THE EFFECTS OF PHARMACIST INTERVENTIONS ON PATIENT ADHERENCE AND REHOSPITALIZATION IN CHF PATIENTS IN THAILAND

by

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The Effects of Pharmacist Intervention on
Patient Adherence and Rehospitalization in
CHF Patients in Thailand

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Background: The number of rehospitalizations is high in patients with Congestive Heart Failure (CHF). One of the major predictors of rehospitalization is patient nonadherence to medication regimens. A relatively simple pharmacist intervention with emphasis on communication strategies is believed to offer a unique solution to improve patient adherence and reduce rehospitalization.

Aims: This study was conducted to evaluate the effectiveness of pharmacist discharge consultations and follow up visit on patient medication adherence and rehospitalization within 3 months.

Method: Using the Health Collaboration Model as the framework, 125 CHF patients admitted to Buddha-chinaraj hospital in Thailand were recruited and 107 patients including 38, 33 and 36 patients in control group, experimental group 1 and experimental group 2 respectively were entered into the final analysis. The experimental group 1 received pharmacist discharge consultation and written information (Informative consultation). The experimental group 2 received the same treatment as group 1 plus a pharmacist follow up visit at the patient's home 7-12 days after discharge (Collaborative consultation). Home interview and pill count were conducted at the time by the researcher. Three months after discharge mail surveys were sent out to determine number of hospital readmissions.

Results: Home interview data showed that, comparing with the control group, participants who received the interventions were significantly higher on comprehension of the dosage regimen and positive belief and motivation. The pill-count method indicated higher adherence among participants who received the collaborative consultation and had no caregiver at home. After controlling for other factors, number of rehospitalizations within three months was significantly lower in the intervention groups compared with the control group. Having a caregiver at home also was found to be significantly related to higher adherence.

Conclusions: This study indicates that pharmacist intervention can improve CHF patient's behavioral outcomes and reduce number of hospital readmissions. Other factors such as caregiver help in the home also played an important role in patients adherence to the dosage regimen. Further studies with larger samples are needed to verify the results. Other chronic diseases or clinical indications besides Congestive Heart Failure should also be studied.

CHAPTER ONE

SPECIFIC AIMS AND HYPOTHESES

A. SPECIFIC AIMS

A.1 The Research Needs

This present study examined the effects of pharmacist intervention programs on patient adherence and rehospitalization. The interventions were exclusively designed for patients diagnosed with Congestive Heart Failure (CHF) who were discharged from Buddha-chinaraj hospital in Thailand.

More than 20% of patients with congestive heart failure discharged from hospitals are rehospitalized within three months (Rich et al., 1995; Vinson et al., 1990). One of the major causes of rehospitalization is patient nonadherence to the medication regimens. Overall, many attempts to search for causes and ways to improve patient adherence produced mixed results. For CHF patients in particular, most interventions that have been found to improve patient adherence and other outcomes are resource intensive, complex, and multi-disciplined in nature. These shortcomings could limit the interventions being implemented successfully in a country where resources are scarce.

In this study, patients' comprehension and understanding of the medication regimen, beliefs and motivation, and recall barriers are considered the key components needed to improve patient adherence. Previous studies showed that these components could be enhanced by relatively simple interventions provided by pharmacists. However, with the emphasis on patient-pharmacist communication strategies, the interventions can be delivered more effectively.

A.2 The Research Focus

The primary focus of this study was to apply a communication theory and its strategies to pharmacy practice and to evaluate them using a quasi-experimental design with one control and two experimental groups. The Health Collaboration Model (HCM) provided frameworks and communication strategies used to design the pharmacist interventions. The effects of the two interventions, informative and collaborative consultation, were evaluated on patients' comprehension and recall, beliefs and motivation, recall barriers as well as patient adherence and the number of hospital readmissions within three months. The secondary objective was to study patient medication adherence in CHF patients in Thailand, since information on the prevalence of nonadherence in chronic diseases, factors affecting it, and the appropriate measurement methods is not available systematically and objectively.

B. HYPOTHESES

B.1 Primary Hypotheses

1. Patients in informative consultation (IC) will have: (a) higher rate of medication adherence, (b) lower numbers of rehospitalization within three months, (c) higher scores on patient comprehension and recall, and (d) higher scores on patient beliefs and motivation, and (e) lower scores on recall barriers than those in the control group.
2. Patients in collaborative consultation (CC) will have: (a) a higher rate of medication adherence, (b) lower numbers of rehospitalization within three months, (c) higher scores on patient comprehension and recall, and

(d) higher scores on patient beliefs and motivation, and (e) lower scores on recall barriers than those in a group without the intervention.

B.2 Secondary Hypotheses

3. Patients who have a higher score on patient comprehension and recall, patient beliefs and motivation, and a lower score on patient recall barrier will have a higher rate of adherence.
4. Patients who have a higher rate of adherence will report a lower number of hospital readmission or emergency room visits.
5. The effectiveness of the program on patient adherence will not vary by patient age, gender, educational level, income, payment source, medication regimen or number of medications, or family member involvement.

C. CHAPTER PREVIEW

The first two chapters, chapter 1 and 2, provide rationale and the needs for research in this area and also what had been done in the past. Chapter 3 is dedicated to theoretical frameworks that were used to develop the interventions and guide how the analyses would be done. The fourth chapter deals with study methodology including study design, settings, sampling method, data collection, instruments development, and analyses plan. The fifth chapter explains patient characteristics and the comparison of these characteristics among control and experimental groups. Then the next chapter discusses whether or not the interventions affect patient comprehension, beliefs and recall barriers and what other characteristics would play a part on these results. The results from this chapter led to chapter 7 which demonstrates the impact of the interventions on patient adherence and number of hospital readmissions. Chapter 7 also focuses on path analysis and how it was used to test how well the proposed model worked in the study. The last chapter (chapter 8) involves the finding summary and discussion of the results as well as the implications for pharmacy practice and future research.

CHAPTER TWO

LITERATURE REVIEW

A. PATIENT ADHERENCE AND REHOSPITALIZATION IN CONGESTIVE HEART FAILURE

As the world population grows older and lives longer, the number of people who have chronic diseases is getting larger as well. In Thailand, it is estimated that 1 out of every 10 of those over 60 years old has suffered from at least one chronic disease (Chongvatana et al., 1998). There are a number of interesting notions about chronic diseases which might prompt us to pay more attention. First, chronic diseases are frequently asymptomatic, which makes it harder for patients to monitor symptoms or to see the effectiveness of the treatments. Persons living with chronic diseases require multiple personal behavior innovations such as taking long-term medication, maintaining diet, getting exercise, and changing habits. They usually have to incorporate recommendations about health and illness behaviors into the repertoire of their daily lives, while getting supervision, support, and reinforcement from health care providers only through regularly or sporadically scheduled appointments over varying periods of time. After a treatment regimen is decided and patients leave clinics or institutions, they are expected to carry out the regimen as prescribed. Patient compliance and patient adherence are the terms commonly used to refer to this type of patient behavior. Both terms are different in the degree of paternalistic ideas used to view the patient-provider relationship. In this study, I will refer to this behavior as patient adherence to reflect a non-paternalistic aspect of the behavior as well as to be consistent throughout the paper.

One of the most important chronic diseases threatening the world's aging population today is heart disease. Similar to other chronic diseases, the numbers of patients with heart disease is rapidly increasing throughout the world. Treatments are proving to be costly and last for a lifetime (McMurray & Hart, 1993; Schuman et al., 1998). Despite huge expenses in health care and advanced medical technology, heart disease remains the number one cause of death in Thailand and elsewhere (Murphy, 1998; Ousvapoom, 1998). Among several conditions of heart disease, congestive heart failure (CHF) has been found to be the most important contributor to morbidity and mortality of those who suffer from the disease (Grag, 1993).

Previous studies found that 27-47% of hospitalized patients with CHF were rehospitalized within 90 days (Rich et al., 1995; Vinson et al., 1990). Since hospitalization is costly and usually correlates with poor quality of life, reducing the number of hospitalizations would seem to be a number one priority of any health care provider involved. Several studies have identified one of the major causes of rehospitalization in CHF patients as behavioral factors such as adherence to a medication regimen, diet, and fluid excess (Chin & Goldman, 1997; Ghali et al., 1988; Rich et al., 1995; Vinson et al., 1990). More precisely, 15-43% of rehospitalized patients reported nonadherence with medication regimens as a primary cause (Chin & Goldman, 1997; Ghali et al., 1988; Michalsen et al., 1998; Opasich et al., 1996). These findings strongly suggest that if adherence to a medication regimen is improved, we might be able to considerably reduce the number of rehospitalizations in this group of patients.

In general, about half of the patients with chronic diseases have not adhered to the recommended medication regimens (Haynes et al., 1979). In CHF patients, the reported rates of nonadherence have varied. The average Medication Possession Ratio (MPR) from two studies were quite high (69% and 71% respectively) (Monane et al., 1994; Roe et al., 1999). One study using validated self-report questions found from the scale 1-100 an adherent rate was 42 (Dimatteo et al., 1993). About 30% of the patients in one study using pill count method either discontinued their medication or reduced their dosages (Cohn et al., 1991). Using pill count technique, the overall adherence rate was 84.6%+/-15.1%, whereas at the cut off point of 80%, 22.4% of the patients were nonadherent (Rich et al., 1996). Twenty-three percent of all cases in one study using self-report method were nonadherent (Michalsen et al., 1998). In one small study, nine out of sixteen patients were considered by geriatric practitioner nurses as nonadherers (Happ et al., 1997). In another study using two questions and a cut-off point of 100%, 26% of all cases were considered nonadherers (Ni et al., 1999). In summary, these previous studies have suggested that the prevalence of nonadherence in CHF patients ranges from 15%-58%. Considering its consequences in terms of the number of rehospitalizations, most nonadherers would be rehospitalized within a few months after initial discharge. This situation seems to prompt researchers to look into what has previously been known to relate with behavior and what kind of strategies could be used to help the patients carry out treatment regimens as recommended.

