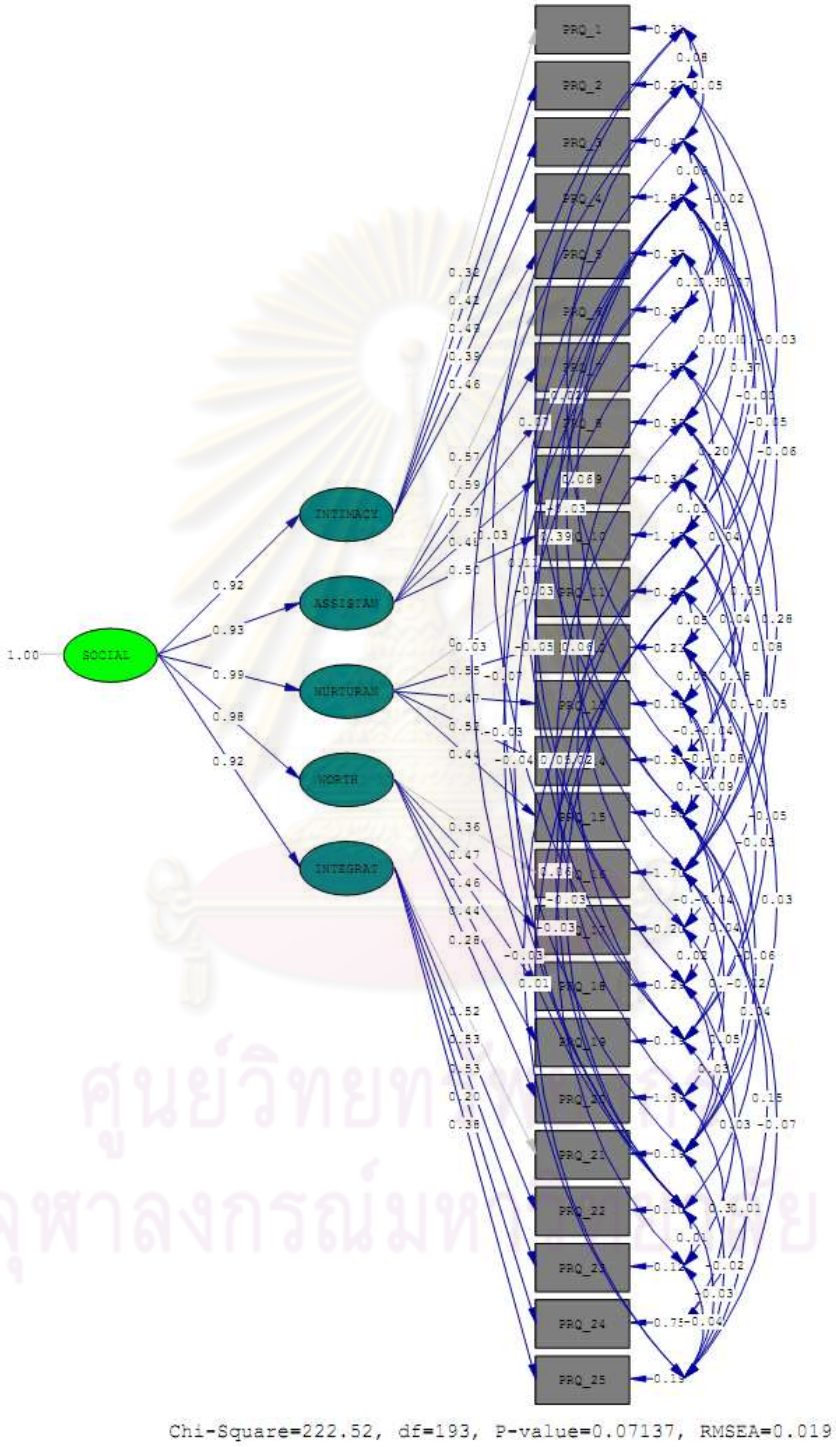
The measurement model of the health beliefs: Original model



The measurement model of the health beliefs: Revised model



The measurement model of the social support: Original model



The measurement model of the social support: Revised model

APPENDIX I:

LISREL PRINTOUT FOR MODEL TESTING OF THE STRUCTURAL EQUATION MODEL

```
                                  DATE:  4/ 6/2011
                                    TIME: 22:05

                                  L I S R E L  8.52

                                       BY

                                Karl G. J"reskog & Dag S"rbom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 The following lines were read from file D:\MED ADHERE.LPJ:

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 SY='D:\DATA_422_11.dsf' NG=1
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 MO NX=8 NY=6 NK=4 NE=3 LY=FU,FI LX=FU,FI BE=FU,FI GA=FU,FI PH=SY,FR PS=DI,FR TE=DI,FR
TD=DI,FR
 LE
 MEDICAT COGNITIV BELIEF
 LK
 SOCIAL REGIMEN INCOME AGE
 FI TE(1,1) TE(2,2) TD(6,6) TD(7,7) TD(8,8)
 FR LY(1,1) LY(2,2) LY(3,3) LY(4,3) LY(5,3) LY(6,3) LX(1,1) LX(2,1) LX(3,1)
 FR LX(4,1) LX(5,1) LX(6,2) LX(7,3) LX(8,4) BE(1,2) BE(1,3) GA(1,1) GA(2,3)
 FR GA(2,4) GA(3,2) GA(3,3)
 PD
 OU ME=ML AM RS EF FS SC IT=250

 TI MED ADHERE

                           Number of Input Variables 14
                           Number of Y - Variables    6
                           Number of X - Variables    8
                           Number of ETA - Variables  3
                           Number of KSI - Variables  4
                           Number of Observations   422

 TI MED ADHERE

         Covariance Matrix

                MMAS       CMT       SUS       SEV       BEN       BAR
            --------  --------  --------  --------  --------  --------
     MMAS       3.29
      CMT       1.15      1.42
      SUS       3.49      0.87     26.22
      SEV       2.46      0.89     12.57     11.42
      BEN       2.30      1.01      6.58      5.63     11.37
      BAR      -2.20     -1.02      4.23      2.09     -0.59     13.45
 INTIMACY       2.01      0.96      3.14      2.24      2.27     -0.89
 ASSISTAN       3.07      1.33      3.57      2.26      2.53     -2.13
```

NURTURAN	1.98	0.88	3.62	2.20	2.38	-0.72
WORTH	3.07	1.13	3.01	2.52	2.60	-1.45
INTEGRAT	2.38	1.12	2.96	2.83	1.82	-1.37
MRCI	5.48	2.40	13.63	9.82	8.59	-7.74
BAHT	0.52	0.36	1.26	0.77	0.64	-0.37
YEAR	-4.65	-4.93	-8.26	-4.94	-4.28	2.44

Covariance Matrix

	INTIMACY	ASSISTAN	NURTURAN	WORTH	INTEGRAT	MRCI
INTIMACY	7.52					
ASSISTAN	6.19	11.52				
NURTURAN	4.65	6.57	7.59			
WORTH	4.41	6.21	4.61	8.34		
INTEGRAT	3.69	5.06	4.43	4.85	7.21	
MRCI	4.89	7.21	4.60	6.06	6.65	92.47
BAHT	0.71	0.79	0.70	0.71	0.57	3.08
YEAR	-4.21	-4.61	-2.98	-3.98	-4.35	-8.30

Covariance Matrix

	BAHT	YEAR
BAHT	1.08	
YEAR	-1.42	43.71

TI MED ADHERE

Parameter Specifications

LAMBDA-Y

	MEDICAT	COGNITIV	BELIEF
MMAS	0	0	0
CMT	0	0	0
SUS	0	0	0
SEV	0	0	1
BEN	0	0	2
BAR	0	0	3

LAMBDA-X

	SOCIAL	REGIMEN	INCOME	AGE
INTIMACY	4	0	0	0
ASSISTAN	5	0	0	0
NURTURAN	6	0	0	0
WORTH	7	0	0	0
INTEGRAT	8	0	0	0
MRCI	0	9	0	0
BAHT	0	0	10	0
YEAR	0	0	0	11

BETA

	MEDICAT	COGNITIV	BELIEF
MEDICAT	0	12	13
COGNITIV	0	0	0
BELIEF	0	0	0

GAMMA

	SOCIAL	REGIMEN	INCOME	AGE
MEDICAT	14	0	0	0
COGNITIV	0	0	15	16
BELIEF	0	17	18	0

PHI

	SOCIAL	REGIMEN	INCOME	AGE
SOCIAL	0			
REGIMEN	19	0		
INCOME	20	21	0	
AGE	22	23	24	0

PSI

MEDICAT	COGNITIV	BELIEF
25	26	27

THETA-EPS

MMAS	CMT	SUS	SEV	BEN	BAR
0	0	28	29	30	31

THETA-DELTA

INTIMACY	ASSISTAN	NURTURAN	WORTH	INTEGRAT	MRCI
32	33	34	35	36	0

THETA-DELTA

BAHT	YEAR
0	0

TI MED ADHERE

Number of Iterations = 16

LISREL Estimates (Maximum Likelihood)

LAMBDA-Y

	MEDICAT	COGNITIV	BELIEF
MMAS	1.72	- -	- -
CMT	- -	1.19	- -
SUS	- -	- -	4.11
SEV	- -	- -	3.06 (0.20) 15.20
BEN	- -	- -	1.79 (0.17) 10.70
BAR	- -	- -	0.59

			(0.19)	
			3.08	

LAMBDA-X

	SOCIAL	REGIMEN	INCOME	AGE
INTIMACY	2.05	- -	- -	- -
	(0.12)			
	17.31			
ASSISTAN	2.86	- -	- -	- -
	(0.14)			
	20.55			
NURTURAN	2.20	- -	- -	- -
	(0.12)			
	18.94			
WORTH	2.24	- -	- -	- -
	(0.12)			
	18.25			
INTEGRAT	1.94	- -	- -	- -
	(0.12)			
	16.44			
MRCI	- -	9.62	- -	- -
		(0.33)		
		29.02		
BAHT	- -	- -	1.04	- -
			(0.04)	
			29.02	
YEAR	- -	- -	- -	6.61
				(0.23)
				29.02

BETA

	MEDICAT	COGNITIV	BELIEF
MEDICAT	- -	0.34	0.27
		(0.04)	(0.04)
		9.17	6.53
COGNITIV	- -	- -	- -
BELIEF	- -	- -	- -

GAMMA

	SOCIAL	REGIMEN	INCOME	AGE
MEDICAT	0.42	- -	- -	- -
	(0.04)			
	9.99			
COGNITIV	- -	- -	0.17	-0.59
			(0.04)	(0.04)
			4.31	-13.69

TI MED ADHERE

Covariance Matrix

	MMAS	CMT	SUS	SEV	BEN	BAR
MMAS	3.29					
CMT	1.15	1.42				
SUS	3.49	0.87	26.22			
SEV	2.46	0.89	12.57	11.42		
BEN	2.30	1.01	6.58	5.63	11.37	
BAR	-2.20	-1.02	4.23	2.09	-0.59	13.45
INTIMACY	2.01	0.96	3.14	2.24	2.27	-0.89
ASSISTAN	3.07	1.33	3.57	2.26	2.53	-2.13
NURTURAN	1.98	0.88	3.62	2.20	2.38	-0.72
WORTH	3.07	1.13	3.01	2.52	2.60	-1.45
INTEGRAT	2.38	1.12	2.96	2.83	1.82	-1.37
MRCI	5.48	2.40	13.63	9.82	8.59	-7.74
BAHT	0.52	0.36	1.26	0.77	0.64	-0.37
YEAR	-4.65	-4.93	-6.26	-4.94	-4.28	2.44