Before moving on to what was previously known to cause nonadherence, one particular consideration of comparing nonadherece rates across studies should be explored. Different methods of measurement might yield different results. In fact, each of these methods has its own advantages and disadvantages. Some of these studies used claims data to measure adherence. The method is relatively easy to use and allows researchers to study premature discontinuation of therapy and the consumption of medications which are not prescribed (Farmer, 1999). However, there are a number of shortcomings related to using this method. First, most of the time, it doesn't reflect current adherence status, because to be able to get valid measurements, claims data have to be collected over a period of time. An extensive review article on prescription claims data indicated that a trimester is a minimum range to get more accurate information on patient adherence (Steiner & Prochazka, 1997). Second, it cannot be used where medication refilling systems and computer systems are not available. Third, it might not be accurate if patients have more than one source of obtaining medication. Besides claim data, these studies also used a self-report method. As we have previously known, self-report method is more likely to underestimate nonadherence. Therefore, to achieve better quality, self-reporting should be validated against some objective methods. For example, the Brief Medication Questionnaire (BMQ) has been validated against the Medication Event Monitoring System (MEMS) and been found to yield very high sensitivity and specificity levels (Svarstad et al., 1999). Unfortunately, several studies conducted in CHF patients using other self-report methods have failed to validate their methods.

It is unfortunate that the information about patient adherence in chronic diseases is not yet available in Thailand. Nonadherence has only been reported unsystematically across disease conditions and patient characteristics. It is more likely to be reported by patients or to be observed and estimated by health care practitioners during the course of encounters. A number of studies have investigated patient adherence in short-course medication regimens for infectious diseases such as malaria and tuberculosis. One study found that patient adherence is one of the biggest problems in managing the treatment of tuberculosis (Tansuphasawadikul et al., 1998). About 70% of 137 patients who received treatment for malaria were considered nonadherent (Fungladda et al., 1998). In Thai elderly, sixty-one percent of Thai elderly reported not taking medication as prescribed (Chongwiriyanurak, 1999). A survey with 143 elderly found that 32% did not refill their medication, 74.8% forgot to take their medication, and 81.8% used medication other than the one being prescribed (Srihavong, 1996). These findings raise questions about the validity and reliability of the information, because the survey relied heavily on self-reporting. However, as the previous studies have shown, self-report method is more likely to underestimate nonadherence (Farmer, 1999; Haynes et al., 1979). Therefore, the actual nonadherence rate could be even higher. Objective methods are needed to confirm these results.

Since there is no single method that would yield the most accurate data, combinations of methods are preferred. In this study, patient adherence was measured by a combination of two methods including pill count and self-reporting. There are a number of reasons these methods are preferred over other methods such as drug level in biologic fluids, biologic markers, and pharmacy records. Drug level in biologic fluids and biologic markers is not more accurate than other methods and the adherence data obtained from these sources are usually limited to recent use (Farmer, 1999). The procedures are usually complicated and potentially expensive, especially when more than one medication is examined. The pharmacy records method is not practical for Thailand's health care system for a number of reasons. First, a refilling system has not yet been utilized in Thailand. Patients usually see a physician once every 1-3 months and the medications are prescribed and dispensed accordingly. Second, pharmacy records are not fully computerized nor designed to yield that type of data. Third, it is rather common for Thai patients to obtain medication from many sources. Therefore, it is potentially inaccurate to rely only on one particular record. On the other hand, pill count is easy to use and less expensive. In Thailand, medication is likely to be dispensed in a blister package, which is relatively easy to count. However, data obtained from this method do not reveal when patients actually take the medication. MEMS can help determine the timing. However, the device is expensive and might alter the original package of medication a patient would otherwise receive. Unlike self-report, pill count and MEMS fail to give patient perspectives or viewpoints on medication use as well as recent changes in the regimens. However, questions used in a self-reporting method must be validated before it can be used effectively.

B. FACTORS AFFECTING PATIENT ADHERENCE

B.1 General findings

For the past forty years, researchers have tried to define, measure, and study not only the frequency and intensity of patient nonadherence, but also what might have caused the behavior to occur (Haynes et al., 1979). Since adherence is viewed as patient behavior, previous studies focused largely on patients' characteristics. In general, demographic characteristics were not found to be good predictors of adherence (Haynes et al., 1979). However, some of them, such as age, have predisposed a person to other more direct causes including having chronic diseases and taking a large number of medications. Age also predisposes an individual to reduced cognitive abilities and increasing depression. These conditions, in turn, have been found to be the significant predictors of adherence (Isaac & Tamblyn, 1993), (Spiers & Kutzik, 1995). The number of medications and complexity of the medication schedule were also found to have a significant impact on medication adherence (Conn et al., 1991; Heminki, 1975; Shimp et al., 1985). A large number of medications and a complex regimen can affect patient recall and cause confusion, as well as require a major change in a patient's life. Other factors found to be significantly related to nonadherence are the patient's motivation to take medication (Becker et al., 1977; Svarstad, 1976) and social support provided by family members (Kirscht et al., 1981). Knowledge and comprehension of regimens alone does not significantly increase medication adherence, but by the same token, patients cannot adhere without knowing and understanding their regimens (Wolfe & Schirm, 1992), (Kimberlin et al., 1993; Srihavong, 1996). In other words, comprehension of regimens is necessary, but not sufficient to change the behavior (Svarstad, 1976)

B.2 Findings in CHF patients

Only a few studies have examined the factors affecting nonadherence in CHF patients. The results are somewhat difficult to compare across the studies because the researchers have had various interests. As a result, different factors ended up being included in the studies. Despite these differences, some findings seemed to be consistent with those found in other groups of the population. A large number of medications related to greater nonadherence (Michalsen et al., 1998; Monane et al., 1994). Knowledge about medication was not significantly related to better adherence (Michalsen et al., 1998; Ni et al., 1999), and surprisingly, older patients were found to be more adherent (Michalsen et al., 1998; Monane et al., 1994). I found no study specifically examining patient's comprehension and recall, belief and motivation, and patient medication-taking skills.

B.3 Patient-Provider Relationship and Patient Adherence

In recent years, researchers have begun turning their attention away from patients' characteristics and toward the effects of patient-provider relationships as a way to predict and improve adherence. Communication between providers and patients is reported to be important for increasing appropriate medication use and achieving desired patient outcomes (Bultman & Svarstad, 2000; McKenney et al., 1973) and patient satisfaction (Schommer, 1995). Frank and Gunderson found that patients who formed good alliances with their therapists within the first 6 months of treatment were significantly more likely to remain in psychotherapy, comply with their prescribed medication regimens, and achieve better outcomes after 2 years, with less medication, than patients who did not (Frank & Gunderson, 1990). Patients who were seen by physicians who sought a patient's point of view or held a patient-centered interaction approach were more likely to be compliant to the treatment regimens (Chewning & Sleath, 1996; Stewart, 1984; Svarstad, 1986). For CHF patients, one of the first studies found that the communication of instructions and information on medications was inversely associated with drug error rates including patient nonadherence (Hulka et al., 1976). More recently, a study indicated that patients who were seen by physicians with a specialty in cardiology, or those with more patients seen per week, were more adherent (Dimatteo et al., 1993). Unfortunately, both studies failed to explain the actual mechanism of these relationships. Only a few studies have paid attention to the types of communication strategies providers used which would lead to better patient adherence. Svarstad, in her observational studies, showed that patients seen by providers who gave more explicit, specific, and direct information were more knowledgeable, motivated, and adherent to medication regimens (Svarstad, 1976). In another study, when one hundred clients who had a newly prescribed antidepressant medication were interviewed, physician *follow up* communication style such as encouraging expression of problems, asking about concerns, listening to clients concerns, and helping solve problems was found to be a predictor of better medication adherence. (Bultman & Svarstad, 2000). Asthma patients seen by physicians who reported that they showed nonverbal attentiveness, gave nonverbal encouragement, gave verbal praise for things done well, maintained interactive conversation, found out underlying worries/concerns, gave specific reassuring information, tailored medication schedule to family's routine, reached agreement on a short and long term goals, and helped patients to use criteria for making decisions about asthma management, were more likely to use peak flow monitoring device as suggested (Clark et al., 1997). Although these previous studies have shown that the patient-provider relationship has an impact on adherence, we need a better understanding of the actual mechanisms by which these influences occur. Since most studies in the past focused on communication between physician and patient, studies on pharmacist and patient are needed. In addition, the designs of these earlier studies made it difficult to establish order and eliminate other explanations. Therefore, a better controlled study is required. Last but not least, relationships between patient and provider might be culturally and organizationally bound. It is important to examine whether findings are similar across cultures, nations, and health care systems.

C. INTERVENTION AND STRATEGIES USED TO IMPROVE ADHERENCE

Studies which identified what might have caused the behavior have made a great contribution not only to the scientific world, but also to the practicing world. Practitioners, researchers, and health educators have moved one step further by designing intervention or obtaining strategies based on this increasing body of knowledge. As previous studies suggested, patient adherence requires comprehension and recall of the regimen, beliefs and motivation to follow it, and medication management skills. These components theoretically could be enhanced by educational, behavioral, and affective interventions discussed in table 1.