Covariance Matrix

	INTIMACY	ASSISTAN	NURTURAN	WORTH	INTEGRAT	MRCI
INTIMACY	7.52					
ASSISTAN	6.19	11.52				
NURTURAN	4.65	6.57	7.59			
WORTH	4.41	6.21	4.61	8.34		
INTEGRAT	3.69	5.06	4.43	4.85	7.21	
MRCI	4.89	7.21	4.60	6.06	6.65	92.47
BAHT	0.71	0.79	0.70	0.71	0.57	3.08
YEAR	-4.21	-4.61	-2.98	-3.98	-4.35	-8.30

Covariance Matrix

	BAHT	YEAR
BAHT	1.08	
YEAR	-1.42	43.71

TI MED ADHERE

Number of Iterations = 6

LISREL Estimates (Maximum Likelihood)

Measurement Equations

MMAS = 1.72*MEDICAT,, R^2 = 1.00

CMT = 1.19*COGNITIV,, R^2 = 1.00

SUS = 4.11*BELIEF, Errorvar.= 9.49 , R^2 = 0.64
(1.63)
5.81

SEV = 3.09*BELIEF, Errorvar.= 1.97 , R^2 = 0.83
(0.30) (0.86)
10.20 2.30

```
     BEN = 2.73*BELIEF, Errorvar.= 3.98 , Rý = 0.65
           (0.42)                 (1.76)
            6.55                   2.26

     BAR =  - 2.10*BELIEF, Errorvar.= 9.06 , Rý = 0.33
             (0.55)                  (1.98)
            -3.79                    4.57


INTIMACY = 1.75*SOCIAL, Errorvar.= 4.48 , Rý = 0.41
           (0.13)                 (0.37)
            13.02                  11.98

ASSISTAN = 2.49*SOCIAL, Errorvar.= 5.32 , Rý = 0.54
           (0.16)                 (0.51)
            15.77                  10.51

NURTURAN = 1.66*SOCIAL, Errorvar.= 4.85 , Rý = 0.36
           (0.16)                 (0.45)
            10.62                  10.69

   WORTH = 2.51*SOCIAL, Errorvar.= 2.03 , Rý = 0.76
           (0.13)                 (0.39)
            18.87                  5.15

INTEGRAT = 2.01*SOCIAL, Errorvar.= 3.16 , Rý = 0.56
           (0.13)                 (0.38)
            14.96                  8.41

    MRCI = 9.60*REGIMEN,, Rý = 1.00
           (0.33)
            29.04

    BAHT = 1.04*INCOME,, Rý = 1.00
           (0.036)
            29.05

    YEAR = 6.60*AGE,, Rý = 1.00
           (0.23)
            29.05


Error Covariance for CMT and MMAS = -0.14
                                    (0.089)
                                     -1.62

Error Covariance for SUS and MMAS = -1.10
                                     (0.85)
                                     -1.30

Error Covariance for SUS and CMT = -0.69
                                    (0.22)
                                   -3.15

Error Covariance for SEV and MMAS = -1.08
                                     (0.63)
                                     -1.72

Error Covariance for SEV and CMT = -0.30
                                    (0.14)
                                   -2.21

Error Covariance for BEN and MMAS = -0.83
                                     (0.63)
                                     -1.32
```

```
Error Covariance for BEN and SUS = -4.57
                                   (1.41)
                                   -3.25

Error Covariance for BEN and SEV = -2.74
                                   (1.18)
                                   -2.32

Error Covariance for BAR and MMAS = 0.12
                                   (0.64)
                                    0.19

Error Covariance for BAR and CMT = -0.30
                                   (0.17)
                                   -1.73

Error Covariance for BAR and SUS = 12.76
                                   (2.12)
                                    6.03

Error Covariance for BAR and SEV = 8.51
                                  (1.62)
                                   5.27

Error Covariance for BAR and BEN = 5.08
                                  (1.67)
                                   3.04

Error Covariance for ASSISTAN and INTIMACY = 1.84
                                            (0.35)
                                             5.26

Error Covariance for NURTURAN and INTIMACY = 1.76
                                            (0.31)
                                             5.66

Error Covariance for NURTURAN and ASSISTAN = 2.44
                                            (0.38)
                                             6.46

Error Covariance for WORTH and NURTURAN = 0.46
                                         (0.28)
                                          1.65

Error Covariance for INTEGRAT and INTIMACY = 0.17
                                            (0.21)
                                             0.81

Error Covariance for INTEGRAT and NURTURAN = 1.09
                                            (0.27)
                                             4.06

Error Covariance for INTEGRAT and WORTH = -0.20
                                         (0.31)
                                         -0.66

Error Covariance for MRCI and INTEGRAT = 1.26
                                        (0.82)
                                         1.54

Error Covariance for BAHT and INTIMACY = 0.16
                                        (0.092)
                                         1.78

Error Covariance for BAHT and NURTURAN = 0.19
```

```
                                        (0.086)
                                         2.21

 Error Covariance for BAHT and MRCI = 8.53
                                      (0.79)
                                      10.84

 Error Covariance for YEAR and INTIMACY = -0.83
                                          (0.48)
                                          -1.72

 Error Covariance for YEAR and MRCI = 32.58
                                      (3.78)
                                       8.61

 Error Covariance for YEAR and BAHT = -3.95
                                      (0.50)
                                      -7.88

         Structural Equations


 MEDICAT  = 0.32*COGNITIV + 0.41*BELIEF + 0.44*SOCIAL, Errorvar.= 0.33  , Rý = 0.70
           (0.073)         (0.15)        (0.056)                  (0.097)
            4.41            2.85          7.78                     3.42

 COGNITIV = 0.61*INCOME - 0.85*AGE, Errorvar.= 0.29  , Rý = 0.71
           (0.083)        (0.075)                 (0.067)
            7.33         -11.31                   4.37

 BELIEF   = 0.66*REGIMEN + 0.58*INCOME, Errorvar.= 0.64  , Rý = 0.36
           (0.11)         (0.10)                  (0.099)
            6.18           5.60                    6.40


         Reduced Form Equations

 MEDICAT  = 0.44*SOCIAL + 0.27*REGIMEN + 0.43*INCOME - 0.27*AGE, Errorvar.= 0.47, Rý =
0.58
           (0.056)        (0.10)         (0.085)        (0.066)

            7.78           2.73           5.08          -4.11


 COGNITIV = 0.0*SOCIAL + 0.0*REGIMEN + 0.61*INCOME - 0.85*AGE, Errorvar.= 0.29, Rý =
0.71
                                       (0.083)        (0.075)

                                        7.33          -11.31


 BELIEF   = 0.0*SOCIAL + 0.66*REGIMEN + 0.58*INCOME + 0.0*AGE, Errorvar.= 0.64, Rý =
0.36
                         (0.11)         (0.10)

                          6.18           5.60


         Correlation Matrix of Independent Variables

              SOCIAL     REGIMEN    INCOME     AGE
              --------   --------   --------   --------
 SOCIAL         1.00

 REGIMEN        0.27       1.00
```