C.1 Educational Interventions

Educational interventions aim to provide medication information, enhance patient comprehension of the regimens, and verify patient knowledge and understanding of the regimens. Previous studies have shown that a combination of verbal and written information is the most effective way to

Table 1: Overview of components included in educational and behavioral interventions

Causes	**Interventions**
Comprehension	Educational (e.g. information giving, written information, verifying understanding)
Motivation Perceived benefit: efficacy Perceived cost: side-effects and concern	Behavioral and affective (e.g. support, reinforcing, reassuring, monitoring, self-monitoring, acknowledging concerns, problem-solving)
Recall	Behavioral (e.g. cueing techniques, tailoring techniques, reminding)
Life style modification	Behavioral (e.g. tailoring)
Pay	Behavioral (e.g. changing regimens, switching brand)

provide medication information and enhance patient understanding (Clinite & Kabat, 1976; Gotsch & Liguori, 1982; Kimberlin & Berardo, 1987; McBean & Blackburn, 1982). However, the current comprehensive meta-analysis study has shown that educational interventions alone only moderately improve patient adherence or provide inconsistent results regarding adherence (Roter et al., 1998). First, as mentioned earlier, knowledge and understanding alone might not be sufficient to change the behavior. Second, providing information about diseases in general might not have the same impact on patient medication use behavior as providing information specifically on the regimens. Third, inconsistent findings might be a result of different communication strategies used to provide educational interventions.

For written information, researchers in the UK studied Patient Insert Leaflets (PILs) in terms of helpfulness. They reported that 74% of 117 patients rated them as helpful and they had learned something from the leaflets. Sixteen percent had anxiety about side effects as a result of reading a PIL. However, only 4% actually stopped taking medication (Bandesha et al., 1996). This finding contradicts what is traditionally believed among health care providers, that written information alone only improves patient satisfaction and knowledge (Gibbs et al., 1989a; Gibbs et al., 1989b; McBean & Blackburn, 1982), but had little impact on adherence (Raynor, 1992). A review study also found that written information was not as helpful in increasing patient adherence for long-term medication as it was for short-term medication such as antibiotics (Morris & Halperin, 1979). However, it was quite clear that written information significantly improved patient knowledge in both drug categories (Johnson et al., 1986). Unfortunately, several studies Morris reviewed failed to report how the written information was distributed and whether it was appropriate for a particular audience. Moreover, the quality of the written information such as format, readability, and content might also be enormously different. This latter point was elaborated more clearly by Ley as he proposed that the type of leaflet used, with its format, print size, layout, and complexity of concepts and language, affected the patient outcomes (Ley, 1982). As the results of these studies, there are attempts to improve written materials both in the areas of content and style.

C.2 Behavioral Interventions

Behavioral intervention involves motivating, reminding, rewarding, monitoring, and skill building. These types of intervention can potentially enhance patient motivation, recall, and their medication management skills. After reviewing eleven relevant studies, the researchers found that financial incentives can improve patient compliance (Giuffrida & Torgerson, 1997). Despite this evidence, patients were more likely to discontinue the desired behavior when the reward was withdrawn (Haynes et al., 1987; Leventhal & Cameron, 1987). The refill reminding technique was found to be very effective for adherence to refill schedule (Baird et al., 1984; Skaer & et al, 1993). However, it is less useful when it comes to patient adherence to dosage schedule. Cueing and tailoring techniques were found to help patients with multiple medications and those who have complex regimens (Haynes et al., 1987). One of the most common behavioral strategies is a monitoring program conducted either by providers or by patients themselves. Providers can utilize some techniques such as home visits and telephone follow up for monitoring and problem solving purposes (Rich et al., 1996). Patient feedback and a collaborative environment are critical to the success of the follow up programs (Svarstad & Bultman, 2000). Patients also were encouraged to monitor their symptoms (Varma et al., 1999) as a way to make treatment outcomes more salient. For asymptomatic diseases, these strategies could take the form of using some device such as a blood pressure cuff (McKenney et al., 1978), with a daily card or calendar to keep track of the symptoms and side effects in diseases with highly somatic experience (Hermansen-Kobulnicky & Chewning, 2002). However, self-monitoring alone would have less or no impact on patient adherence unless it is followed up and reinforced by health care providers (Svarstad, 1986).

C.3 Affective Interventions

This type of intervention is likely to be viewed by previous studies as social support from family member, friends, and community. Interventions targeting patient family members were found to be successful in increasing patient adherence and other outcomes (Kirscht et al., 1981; Morisky et al., 1985). However, these interventions received little attention from mainstream studies for a number of reasons. Interventions engaging family members could be very complicated and time consuming. The living arrangement where elderly and their adult children live in separate houses can also be a substantial barrier. In this study, family involvement is considered to be one of the important factors affecting patient adherence. Little information is known about an impact of practitioners' supportive style on patient adherence. Experimental studies focusing on providers' supportive strategies are needed to examine the effects.

C.4 Interventions in CHF Patients

In the CHF field, only a few intervention studies have explicitly measured patient adherence, even though some of them have referred to it as one of the primary targets for behavioral changes. However, it is my intention to introduce you to the overview of intervention studies conducted in these groups of patients; therefore, I will discuss any interventions studies that targeted patient behaviors and reported rehospitalization as one of the main outcomes. It is somewhat consistent with previous studies in the extent to which the interventions that worked successfully were the ones consisting of at least two components or strategies. Follow up by telephone call was a common practice in these studies (Fulmer & et al, 1999; Gattis et al., 1999; Heidenreich et al., 1999; Naylor et al., 1994; Rich et al., 1995; Rich et al., 1993; Shar et al., 1998; Stewart et al., 1999; West et al., 1997). Telephone follow up could be a means to educate, monitor and assess problems or concerns, give feedback (rewarding), and show how much providers care about the patients (social support). Home visits were another common method for following up in these studies (Rich et al., 1996; Rich et al., 1995; Rich et al., 1993). About half of the studies I reviewed handed out written information such as educational material or a booklet (Heidenreich et al., 1999; Rich et al., 1996; Shar et al., 1998; Varma et al., 1999). Only one study indicated that their written materials specifically contained information about medication regimens (Varma et al., 1999). No separate evaluation for written information was performed. Even though pharmacist involvement in these studies was relatively small, several studies have used a multidisciplinary approach, which usually consists of a team of physicians, nurses, dieticians, and social workers

(Rich et al., 1996; Rich et al., 1995; Rich et al., 1993; Stewart et al., 1999; West et al., 1997). These massive interdisciplinary interventions have been found to be overwhelmingly successful. However, it seems to be nearly impossible to implement successfully elsewhere, especially in developing countries where resources are scarce. In addition, none of these studies documented long-term effects after the programs were withdrawn, and only one study explicitly mentioned a behavioral theory --social learning theory-- as being used to help design the intervention (West et al., 1997).

C.5 Providing Medication Information and Other Interventions in Thailand

Providing extensive medication information of any form is not a common practice among Thai health care providers. Physicians give little information about medication in the clinic visit. Pharmacist's verbal consultation for prescription drugs is usually provided when medication is dispensed or in a form of discharge counseling. However, the quality of consultation remains largely unknown. Even though pamphlets containing information about diseases and how to take medication in general are available for patients at several health care settings, they have not been widely and properly recognized and utilized. Moreover, there is no study evaluating the effectiveness of printed materials in Thailand (Sitthi-amorn & Ngamvithayapongse, 1998). According to data from The United Nations, in 1997, the national literacy level was quite high, 94%, but only 59% enrolled in secondary school that year (UNESCO, 1997). For the much older groups, in 1970, only 17.4% enrolled in secondary school. These data indicate that over two thirds of the population 60 years and older might be able to read at the equivalent of 6-7th grade level or below. Written information which is too complicated and requires a reading level over primary school might not be practical for this sector of the population. Moreover, a conservative assumption that Thai people do not like to read might have also led to the lack of studies being done in this area. One observational study indicated that Thai college students did not want any health related information and preferred to rely solely on their health care providers to make decisions for them (Charupatanapong et al., 1996). These were groups of teenagers with no known health threat. Unfortunately, there was no study on Thai elderly with chronic diseases regarding this issue.

There are a few unpublished studies investigating the effectiveness of pharmacy interventions in general. In these studies, patient adherence was measured using a self-reporting method. Few studies used randomized controlled design and most of these studies failed to document the link between process and outcomes, which is very critical for establishing the value of pharmacists' interventions (Lipowski, 1996).

C.6 Summary

This section reveals evidence that these interventions promise to make a positive impact on patient adherence. However, there are some concerns and gaps that need to be addressed and filled in. First, most interventions paid little attention to provider-patient communication, even though it is considered a means to deliver interventions. Second, most studies failed to explicitly establish a linkage between intervention characteristics and patient outcomes through other intervening factors. Third, several studies likely were too complicated and too expensive to implement in the real world. Fourth, most studies failed to adopt an explicit theory in order to understand and design the interventions.

CHAPTER THREE

THEORETICAL FRAMEWORKS AND SIGNIFICANCE

A. AN OVERVIEW OF THEORETICAL FRAMEWORKS

One way to understand more about designing and implementing interventions is to explore existing theories or frameworks. Not many theories in the area of health behavior explicitly illustrate or incorporate patient-provider interaction as a key concept. Some theories have been developed to explain and predict the prevalence and the differences among patterns of patient-provider interactions, whereas a smaller number of theories illustrate the link between the interaction and patient medication behavior. Surprisingly, only few theories have incorporated both. Value expectancy theories such as Health Belief Model or the theory of Reasoned Action, the well-known models used to predict and explain several health behaviors, mainly focus on individual beliefs and outcomes (Rosenstock 1974; Becker 1974; Becker & Maiman, 1980). Even though some researchers have conceptualized the patient-provider relationship as part of the constructs in these theories, it has not been fully developed or tested (Becker et al., 1977). In terms of using it as a framework to develop a communication related intervention, it fails to indicate specific strategies that seem to be effective (Svarstad, 1986)

Self-regulation theory and self-efficacy (Bandura, 1977; Leventhal & Cameron, 1987) are also considered cognitive and very individualized in nature, indicating the way people control and adapt their thoughts, emotions, and behavior to a changing situation, especially somatic experience, and other personal outcomes. Since the center of the model is somatic experience, it is difficult to apply to asymptomatic diseases. And despite several conceptual papers, there are only a few empirical studies being conducted based on the model and most of them do not incorporate the patient-provider relationship as part of the study (Berger, 1995; Conrad, 1985). Few studies that I am aware of have indicated using this theory in relation to provider-patient communication. For example, researchers conducted an experiment to examine the effects of patient self-efficacy on how well they communicated with providers (Greenfield et al., 1988). Physicians' teaching and communication behaviors were significantly related to a level of confidence the physicians have in carrying out the behavior and a level of self-regulation such as attempts to observe and evaluate one's own behavior (Clark et al., 1997).