	(0.05)			
	5.51			
INCOME	0.28	-0.55	1.00	
	(0.05)	(0.08)		
	6.00	-7.20		
AGE	-0.28	-0.64	0.37	1.00
	(0.05)	(0.05)	(0.08)	
	-5.85	-12.54	4.54	

Covariance Matrix of Latent Variables

	MEDICAT	COGNITIV	BELIEF	SOCIAL	REGIMEN	INCOME	
MEDICAT	1.11						
COGNITIV	0.63	1.00					
BELIEF	0.66	0.31	0.99				
SOCIAL	0.71	0.41	0.34	1.00			
REGIMEN	0.33	0.21	0.34	0.27	1.00		
INCOME	0.31	0.30	0.22	0.28	-0.55	1.00	
AGE	-0.41	-0.63	-0.21	-0.28	-0.64	0.37	

Covariance Matrix of Latent Variables

	AGE
AGE	1.00

Goodness of Fit Statistics

Degrees of Freedom = 42
Minimum Fit Function Chi-Square = 58.97 (P = 0.043)
Normal Theory Weighted Least Squares Chi-Square = 57.77 (P = 0.053)
Chi-Square Difference with 1 Degree of Freedom = 0.76 (P = 0.38)
Estimated Non-centrality Parameter (NCP) = 15.77
90 Percent Confidence Interval for NCP = (0.0 ; 39.84)

Minimum Fit Function Value = 0.14
Population Discrepancy Function Value (F0) = 0.037
90 Percent Confidence Interval for F0 = (0.0 ; 0.095)
Root Mean Square Error of Approximation (RMSEA) = 0.030
90 Percent Confidence Interval for RMSEA = (0.0 ; 0.047)
P-Value for Test of Close Fit (RMSEA < 0.05) = 0.97

Expected Cross-Validation Index (ECVI) = 0.44
90 Percent Confidence Interval for ECVI = (0.40 ; 0.49)
ECVI for Saturated Model = 0.50
ECVI for Independence Model = 10.61

Chi-Square for Independence Model with 91 Degrees of Freedom = 4436.79
Independence AIC = 4464.79
Model AIC = 183.77
Saturated AIC = 210.00
Independence CAIC = 4535.42
Model CAIC = 501.61
Saturated CAIC = 739.73

Normed Fit Index (NFI) = 0.99
Non-Normed Fit Index (NNFI) = 0.99
Parsimony Normed Fit Index (PNFI) = 0.46
Comparative Fit Index (CFI) = 1.00
Incremental Fit Index (IFI) = 1.00
Relative Fit Index (RFI) = 0.97

Critical N (CN) = 473.68

Root Mean Square Residual (RMR) = 0.31
Standardized RMR = 0.025
Goodness of Fit Index (GFI) = 0.98
Adjusted Goodness of Fit Index (AGFI) = 0.95
Parsimony Goodness of Fit Index (PGFI) = 0.39

TI MED ADHERE

Fitted Covariance Matrix

	MMAS	CMT	SUS	SEV	BEN	BAR
MMAS	3.30					
CMT	1.14	1.43				
SUS	3.54	0.84	26.18			
SEV	2.41	0.85	12.55	11.40		
BEN	2.26	1.01	6.53	5.61	11.37	
BAR	-2.25	-1.08	4.21	2.08	-0.61	13.45
INTIMACY	2.13	0.85	2.42	1.82	1.61	-1.24
ASSISTAN	3.03	1.20	3.45	2.59	2.29	-1.77
NURTURAN	2.02	0.80	2.29	1.72	1.52	-1.17
WORTH	3.06	1.21	3.48	2.61	2.31	-1.78
INTEGRAT	2.45	0.97	2.79	2.10	1.85	-1.43
MRCI	5.40	2.42	13.59	10.22	9.05	-6.97
BAHT	0.55	0.37	0.93	0.70	0.62	-0.48
YEAR	-4.67	-4.93	-5.76	-4.33	-3.83	2.95

Fitted Covariance Matrix

	INTIMACY	ASSISTAN	NURTURAN	WORTH	INTEGRAT	MRCI
INTIMACY	7.54					
ASSISTAN	6.19	11.52				
NURTURAN	4.65	6.56	7.59			
WORTH	4.39	6.25	4.62	8.34		
INTEGRAT	3.69	5.01	4.43	4.85	7.22	
MRCI	4.45	6.34	4.21	6.39	6.39	92.23
BAHT	0.67	0.72	0.67	0.73	0.58	3.06
YEAR	-4.06	-4.60	-3.06	-4.64	-3.72	-8.05

Fitted Covariance Matrix

	BAHT	YEAR
BAHT	1.08	
YEAR	-1.44	43.63

Fitted Residuals

	MMAS	CMT	SUS	SEV	BEN	BAR
MMAS	-0.01					
CMT	0.00	0.00				
SUS	-0.04	0.03	0.04			
SEV	0.05	0.04	0.03	0.02		
BEN	0.04	-0.01	0.05	0.02	0.00	
BAR	0.06	0.05	0.01	0.01	0.02	0.00
INTIMACY	-0.12	0.11	0.72	0.42	0.66	0.35
ASSISTAN	0.04	0.12	0.12	-0.33	0.23	-0.36
NURTURAN	-0.04	0.08	1.33	0.48	0.86	0.46
WORTH	0.01	-0.09	-0.47	-0.09	0.28	0.33
INTEGRAT	-0.07	0.14	0.18	0.73	-0.03	0.06

MRCI	0.08	-0.02	0.04	-0.40	-0.45	-0.78
BAHT	-0.03	-0.01	0.33	0.07	0.02	0.11
YEAR	0.02	0.00	-0.50	-0.61	-0.45	-0.52

Fitted Residuals

	INTIMACY	ASSISTAN	NURTURAN	WORTH	INTEGRAT	MRCI
INTIMACY	-0.01					
ASSISTAN	-0.01	0.00				
NURTURAN	0.00	0.01	0.01			
WORTH	0.02	-0.04	-0.01	0.00		
INTEGRAT	0.00	0.05	0.00	0.00	0.00	
MRCI	0.44	0.87	0.39	-0.33	0.26	0.24
BAHT	0.03	0.06	0.03	-0.02	-0.02	0.02
YEAR	-0.15	-0.01	0.07	0.66	-0.63	-0.25

Fitted Residuals

	BAHT	YEAR
BAHT	0.00	
YEAR	0.02	0.09

Summary Statistics for Fitted Residuals

```
Smallest Fitted Residual =   -0.78
  Median Fitted Residual =    0.02
 Largest Fitted Residual =    1.33
```

Stemleaf Plot

```
- 7|8
- 6|31
- 5|20
- 4|7550
- 3|633
- 2|5
- 1|52
- 0|997444332221111111000000000000
  0|111112222222233334444455556667788 9
  1|112248
  2|3468
  3|3359
  4|2468
  5|
  6|66
  7|23
  8|67
  9|
 10|
 11|
 12|
 13|3
```

Standardized Residuals

	MMAS	CMT	SUS	SEV	BEN	BAR
MMAS	-1.31					
CMT	0.13	-0.45				
SUS	-0.40	0.28	0.59			
SEV	0.84	0.64	0.57	0.57		
BEN	0.60	-0.08	0.49	0.49	- -	
BAR	0.64	0.63	0.44	0.48	0.49	0.19
INTIMACY	-1.30	1.12	1.36	1.24	1.87	0.86

ASSISTAN	0.57	1.20	0.20	-0.86	0.58	-0.77
NURTURAN	-1.11	0.81	2.47	1.41	2.41	1.11
WORTH	0.25	-1.54	-1.07	-0.34	0.96	0.95
INTEGRAT	-0.93	1.73	0.37	2.45	-0.11	0.16
MRCI	0.94	-0.14	0.04	-0.60	-0.59	-0.83
BAHT	-0.71	-0.48	1.87	0.70	0.16	0.74
YEAR	0.22	0.07	-0.44	-0.90	-0.60	-0.56

Standardized Residuals

	INTIMACY	ASSISTAN	NURTURAN	WORTH	INTEGRAT	MRCI
INTIMACY	-0.52					
ASSISTAN	-0.20	- -				
NURTURAN	-0.05	0.20	0.21			
WORTH	0.35	-0.68	-0.27	- -		
INTEGRAT	0.09	0.41	0.03	0.12	-0.17	
MRCI	0.49	0.93	0.42	-0.65	0.63	0.90
BAHT	0.71	0.61	0.59	-0.30	-0.18	0.36
YEAR	-0.36	-0.02	0.12	1.89	-1.28	-0.49

Standardized Residuals

	BAHT	YEAR
BAHT	0.48	
YEAR	0.33	0.60

Summary Statistics for Standardized Residuals

```
Smallest Standardized Residual =   -1.54
  Median Standardized Residual =    0.22
 Largest Standardized Residual =    2.47
```