Another paradigm that was frequently used in the area of patient-provider interaction is the cognitive processing paradigm. Previous studies showed the effects of different physician communication styles on several outcomes such as the amount of medication information obtained from patients, patient understanding of the treatments, patient satisfaction, patient adherence to appointments, and patient adherence to the regimens (Carter et al., 1982; Hall et al., 1981; Inui et al., 1982; Korsch et al., 1968; Roter & Hall, 1987; Roter et al., 1988). A number of interactive analysis scales (IAs) were developed based on the cognitive processing paradigm to examine these patterns of communication (Davis, 1968). These scales, therefore, have more to say about how well information is transmitted from one person to another cognitively, and less to say about how one person could influence others socially. As a result, this system of analysis is limited to one aspect of communication strategies.

Table 2: Overview of adherence models

Perspective/Paradigm	Theory/Model	Overview	Contribution
Models of individual health behavior	Health Belief Model	Individual's belief of specific health action would prevent or treat illness. This action determined by treatment benefit and cost	Adherence determined by patient perceptions of illness severity and vulnerability and treatment benefit
	Theory of Reason Action	Individual behavior determined by behavioral intention which is affected by one's attitude and subjective norm.	Adherence determined by attitude toward taking medication and normative beliefs
	Transtheoretical Model	"Behavioral change is a process involving progress through a series of five stages"	Adherence behavior consists of stages. Patients will go through stages until they fully adhere to a provider recommendation
	Self regulation model	Behavior determined by individual active problem solver and his/her perceptions of current and desired state	Adherence determined by somatic experience or symptoms and how patients interpret those symptoms
Models of interpersonal health behavior	Social learning/cognitive theory	Individual behavior is affected by the interaction between person's characteristic and the environment.	Behavior changes determined by external environment such as changing lifestyle, routine medication use
	Communication model	Type of information, delivery, reception, comprehension and acceptance of message determined behavior	Effective communication (clear, organized, verbal and nonverbal) increases likelihood of adherence
Models of applied intra and interpersonal health behavior	Client-centered	Focus on decision-making processes such as identifying treatment goals, choosing from regimen options, and monitoring symptoms and evaluating regimens	Patient is viewed as a partner in a care process not only a receiver. Clients decision making to take or not taking medication determined by this partnership.
	Health Collaboration Model	Focus on individual comprehension, recall, and motivation which affected by quality of providers' communication strategies and patient feedback	Patient adherence determined by the care process. Patients are more likely to achieve better outcomes when they actively collaborate in the process (e.g. increasing feedback).

In pharmacy, previous studies have focused mostly on factors which have prompted pharmacist-patient communication to occur, rather than on the nature and quality of the communication. Using role theory, Mason and Svarstad developed pharmacists' Counseling Role Orientation (CRO) which theoretically can be used to predict whether or not pharmacists would provide verbal consultation (Mason & Svarstad, 1984). However, in this case, role theory is more appropriate in response to questions of prevalence of verbal consultation, not the quality of it.

When Prochaska and DiClemnte succeeded on integrating the major theories together, one of the main results is that the behavioral change is a process and occurs in stages. People are categorized into different stages depending on their readiness for changes to take place. The previous study showed the success story of professional's ability to move a person from one stage to the next (Prochaska & DiClemente, 1983). Since the processes are important, given the ultimate outcomes might not be the only indicator, the model assists in explaining additional variance resulting from other theories. However, Transtheoretical model by itself says little about predictive relationship among constructs and behaviors in question. The theory has been used primarily in developing an intervention since it contains suggested strategies for behavioral changes in each stage. However, those strategies are not specific to any particular behavior including medication use behavior or patient-provider communication.

There are two similar models, the client-centered model and the health collaboration model, which discuss more about the nature and quality of patient-provider communication. The models apply theories related to patient behaviors, cognitive paradigm, and other communication theories in order to improve medication management outcomes. The two models also hold similar assumptions, which indicates that clients or patients will benefit from the care process and are more likely to achieve better outcomes when they actively collaborate in the process. The client-centered model focuses more on decision-making processes such as identifying treatment goals, choosing from regimen options, and monitoring symptoms and evaluating regimens (Chewning & Sleath, 1996), while the main outcome of the health collaboration model is improved patient medication use behavior, especially patient adherence to the medication regimen (Svarstad & Bultman, 2000). Since this study focuses on medication use behavior, I found the health collaboration model more relevant and helpful in designing an intervention.

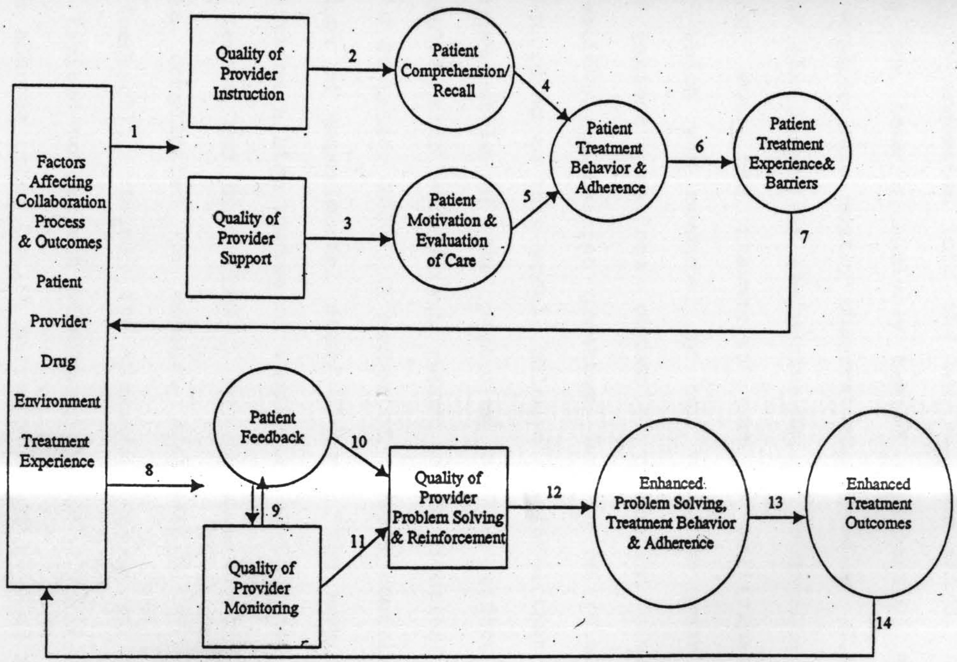
B. HEALTH COLLABORATION MODEL

This model indicates the importance of different strategies and the impacts of these strategies on patient medication behavior (Svarstad, 1976). The model has theoretically shown the actual mechanisms whereby patient-provider communication influences patient medication use behavior, especially patient adherence. Svarstad assimilated the cognitive model and power-based model as well as social influence perspectives to develop a model originally called " Health Communication Model". Even though it was originally created by observing patient-physician interaction, it has been modified over the years in attempts to explain patient-pharmacist interactions. The fact that this model was partly created by combining and modifying social psychological theories and some of the health behavior theories I mentioned earlier makes this model more comprehensive and elaborated. It contains both educational and behavioral aspects, which are known to significantly improve patient adherence.

The most important aspect of this model is the fact that the model has focused on what patients need and how to enhance the collaborative nature between patients and providers to achieve those needs. By using communication strategies, providers will be able to effectively communicate with the patients, and then collaboratively help the patients take their medications as recommended. The model suggests potential intervening factors, which would legitimize the connections between process (pharmacist consultation) and outcomes (patient adherence and rehospitalization). These factors are patient comprehension and recall, and patient beliefs and motivation. The theory's strategies aimed to improve patient comprehension and recall include explicit directions, explanation of purpose or importance, written reinforcement and supplementation, explicit categorization, repetition, simplification, and consistency of advice. The strategies aimed for patient beliefs and motivation include positive inducements and reinforcement, positive expectations and direction, the participatory approach to negative feedback, compliance monitoring and follow up, and friendliness or approachability. The use of multiple strategies is recommended.