Stemleaf Plot

```
-14|4
-12|108
-10|17
- 8|3063
- 6|718500
- 4|96298540
- 2|64070
- 0|8741852000
  0|3479223669
  2|0012583567
  4|1248899999777899
  6|0013344014
  8|14603456
 10|12
 12|046
 14|1
 16|3
 18|779
 20|
 22|
 24|157

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```
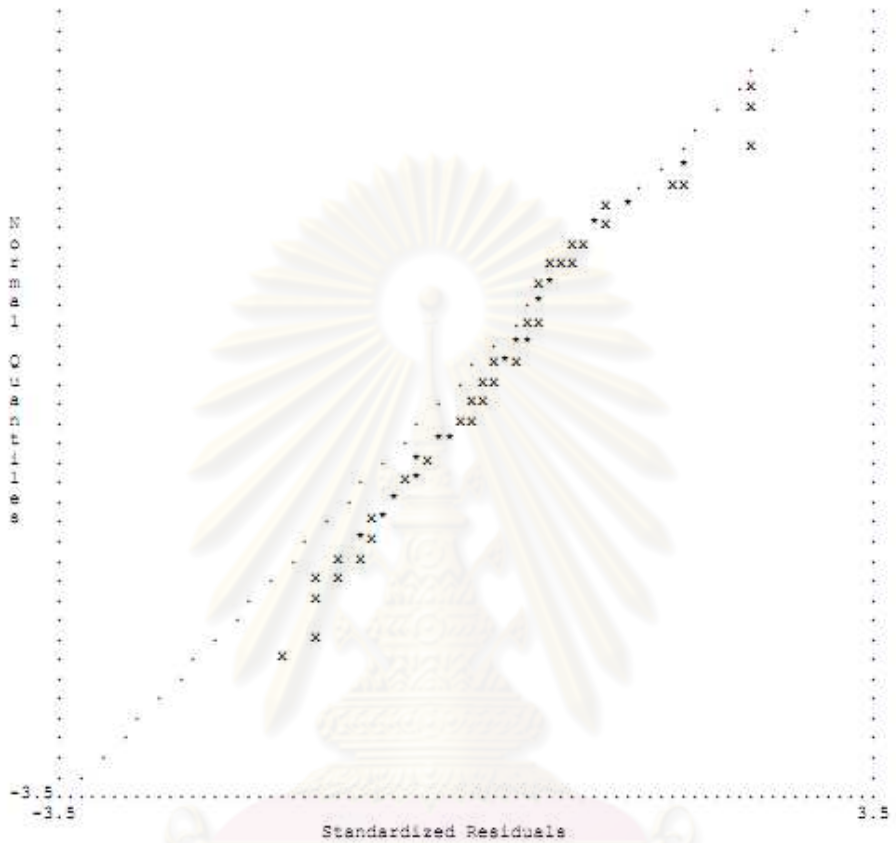

Qplot of Standardized Residuals