In the latest version (Svarstad & Bultman, 2001), Health Collaboration Model (HCM), the new construct called "Quality of provider monitoring and problem solving and reinforcement" has been created, partly to reflect the dynamic and more collaborative nature of the provider-patient relationship (Figure 1). The provider's monitoring style and patient feedback have become the central constructs which are very critical to the success of the model in term of its predictive power and its usefulness in planning interventions. Besides these advantages, there are a number of shortcomings to the model. First, the model seems to overlook certain components which are known to be associated with patient health behavior. These components include resources, self-efficacy, medication-taking barriers such as forgetfulness and difficulties reading and opening a bottle, and social support by family members or friends. In HCM, these factors seem to be rounded up in the predisposing or antecedent category, which does not play a major role in

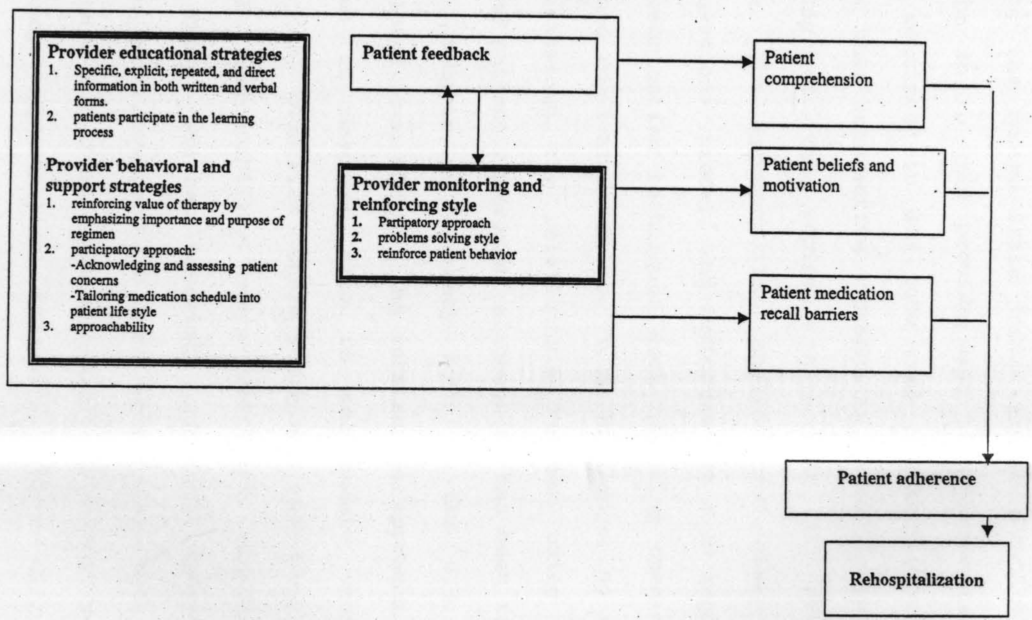
Figure 1: The Health Collaboration Model



the model. Second, non-verbal communication has not been explicitly incorporated into the model. And third, this model has not been extensively tested empirically. Most relevant studies were mostly observational studies. Sleath found that the length of pharmacist-patient communication was longer when the pharmacist uses a participatory approach, which was measured by ten variables such as number of patient questions, number of pharmacist closed-ended questions, pharmacist greeting, and so on (Sleath, 1996). According to this model, Bultman concluded that the collaborative style of the physician had an effect on client satisfaction and client report of medication use (Bultman & Svarstad, 2000). A number of reasons contribute to the lack of experimental study. First, the model by nature contains a high degree of complexity as it indicates multiple levels and dimensions. Second, some constructs are quite complicated to measure systematically (e.g. patient feedback). Third, the ultimate outcome of this model is limited to patient adherence, unlike other models that also address other health outcomes. And fourth, many of these strategies are difficult to apply to real practice by an untrained provider. It is also unclear whether the model would work in different countries and cultures. However, I believe it is worth exploring since these strategies are relatively elaborated and yet flexible for changes.

In this present study, attempts to overcome the limitations of the model have been carried out including (1) simplifying the model, (2) adding an intervening factor, (3) expanding the outcomes from patient adherence to rehospitalization, (4) selecting strategies that would work practically in Thai culture and could easily be adopted by Thai pharmacists, and (5) finding ways to put these strategies into practice (Figure 2). In addition to patient comprehension, along with beliefs and motivation, the concept of patient medication recall barriers has been added as one of the intervening factors affecting patient adherence. This factor reflects the impacts of medication complexity, patients' lifestyle changes and skill building, on patient adherence, especially for those who are older or have chronic diseases.

Figure 2: The Proposed study Model (intervention, ▬ , patient assessments —)



With similar philosophies, an interactive approach developed by the United State Indian Health Services has been brought in to help provide ways to incorporate the strategies mentioned in HCM into real pharmacy practice. The goal of this interactive approach is to verify patient understanding of the regimen, not just to provide information. The approach has spelled out clear and explicit questions, probes, and responses. It also suggests helpful communication techniques such as using open-ended questions and non-verbal skills. To my knowledge, no study has ever examined the relationship between using this approach and patient adherence, although it has been taught in several schools of pharmacy both in the U.S. and Thailand. Apart from HCM and the interactive approach, the intervention is designed also to accommodate pharmacy situations in countries where limited resources and traditional responsibility are considered significant barriers. Third, written materials regarding medication information are developed to use effectively with the elderly with a low literacy level. Finally, two main parts, the discharge consultation and the follow up, will characterize these interventions.

CHAPTER FOUR

STUDY METHODOLOGY

A. OVERVIEW OF STUDY DESIGN AND METHOD

I conducted a quasi-experimental study with a non-equivalent control group to test the effectiveness of pharmacist interventions. Nurses and pharmacists used eligibility criteria to screen all pateints with Congestive heart failure (CHF) conditions admitted to a regional hospital in Thailand.

The study included a *pre-intervention period*, during which pharmacists used traditional discharge consultation procedures, and an *intervention period* in which pharmacists used a collaborative approach learned in a training workshop. When patients were still in the hospital, they were told about the project and asked to sign the consent form. Patient's caregiver was asked to bring in patient's leftover medication from home and was asked for patient's telephone number, an address and a map to homes, and permission to tape record the consultations. Patient outcomes were assessed at the patient's own home by the researcher within 7-12 days of their initial discharges ;and a mail survey was sent out at the end of three month period to assess a number of hospital readmissions.

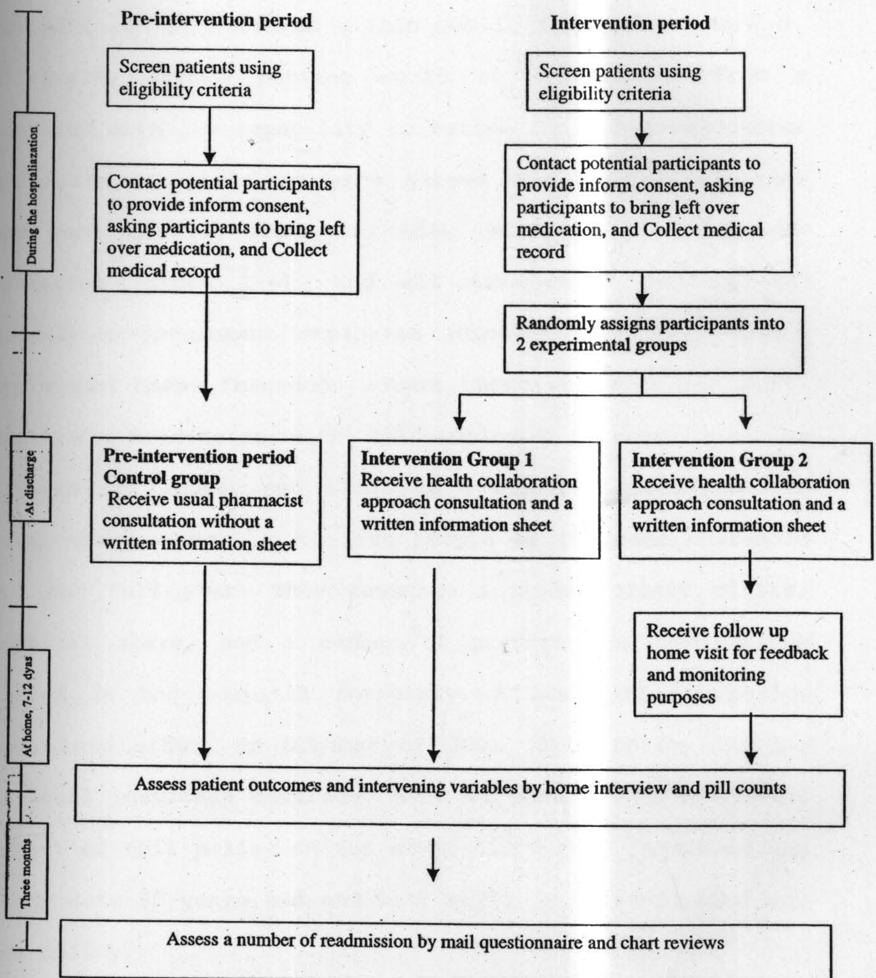
Participants in this study were enrolled during the pre-intervention or intervention period. Participants enrolled during the pre-intervention period received standard nursing consultation and traditional pharmacist consultation. Those who were enrolled during the intervention period were randomly assigned to two experimental groups. At discharge, both experimental groups received standard nurse consultation as well as participatory and collaborative interventions by hospital pharmacists. Within ten to twelve days after discharge, the researcher visited and interviewed all participants in their own homes. The hospital pharmacist who provided the discharge consultation accompanied the researcher to the home of all participants in experimental group 2. The follow-up consultation by the pharmacist took place before the home interview was conducted. At this point, medications were counted. Three months after the initial discharge, all participants received a short mail questionnaire that was used by the researcher to identify the number of hospital readmissions. At the same time, pharmacists were asked to do patient chart reviews to gather additional data.

B. SETTINGS

Buddhachinaraj hospital is located in the metropolitan area of Phitsanulok province about 377 Kilometers (236 miles) northern of Bangkok, the capital city of Thailand.

B.1 Phitsanulok Province and health care system

The province occupies 10,815 square kilometers or 2.1% of Thailand's total geographic territory. The population of Phitsanulok was 866,604 in 2001. The average income per capita was 42,456 TBH ($US 1,011). Only 10% of all residents live in the metropolitan area. More than 95% of all residents are Buddhists. The official language is Thai. The province's health care facilities consist of 1 regional hospital (Buddhachinaraj hospital), 3 non-ministry of public health hospitals, 7 private hospitals, 8 community hospitals (30-60 beds), and 148 health centers. These facilities listed here are in the order of treatment capabilities (e.g. number of beds, medical equipments, and medical personnel).


Pre-intervention period
Intervention period
During the hosptaliazation
Screen patients using eligibility criteria
Contact potential participants to provide inform consent, asking participants to bring left over medication, and Collect medical record
Screen patients using eligibility criteria
Contact potential participants to provide inform consent, asking participants to bring left over medication, and Collect medical record
Randomly assigns participants into 2 experimental groups
At discharge
Pre-intervention period Control group
Receive usual pharmacist consultation without a written information sheet
Intervention Group 1
Receive health collaboration approach consultation and a written information sheet
Intervention Group 2
Receive health collaboration approach consultation and a written information sheet
At home, 7-12 dyas
Receive follow up home visit for feedback and monitoring purposes
Assess patient outcomes and intervening variables by home interview and pill counts
Three months
Assess a number of readmission by mail questionnaire and chart reviews

Patients can be referred within public facilities where a clinically severe patient would be transferred from a facility with low capability to better ones. Before October 2001, the National insurance scheme covered Thai citizens who were aged 60 years or older, students in compulsory education (grade 1-6), and all government officers and elderly ex-government employees (Choowattanapakorn, 1999). Employment-based insurance covers those who were not self-employed. Households with self-employed persons, such as farmers or labors, can also buy a 500 THB ($US12)-health card, which covers up to five people in the same household for one full year. This coverage includes clinic visits, hospital stays, and a number of prescription medications listed in the hospital formulary. A new national policy came into effect in October of 2001. This policy changed national insurance coverage. But, we expect only a minimal impact of this policy on our study since most people in the study were 60 years old and will still be covered under the new policy.

B.2 Buddhachinaraj Hospital and Pharmacy related information

The hospital opened to the public in 1941. In 2001, it consisted of 948 beds, 100 physicians, 414 registered nurses, and 27 pharmacists. The hospital pharmacy department consists of an outpatient pharmacy and satellite inpatient pharmacies located in designated hospital buildings. Outpatient clinics also are located in the hospital compound and are controlled by the same administration as the inpatients facilities. In 2001, no computer network linked all of these pharmacy sites together. Therefore, patient information could not be transferred from one site to another electronically. In terms of pharmacy practice, discharged patients received non-refillable home medications from one of the satellite pharmacies within the hospital. There was no law or requirement for pharmacist to give any oral or written information to patients. At the regular clinic visit, patients also get a non-refillable prescription which is normally filled at an outpatient pharmacy department. Usually, the national insurance pays for a one month supply, so patients have to come back to see a physician once a month in order to refill their medication. They also have an option of obtaining medication at a community pharmacy without a prescription, but those will not be covered by any insurance. Some patients choose to follow up with their regular physician at his/her private clinic and to receive medication from the clinic; in that case, the patient would personally cover the cost of treatment including the medication.

B.3 Process of care

There are at least two different ways a patient can generally be admitted to the hospital. The first is by a physician's order made at the outpatient department located within the hospital compound; and the second is by a referral from a community hospital or a physician private clinic. The patient then will be assigned to any available bed in a general ward or a private room depending on their insurance type and their decision to pay out of pocket. An attending physician supervised by an internist or a cardiologist is assigned to each of these general wards. This attending physician will usually rotate every month or two.

During the hospital stay, medications are filled at the satellite pharmacy as a daily dose basis. These medications are brought to the patient by a nurse who then administers it according to instructions provided in a patient medical chart. When a patient is ready to go home, home medication is prescribed and filled at a satellite pharmacy by a pharmacist or a pharmacy technician. A pharmacist then checks the prescription and brings the medication to the patients directly. During off hours, patients would have to obtain their home medication at the satellite pharmacy by themselves.

At discharge, the patient's next clinic visit with his or her regular physician also is set. This visit usually will be within 12-15 days. Little is known about whether patients actually keep those appointments.

C. SAMPLING DESIGN

The sampling population is patients diagnosed with Congestive Heart Failure (CHF) who were admitted to an internal medicine division, Buddhachinaraj hospital between Feburary 27, 2001 and October 28, 2001. After, the researcher contacted the head of the internal medicine devision and the head of pharmacy department for permission to conduct this study, she contacted a satellite pharmacy located in the internal medicine building. There, seven pharmacists agreed to participate in the study. The second step was to identify six units out of the eight units within the internal medicine devision as potential settings for the study. The head pharmacist and the researcher indentified settings based on research criteria and practicallity issues. Two units which were initially eliminated were the Intensive Care Unit (ICU) and the Cardiology Care Unit (CCU). These two units were excluded because most patients are in critical conditions and pharmacists have not provided them with any clinical services. During the pilot study, another unit, male unit #2, was eliminated because, due to a heavy workload and pharmacist shortage, the pharmacist was no longer assigned to that unit. For the final stage, a total of five units, male units #1 and 3, and female units #1, 2, and 3, were visited and observed by the researcher for a final evaluation. Ultimately, patients with CHF condition who were admitted to one of these five units were initially eligible to participate in the study.

C.1 Sample Size Determination

A meta-analysis study suggested that, using indirect or subjective methods, the effectiveness of educational and behavioral intervention on adherence and hospitalization was low to moderate (ES=0.10-0.46) (Roter et al., 1998). Sample size was calculated based on the average of these effect sizes as well as the analysis methods planned to determine the effectiveness of the interventions. According to the power table of F test at a=0.05, U = 1, an effect size of 0.35, and power value of 0.80-0.90, the sample size would be about 40 patients per group (Cohen, 1988). Therefore, a sample size of 140 was desired. Expecting a 10 percent discontinuation for various reasons would produce a group size of over 40 participants. However, the number of enrollments for the entire study period was lower than it was originally expected. Because of time constraint, the total of 125 individuals were enrolled in the study and 107 participants were entered into the final analysis.

C.2 Eligibility and Consent

All patients admitted to the Buddhachinaraj hospital with the diagnosis of Congestive Heart Failure (CHF) were eligible for participation. Patients were excluded from participation if the reason for their current admission was not related to CHF conditions, if they were not expected to survive for six months, if they had marked dementia or another psychological disorder that prevented them from participating in the counseling program, or if they lived outside Phitsanulok province or nearby provinces or had no legitimate address.

The pharmacist pre-identified participants by using a written form that later was confirmed by the researcher. The researcher then approached the potential participants and asked them if they would like to participate in the study. She then asked those who were willing to participate to provide informed consent (appendix C).

C.3 Randomization

During the intervention period, patients were randomized using the last digit of their hospital identification number. Patients with an odd number were assigned to experimental group 1 while those with an even number were assigned to experimental group 2.

C.4 Pharmacists' and Nurses' Involvement in the Recruitment Process

In the beginning, the researcher attempted to identify a potential participant by herself. However, the attempt failed to cover every unit at once and left no time for her to approach potential participants for their consent. Therefore, pharmacists and nurses working in each unit were asked to use the researcher's recruitment form to identify patients. Two preliminary criteria (a diagnosis and distance of patient's homes from the hospital) were assessed by the pharmacists or nurses at the point of admission. The CHF diagnosis was established using medical records for known cases and by verbally asking the attending physician for newly diagnosed cases. If these two criteria were met, pharmacists or nurses then were asked to report the following information using the researcher's recruitment form: (1) patient's personal information, (2) when they were admitted to the hospital, and (3) their attending physician and pharmacist. This partially completed form was then placed in a designated basket in the office for the researcher to later confirm the eligibility status of each patient and to approach potential participants for their consent. One copy of the consent form and a card indicating their participation and date when the home interview would take place were handed out to all participants. Enrollment continued until the total of 107 patients were interviewed at home.

D. THE INTERVENTIONS

The Health Collaboration Model and interactive consultation approach provided a framework and a means for creating and evaluating these interventions. There were two interventions including (I) the informative consultation - the discharge consultation and written information sheets - and (II) the collaborative consultation - the informative consultation plus the follow-up visit. The informative consultation was provided to those in experimental group 1 at the point of discharge. The collaborative consultation was provided to the patients in the experimental group 2 at discharge and then again seven to twelve days after that.

D.1 The Informative Consultation (IC)

This intervention included the discharge consultation and the written information sheets (educational, behavioral, and support strategies).

After receiving a standard nursing consultation, both experimental groups were provided with written medication information and with a verbal consultation by the pharmacist. Communication strategies related to this part are:

D.1.a Participatory approaches

The participatory approach is defined as (1) assessing patient concerns in a more thorough and respectful manner and acknowledging the legitimacy of patient concerns, (2) tailoring or adjusting the drug regimen to fit patient routines and preferences, and (3) negotiating mutually acceptable solutions (Svarstad & Bultman, 2000). For the purpose of this study, acknowledging the legitimacy of patient concerns and assessing those concerns will be addressed by having pharmacists use prime questions and show-and-tell questions to initiate dialogue (Garner et al, 1997), in order to assess patient concerns, and to verify patient understanding of the regimen. The pharmacist was also encouraged to use other open-ended questions to probe when necessary. This approach would encourage the patients to take an active role in the consultation process. The concept of tailoring strengthens a patient-centered approach by adjusting a medication schedule to a patient's existing lifestyle. Pharmacists talked with patients about their lifestyles as well as their daily routines.

D.1.b Providing information

First, pharmacist provided and repeated explicit, direct, and individualized information.

Cognitive information processing perspectives provide a framework for understanding the effects of the learning process as well as providing strategies used to help persons cognitively process information more effectively. In 1982, Lay proposed a cognitive model which predicts significant correlation between understanding, memory, satisfaction, and compliance. Communication strategies found to be useful in enhancing a person's cognitive processes include giving *specific, explicit, repeated, and direct information in both written and verbal forms.*

Explicit and direct information is defined in this study as specific regimen information - the name of medication, how to take it, what it is for, how long the patient would continue taking it, and how this medication would help the patient.