```
 3.5.....................................................
    :                                                  ..
    :                                                . :
    .                                                . .
```



The Modification Indices Suggest to Add an Error Covariance

Between	and	Decrease in Chi-Square	New Estimate
WORTH	MMAS	9.0	0.44
INTEGRAT	SEV	14.5	0.77

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Factor Scores Regressions

ETA

	MMAS	CMT	SUS	SEV	BEN	BAR
MEDICAT	0.48	0.12	0.01	0.06	0.03	-0.03
COGNITIV	0.08	0.83	0.02	0.00	-0.02	0.02
BELIEF	-0.05	-0.03	0.10	0.19	0.12	-0.24

ETA

	INTIMACY	ASSISTAN	NURTURAN	WORTH	INTEGRAT	MRCI
MEDICAT	0.00	0.00	0.00	0.00	0.00	-0.01

COGNITIV	0.00	-0.01	0.00	-0.01	-0.01	0.00
BELIEF	0.00	-0.01	0.01	-0.03	-0.01	-0.02

ETA

	BAHT	YEAR
MEDICAT	-0.03	0.01
COGNITIV	-0.01	0.00
BELIEF	-0.04	0.01

KSI

	MMAS	CMT	SUS	SEV	BEN	BAR
SOCIAL	0.08	0.02	0.00	0.00	0.00	0.00
REGIMEN	0.00	-0.26	0.00	0.01	0.01	-0.01
INCOME	0.03	0.50	0.04	0.05	0.02	-0.06
AGE	-0.03	-0.08	0.01	0.03	0.02	-0.03

KSI

	INTIMACY	ASSISTAN	NURTURAN	WORTH	INTEGRAT	MRCI
SOCIAL	0.03	0.06	-0.04	0.17	0.10	0.00
REGIMEN	0.01	-0.01	0.07	0.03	-0.05	0.13
INCOME	-0.01	0.03	-0.08	0.00	0.07	-0.12
AGE	0.01	0.01	-0.06	-0.01	0.04	-0.09

KSI

	BAHT	YEAR
SOCIAL	0.02	0.00
REGIMEN	-1.02	-0.13
INCOME	1.20	0.15
AGE	0.80	0.16

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Standardized Solution

LAMBDA-Y

	MEDICAT	COGNITIV	BELIEF
MMAS	1.82	- -	- -
CMT	- -	1.19	- -
SUS	- -	- -	4.08
SEV	- -	- -	3.07
BEN	- -	- -	2.72
BAR	- -	- -	-2.09

LAMBDA-X

	SOCIAL	REGIMEN	INCOME	AGE
INTIMACY	1.75	- -	- -	- -
ASSISTAN	2.49	- -	- -	- -
NURTURAN	1.66	- -	- -	- -
WORTH	2.51	- -	- -	- -
INTEGRAT	2.01	- -	- -	- -
MRCI	- -	9.60	- -	- -
BAHT	- -	- -	1.04	- -
YEAR	- -	- -	- -	6.60

BETA

	MEDICAT	COGNITIV	BELIEF
MEDICAT	- -	0.30	0.39
COGNITIV	- -	- -	- -
BELIEF	- -	- -	- -

GAMMA

	SOCIAL	REGIMEN	INCOME	AGE
MEDICAT	0.42	- -	- -	- -
COGNITIV	- -	- -	0.60	-0.85
BELIEF	- -	0.67	0.58	- -

Correlation Matrix of ETA and KSI

	MEDICAT	COGNITIV	BELIEF	SOCIAL	REGIMEN	INCOME
MEDICAT	1.00					
COGNITIV	0.59	1.00				
BELIEF	0.63	0.31	1.00			
SOCIAL	0.67	0.41	0.34	1.00		
REGIMEN	0.31	0.21	0.35	0.27	1.00	
INCOME	0.29	0.30	0.22	0.28	-0.55	1.00
AGE	-0.39	-0.63	-0.21	-0.28	-0.64	0.37

Correlation Matrix of ETA and KSI

	AGE
AGE	1.00

PSI
Note: This matrix is diagonal.

MEDICAT	COGNITIV	BELIEF
0.30	0.29	0.64

Regression Matrix ETA on KSI (Standardized)

	SOCIAL	REGIMEN	INCOME	AGE
MEDICAT	0.42	0.26	0.41	-0.26
COGNITIV	- -	- -	0.60	-0.85
BELIEF	- -	0.67	0.58	- -

TI MED ADHERE

Completely Standardized Solution

LAMBDA-Y

	MEDICAT	COGNITIV	BELIEF
MMAS	1.00	- -	- -
CMT	- -	1.00	- -
SUS	- -	- -	0.80
SEV	- -	- -	0.91
BEN	- -	- -	0.81
BAR	- -	- -	-0.57

LAMBDA-X

	SOCIAL	REGIMEN	INCOME	AGE
INTIMACY	0.64	- -	- -	- -
ASSISTAN	0.73	- -	- -	- -
NURTURAN	0.60	- -	- -	- -
WORTH	0.87	- -	- -	- -
INTEGRAT	0.75	- -	- -	- -
MRCI	- -	1.00	- -	- -
BAHT	- -	- -	1.00	- -
YEAR	- -	- -	- -	1.00

BETA

	MEDICAT	COGNITIV	BELIEF
MEDICAT	- -	0.30	0.39
COGNITIV	- -	- -	- -
BELIEF	- -	- -	- -

GAMMA

	SOCIAL	REGIMEN	INCOME	AGE
MEDICAT	0.42	- -	- -	- -
COGNITIV	- -	- -	0.60	-0.85
BELIEF	- -	0.67	0.58	- -

Correlation Matrix of ETA and KSI

	MEDICAT	COGNITIV	BELIEF	SOCIAL	REGIMEN	INCOME
MEDICAT	1.00					
COGNITIV	0.59	1.00				
BELIEF	0.63	0.31	1.00			
SOCIAL	0.67	0.41	0.34	1.00		
REGIMEN	0.31	0.21	0.35	0.27	1.00	
INCOME	0.29	0.30	0.22	0.28	-0.55	1.00
AGE	-0.39	-0.63	-0.21	-0.28	-0.64	0.37

Correlation Matrix of ETA and KSI

	AGE
AGE	1.00

PSI
Note: This matrix is diagonal.

MEDICAT	COGNITIV	BELIEF
0.30	0.29	0.64

THETA-EPS

	MMAS	CMT	SUS	SEV	BEN	BAR
MMAS	- -					
CMT	-0.07	- -				
SUS	-0.12	-0.11	0.36			
SEV	-0.18	-0.07	- -	0.17		
BEN	-0.14	- -	-0.26	-0.24	0.35	
BAR	0.02	-0.07	0.68	0.69	0.41	0.67

THETA-DELTA

INTIMACY	ASSISTAN	NURTURAN	WORTH	INTEGRAT	MRCI

INTIMACY	0.59					
ASSISTAN	0.20	0.46				
NURTURAN	0.23	0.26	0.64			
WORTH	- -	- -	0.06	0.24		
INTEGRAT	0.02	- -	0.15	-0.03	0.44	
MRCI	- -	- -	- -	- -	0.05	- -
BAHT	0.06	- -	0.07	- -	- -	0.85
YEAR	-0.05	- -	- -	- -	- -	0.51

THETA-DELTA

	BAHT	YEAR
BAHT	- -	
YEAR	-0.58	- -

Regression Matrix ETA on KSI (Standardized)

	SOCIAL	REGIMEN	INCOME	AGE
MEDICAT	0.42	0.26	0.41	-0.26
COGNITIV	- -	- -	0.60	-0.85
BELIEF	- -	0.67	0.58	- -

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Total and Indirect Effects

Total Effects of KSI on ETA

	SOCIAL	REGIMEN	INCOME	AGE