The second element of providing information involved distributing a written information sheet. In 1996, the U.S. FDA steering Committee for the Collaborative Development of a Long-Range Action Plan for the provision of Useful Prescription Medicine Information developed criteria for evaluating the quality of written drug information (Svarstad & Bultman, 2000). The present study applied these criteria, a guideline for developing publications for people with limited-literacy skills (Clear and Simple), and a manual for accurate drug use (Thai) to create the written information sheets. A one-page user-friendly written information sheet was prepared in advance for a common heart regimen including an ACE inhibitors (Angiotensin-Converting Enzyme), diuretics, digoxin, and dinitrate. The written information was customized to accommodate the different brands available in the hospital. The written information sheets included the following sections: name, indication, how to use and store the medication, side effects, drug interaction, and other warnings. They were formatted in a user-friendly style. Because this cohort group was elderly and had a minimum of formal schooling, the sheet was supposed to be readable at the 4^{th} to 5^{th} grade level. Since I was not aware of any readability scale for the Thai language, I conducted a small test using samples with similar demographic backgrounds. The final version of the written information sheet was then given to the patient as part of the pharmacist interventions.

D.1.c Reinforcing value of therapy (emphasizing the importance and purpose of medication) and goal setting

People are more likely to be motivated to take action if they highly value the outcomes of that action. In the case of chronic diseases, the value of therapy or other benefits might not be so obvious. It is the pharmacists' duty to *help patients identify and set their immediate goal and to indicate ways to monitor it*. In this study, 1) pharmacists were expected to provide and discuss potential benefits and the value of a therapeutic regimen with the patients, and 2) pharmacists encouraged the patients to self-monitor their own conditions in order to make the benefits more salient and observable. The important conditions include 1) tiredness, 2) shortness of breath while sitting, and 3) ankle swelling (Varma et al., 1999).

D.1.d Approachability and support

Approachability is defined as verbal or non-verbal cues that indicate one is friendly or receptive to patient feedback and participation (Mason & Svarstad, 1984; Svarstad, 1986). Pharmacists should express empathetic responses, warm and positive feelings, and becoming an active listeners. Pharmacists also utilized some non-verbal skills such as an open body gesture, uncrossing arms and legs, squarely facing patients, making eye contact 50-75% of the time, and appearing relaxed.

D.2 The Collaborative Consultation (CC)

This intervention combined all of the elements from the Informative consultation plus the follow-up consultation which included monitoring, problem solving, and reinforcing. After the discharge consultation, patients assigned to the experimental group 2 were told by the attending pharmacist that they would be visited at their own home in the next ten to twelve days by the same pharmacist who provided the discharge consultation. Home visit was selected as a mean of providing a follow up because it is a much-preferred way of establishing rapport with patients and because outside Bangkok, the capital of Thailand, phone services are limited. In 2001, there were only 6 million phone lines to serve 50 million people (AIT, 2001). Therefore the majority of Thai people, especially those who live in the rural areas, do not have access to a phone.

The original study design was to have the follow up visit and the home interview take place on two different days. However, two limitations prevented the execution of the plan. First, the distance between the hospital and patients' homes were too great and the next clinic visit to a regular physician, usually within 12-15 days after the discharge, made it difficult for the researcher to make double round trips in short periods of time. Therefore, the pharmacist went to the patient's home with the researcher. They then provided follow up services described in detail below. In the meantime, the researcher sat away from where the consultation took place. When they finished, the pharmacist and the researcher switched places and the home interview began.

D.2.a Monitoring patient feedback

At the follow up visit, pharmacists used the participatory and collaborative approaches mentioned earlier, including show-and-tell questions and other open-ended questions to monitor patient feedback.

D.2.b Problem solving

Pharmacists were expected to manage particular problems regarding patient comprehension and recall, patient beliefs and motivation, and patient medication-taking skills and resources. Other problems were directly reported to the patient's physicians.

Table 3: Overview of problem solving management

Major concerns	**Problem-Solving**
Patients have problems with water pills due to an inconvenient life style	Tailor administration time to accommodate patient lifestyle
Patients experience dizziness due to low blood pressure	Change administration time to bedtime.
Patients experience severe cough as a result of taking ACE inhibitors	Acknowledge the causes. Inform physician and adjust the regimen.
Patients cannot remember the regimen and when to take medication	Simplify medication dosage regimen, Tailoring , Cueing, and Reminding system
Patients doubt medication efficacy	Reinforce value of therapy, encourage self-monitoring
Patients having difficulty reading the medication label	Change label, clarify the direction
Patients having difficulty opening a medication container	Change medication package

D.2.c Reinforcing patient behavior

If the patients indicated no problem or concern regarding their medication, and reported taking the medication as recommended, the pharmacist reinforced their behaviors by expressing admiration or using positive responses.

D.3 Pharmacist training program

Following the pre-intervention period, the pharmacists were trained using a folder developed by the researcher and an interactive approach manual developed by Gardner et al, 1997. The pharmacists were asked to attend one workshop, which were designed to provide opportunities for pharmacists to develop clinical and communication skills required for carrying out these interventions. The training workshop included lecture and a role-playing component. A lecture section involved 1) CHF patient medication use behaviors and 2) the participatory and collaborative communication strategies. In the role-play section, each pharmacist role-played a patient consultation using a participatory and collaborative approach. The scenario was obtained from five real cases selected during the pre-intervention period (Appendix A). The role-players were video-taped and critiqued based on the components identified earlier.

E. DATA COLLECTION PROCESS

Medication profile, hospital records, pill count, home interviews using a structured questionnaire, and a mail questionnaire were the primary means for data collection in this study.

E.1 Hospital Record Review

This process took place at the hospital when enrolled patients were discharged. Two forms were collected including 1) the patient medication profile, and 2) the initial recruitment form. The researcher asked a pharmacist to provide a medication profile for each of the participants. This medication profile yielded important information including the home medication, its prescribed directions, the amount of medication that was dispensed, names of the attending physician and pharmacist, the discharge date, the next clinic visit appointment date, how long the patient had stayed in the hospital, and what symptoms they had prior to admission. The initial recruitment form provided the researcher with the patient's personal information (such as the patients hospital room number and bed number, patient's age and gender, the patient's address, and a detailed map). This form was placed in the designated basket in the researcher's office. The researcher then noted the patient identification number on the right hand side of these forms and kept them in the individual patient's folder.

E.2 Home Interview

Participants were told at the hospital that they would be interviewed a few days after they were discharged from the hospital. Most patients were visited by the researcher within 10-12 days. A shorter period elapsed on a case-by-case basis if the patient's next clinic visit was less than 12 days from the initial discharge. Patients with home phones were called a few hours in advance to make sure that they were home. However, most patients were visited without advance notice. The researcher then used the directions and map provided by the patient to get to the patient's home. The mileage and travel time were recorded in detail.

Most participants lived in remote areas; therefore, the average travel time was more than one and a half hours. At the home interview, two instruments were used 1) The Structured Home Assessment Questionnaire, and 2) The Pill Count Report form. The times of the interview were recorded from the start to finish. However, it is difficult to tell exactly what the interviewing time was since the record included time spent talking about other issues. The average time spent at patient home was about 1 hour.

E.3 Mail Questionnaire

The researcher prepared the mail questionnaires and purchased a $5 money order for each patient. The questionnaire, the money order, and an instruction sheet were then sent out one day prior to the date marked to indicate that it had been three months after the initial discharge. The instruction sheet asked the patient to answer the short questionnaire and to send it back to the researcher. On the back of the questionnaire was a pre-stamped with the researcher's name and address. The money order was for the patient to keep. Three envelopes came back because of invalid addresses. The reminder form and another copy of the questionnaire was sent out if the researcher did not receive the original questionnaire back within a month.

E.4 Patient Chart Review

Five pharmacists were asked to collect and review the patient's medical chart at three months after the initial discharge. The patient chart review sheet was developed by the researcher and the pharmacists mainly to gather clinical and hospital readmission data from the patient's official medical record. Each of the pharmacists was paid $10 for each complete chart review. The review yielded several relevant clinical data including a diagnosis date, primary cause, conditions and symptoms, and supplemental data on hospital readmission.

F. INSTRUMENT DEVELOPMENT

F.1 Measurement of Intermediate Outcomes

According to the framework stated in earier chapter, the intervening variables include Patient Comprehension and Recall of the regimen, Patient Specific Belief and Motivation, and Patient Recall Barriers

F.1.a Patient comprehension and recall of the regimen

This factor was measured by structured interviews at the patient's home. The patients were asked four open-ended questions which were modified from the Brief Medication Questionnaire (BMQ) (Svarstad et al, 1999). The items include:

1) "What are the names of the medication the doctor wants you to take?";
2) "How many times per day are you supposed to take it?";
3) "For what reason are you taking it?";
4) "For how long do you have to take it?"

The researcher then compared the answers with the pharmacy medication profile and sometimes with the physician's informal interview. She then coded each item as correct or incorrect. Those who answered correctly were given the score of 1 and those who answered incorrectly were given a score of 0. Finally, the Patient Comprehension and Recall Scale was constructed with the score ranging from 0 to 4.

F.1.b Patient specific beliefs and motivation

Seven items were asked during the home interview. These items were taken and modified from two previous studies, (1) Svarstad et al. 1999 and (2) Bennett et al. The first two items were taken from BMQ (Brief Medication Questionnaires) developed by Svarstad. The 80% validity was found for the original scale. In this study, these items were used to assess beliefs and motivation for every heart medication.