MEDICAT	0.44	0.27	0.43	-0.27
	(0.06)	(0.10)	(0.09)	(0.07)
	7.78	2.73	5.08	-4.11
COGNITIV	- -	- -	0.61	-0.85
			(0.08)	(0.07)
			7.33	-11.31
BELIEF	- -	0.66	0.58	- -
		(0.11)	(0.10)	
		6.18	5.60	

Indirect Effects of KSI on ETA

	SOCIAL	REGIMEN	INCOME	AGE
MEDICAT	- -	0.27	0.43	-0.27
		(0.10)	(0.09)	(0.07)
		2.73	5.08	-4.11
COGNITIV	- -	- -	- -	- -
BELIEF	- -	- -	- -	- -

Total Effects of ETA on ETA

	MEDICAT	COGNITIV	BELIEF
MEDICAT	- -	0.32	0.41
		(0.07)	(0.15)
		4.41	2.85

COGNITIV	- -	- -	- -
BELIEF	- -	- -	- -

Largest Eigenvalue of B*B' (Stability Index) is 0.273

Total Effects of ETA on Y

	MEDICAT	COGNITIV	BELIEF
MMAS	1.72	0.55	0.71
		(0.12)	(0.25)
		4.41	2.85
CMT	- -	1.19	- -
SUS	- -	- -	4.11
SEV	- -	- -	3.09
			(0.30)
			10.20
BEN	- -	- -	2.73
			(0.42)
			6.55
BAR	- -	- -	-2.10
			(0.55)
			-3.79

Indirect Effects of ETA on Y

	MEDICAT	COGNITIV	BELIEF
MMAS	- -	0.55	0.71
		(0.12)	(0.25)
		4.41	2.85
CMT	- -	- -	- -
SUS	- -	- -	- -
SEV	- -	- -	- -
BEN	- -	- -	- -
BAR	- -	- -	- -

Total Effects of KSI on Y

	SOCIAL	REGIMEN	INCOME	AGE
MMAS	0.75	0.47	0.75	-0.47
	(0.10)	(0.17)	(0.15)	(0.11)
	7.78	2.73	5.08	-4.11
CMT	- -	- -	0.72	-1.01
			(0.10)	(0.09)
			7.33	-11.31
SUS	- -	2.72	2.38	- -
		(0.44)	(0.42)	

		6.18	5.60	
SEV	- -	2.04	1.79	- -
		(0.30)	(0.29)	
		6.85	6.10	
BEN	- -	1.81	1.58	- -
		(0.27)	(0.27)	
		6.59	5.96	
BAR	- -	-1.39	-1.22	- -
		(0.29)	(0.27)	
		-4.74	-4.46	

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Standardized Total and Indirect Effects

Standardized Total Effects of KSI on ETA

	SOCIAL	REGIMEN	INCOME	AGE
MEDICAT	0.42	0.26	0.41	-0.26
COGNITIV	- -	- -	0.60	-0.85
BELIEF	- -	0.67	0.58	- -

Standardized Indirect Effects of KSI on ETA

	SOCIAL	REGIMEN	INCOME	AGE
MEDICAT	- -	0.26	0.41	-0.26
COGNITIV	- -	- -	- -	- -
BELIEF	- -	- -	- -	- -

Standardized Total Effects of ETA on ETA

	MEDICAT	COGNITIV	BELIEF
MEDICAT	- -	0.30	0.39
COGNITIV	- -	- -	- -
BELIEF	- -	- -	- -

Standardized Total Effects of ETA on Y

	MEDICAT	COGNITIV	BELIEF
MMAS	1.82	0.55	0.71
CMT	- -	1.19	- -
SUS	- -	- -	4.08
SEV	- -	- -	3.07
BEN	- -	- -	2.72
BAR	- -	- -	-2.09

Completely Standardized Total Effects of ETA on Y

	MEDICAT	COGNITIV	BELIEF
MMAS	1.00	0.30	0.39
CMT	- -	1.00	- -
SUS	- -	- -	0.80
SEV	- -	- -	0.91
BEN	- -	- -	0.81
BAR	- -	- -	-0.57

Standardized Indirect Effects of ETA on Y

	MEDICAT	COGNITIV	BELIEF
MMAS	- -	0.55	0.71
CMT	- -	- -	- -
SUS	- -	- -	- -
SEV	- -	- -	- -
BEN	- -	- -	- -
BAR	- -	- -	- -

Completely Standardized Indirect Effects of ETA on Y

	MEDICAT	COGNITIV	BELIEF
MMAS	- -	0.30	0.39
CMT	- -	- -	- -
SUS	- -	- -	- -
SEV	- -	- -	- -
BEN	- -	- -	- -
BAR	- -	- -	- -

Standardized Total Effects of KSI on Y

	SOCIAL	REGIMEN	INCOME	AGE
MMAS	0.75	0.47	0.75	-0.47
CMT	- -	- -	0.72	-1.01
SUS	- -	2.72	2.38	- -
SEV	- -	2.04	1.79	- -
BEN	- -	1.81	1.58	- -
BAR	- -	-1.39	-1.22	- -

Completely Standardized Total Effects of KSI on Y

	SOCIAL	REGIMEN	INCOME	AGE
MMAS	0.42	0.26	0.41	-0.26
CMT	- -	- -	0.60	-0.85
SUS	- -	0.53	0.47	- -
SEV	- -	0.61	0.53	- -
BEN	- -	0.54	0.47	- -
BAR	- -	-0.38	-0.33	- -

Time used: 0.078 Seconds

BIOGRAPHY

My name is Somluk tepsuriyanont. I was born on November 17, 1971 at Ubon Ratchathani province, north eastern part of Thailand. I finished my bachelor degree of nursing science from Suprasittiprasong Nursing Collage, Ubonratchathani province in 1994. During 1994-1996, I had worked as the registered nurse in emergency department, Najaluay Hospital, Najaluay district, Ubonratchathani province.

During 1996-1999, I had worked as the registered nurse in outpatient and emergency department at Ratchavej Hospital, Ubonratchathani province.

During 1999 -2001, I worked as a lecturer at the faculty of nursing, Ratchathani University, Ubonratchathani province. I had responsible for teaching fundamental of nursing and adult nursing.

During 2001-2002, I had studied in master degree of nursing science (Adult Nursing) at the faculty of Nursing, Khon Kaen University and I graduated in 2003.

During 2002 -2006, I return to worked as a lecturer at the faculty of nursing, Ratchathani University.

In mid of year 2006, I started to perform PhD study in nursing science at faculty of nursing, Chulalongkorn University and received scholarship from faculty of nursing, Naresuan University, Phitsanulok province. In 2011, I graduated and obtained the doctor of philosophy in nursing science. After graduation, I have returned to work at the faculty of nursing, Naresuan University.