1. " How well does the medication work for you?"
2. "What kinds of worries or concerns do you have about (medication's name) that have not been dealt with by your health care providers."

The first item was scored on a zero to three point scale(NOT WELL =0, WELL=1, and VERY WELL=2). The second item was scored on a zero to one point scale (ANY CONCERN=0 and NO CONCERN=1).

The remaining five items were asked specifically for diuretics. Developed by Bennett and his colleagues the " Beliefs about Medication Compliance Scale" (BMCS) instrument assesses benefits and barriers subscales. A 0.87 and 0.91 Cronbach alpha was found in those subscales respectively. The content validity, after being evaluated by two nurses with expertise in HF and adherence, was found to be supported by factor analysis. BMCS was developed to use with only one particular drug category - the water pill. Future use with other medications needs to be reevaluated (Bennett et al., 1997). Five items out of original nine items were used in this study.

3. " Taking your water pills will lessen your swelling."
4. "Taking your water pills helps you breathe more easily.";
5. "Taking your water pills is unpleasant."
6. "Taking your water pills makes it too hard to go away from home."
7. "Taking water pills causes you to wake up at night to go to the bathroom"

These items contained 4-point response categories ranging from strongly disagree (=0) to strongly agree (=3). Reversed coding were used for items number 5,6, and 7. These five items were not used in the final analysis because it yielded small variability.

The specific belief scales for both diuretics and ACE inhibitors were constructed by adding up the first two items. A maximum of three points were granted to patients who reported that the medication worked very well and that they had no concerns about the medication. The higher scores indicated that the patient believed that the medication was working and that he or she had no concerns about the medication.

F.1.c Patient General beliefs and motivation

Items are modified from Bultman's work regarding client initial beliefs. The original items were found to be highly correlated with self-reported patient adherence (Bultman & Svarstad, 2000).

These items were taken from Client initial beliefs items with a score of zero to four. Four means that they strongly agreed with the statement, zero means that they strongly disagreed.

1. "Overcoming heart failure usually requires (three medications' names)."

2. "Taking this is good option for me."

3. "I would prefer a different medication."

4. "The side effects of (medication's name) are likely to be bothersome."

Reversed coding was performed for items number 3 and 4.

Additional items from the BMCS were also used to assess the patient general beliefs. Three more items with the 4-point response categories: strongly disagree to strongly agree, were asked:

5. "If you take your water pills as you are told, you will decrease your chances of being hospitalized."

6. "Taking your water pills will help you maintain your quality of life."

7. "When you take your water pills you will not have to worry as much about your disease."

F.1.d Patient Recall Barriers

This variable was developed by combining three related constructs to indicate whether patients have any recall barriers. These constructs included (1) regimen complexity, (2) patient reminder technique, and (3) difficulties remembering. Each construct was worth one point. The maximum score of 3 points was created by summing up these three constructs. The higher the scores were, the more recall barriers the patient had.

Regimen complexity

Generally, patients are more likely to forget when the prescribed regimen was too complex (Conn et al., 1991). In this study, Complexity was operationalized as having been prescribed the CHF medication regimen more than one time a day. Therefore, those who were to take diuretics or ACE inhibitors more than one time a day would receive a score of 1, other patients would get 0. The data were collected from pharmacy medication profile and was verified with the patients.

Patient medication reminder technique

Patients might be able to develop cues or reminder technique to remind themselves to take the medication. Three types of cues, on exact time, meal time, and daily ritual, were suggested in a past study (Cramer, 1998). Other studies suggested visual cues and boxes or medication organizers as means to help patients keep track of the medications (Felkey, 1995). Five items were used to assess these techniques. Each of these items contains 4-point responses categories: All the time, Often, Sometimes, and Never.

1. "How often do you take the medication at the exact time of the day according to your watch or clock/"
2. "How often do you take the medication in relation to meals?"
3. "How often do you take the medication the in relation to your other daily activities such as getting up, taking a shower, going to work, or going to bed/"
4. "How often do you keep your medicines in a pill organizer box?"
5. "How often do you keep them where you can see them?"

If patients reported sometimes or never using any of these techniques they received 1 points, otherwise they received a score of 0.

Difficulties remembering

The patients was asked "How hard it is to remember to take your medication?".

This item was taken from BMQ (Brief Medication Questionnaire) and came with 4-point response categories -- Very hard, Somewhat hard, Hard, and Not at all hard. Those who reported not hard at all received a score of 0 and the rest received a score of 1.

F.2 Measurement of Patient Medication Adherence and Hospital Readmission

F.2.a Patient adherence

Patient adherence was measured by a combination of pill counting and self-reporting methods. The pill count method was used to measure patient adherence for every participant and for every medication identified as part of a heart regimen. The pill count report sheet was created to collect the following data and finally to calculate the percentage of missed doses used as the behavioral outcome in this study. During hospitalization, patients or caregivers were asked to bring their leftover medication from home. These medications were counted and returned to the patients. At discharge, the number of leftover medications was added to the number of newly dispensed medications to form "Time 1 Medication". At the patient's home, seven to twelve days later, the medication was then counted again and recorded as "Time 2 Medication".

Table 4: Construct measures

Measures	Content	Coding scheme	Range of scores
Patient Comprehension scores	1. Medication name 2. Purposes of taking the medication 3. Recall dosage regimen 4. How long patient suppose to take the medication	Incorrect/don't know =0 Correct=1	0-4
Patient Specific Belief Scores	1. Medication 's effectiveness 2. Problems or concerns	Not well=0 Well =1 Very well=2 Yes=0 None=1	0-3
Patient Recall Barriers Scores	1. Complexity of the regimen 2. Utilizing any recall technique 3. Forgetfulness	Take once a day=0 Take more than once a day=1 Yes=0 No=1 No=0 Yes=1	0-3
Caregiver help Scores	10-item (tasks related caregiver help)	Not true=0 Somewhat true/True=1	0-10
Patient Adherence	1.Pillcount: Percent missed doses 2. Self-report: 2.1 How exactly patient take the medication? 2.2 How difficult to remember to take their medication in general?	(#Home medication -# med at home-pill count) x 100 / # days after discharge Decreased/increased doses = 0 As prescribed = 1 Yes=0 No=1	0-100% 0 or 1
Number of hospital readmissions	Number of readmissions within 3 months		0-4

The patient adherence rate was calculated by subtracting "Time 1 Medication" with "Time 2 Medication" and comparing this number with the total number of pills that should have been taken. At the same time, patients were also asked what exactly they had been taking their medication for after their discharge from the hospital.

F.2.b Hospital Readmissions

Hospital readmission is defined as any participant's admission to a hospital for medical treatment that lasted for at least 24 hours. An emergency room (ER) visit is defined as any participant's registration into an ER or Urgent Care Unit for temporary medical treatment. This outcome was obtained from two sources. The primary source was a short mail questionnaire, which was sent out to the patient's home at approximately three months after the initial discharge. Patients or caregivers were asked: "Have you (the patient) been admitted to a hospital since you left the hospital three months ago?", and "Have you gone to an emergency room or an urgent care unit since you were discharged from the hospital?". Only the patients who reported having been rehospitalized or visiting the ER were asked about the name of the hospital, the admission date, the length of stay, and the reasons for the rehospitalization or ER visit. If the patient did not respond within a month, a reminder was mailed out in an attempt to increase the response rate.

The secondary source was a patient chart review. Assigned pharmacists reviewed a patient's medical chart three months after his or her initial discharge. The number of readmissions was reported on a chart review instrument. This method might not be reliable as a primary measure because the patient could be readmitted at other hospitals or hospital staffs could code document improperly. This method was only used if there was sufficient evidence as to whether the patient was actually readmitted.

Two variables were created to represent this outcome including number of hospital readmissions and any readmission. For the any readmission variable, those who reported "Yes" to the question "Have you (the patient) been admitted to a hospital since you left the hospital three months ago?" were coded as 1 and those who answered "No" received 0. In number of hospital readmissions, patients who were never readmitted were also coded as 0, otherwise the exact number of times that the patient was readmitted was entered into the data file. The researcher had to make sure that the initial admission (time when the patient was recruited) would not be counted. Two people passed away without any readmission. The average number of readmissions from others who were readmitted and passed away were used to replace the missing data.

F.3 Measurement of Program Fidelity and Covariates

F.3.a Program fidelity

The fidelity of the intervention was determined by monitoring the recorded conversation between pharmacist and patient. In addition, patients in experimental groups 1 and 2 were asked: "Have you received written information from a pharmacist?" and "Has the pharmacist talked to you about your medication?".

F.3.b Predisposing factors

Patient predisposing factors were identifiend as (1) demographic variables, (2) caregiver variables, and (3) clinical and medication related variables. All data came from three different sources: (1) the pharmacy profile; (2) the recruitment form at the hospital recruitment process;

and (3) the structured questionnaire used during the home interview.

The *demographic variables* included age, gender, and education. The researcher also attempted to collect data on family income or socioeconomic status, but the pilot study proved very difficult to get reliable data that would reflect the patient's true status. The elderly usually had no income, but they were financially supported by their adult children who were generally unavailable to answer questions. Therefore, the variable wasn't included in the final analysis.

The *Family caregiver Helps* variables attempted to identify: (1) whether or not patients had caregiver help at home, (2) who was the primary caregiver, and (2) what type of care had been provided. The data were obtained using the structured questionnaire at a home interview. The family caregiver involvement in medication management was measured using ten items. First, the patient was asked whether she or he had primary caregivers. Second, patients were asked to complete the family involvement scale. The questions began with "I would like you to think about your family member and tell me how helpful they are for you regarding the medication issue." These ten items include:

1. How helpful are they for you on reminding you to take the medication?
2. How helpful are they for you on preparing each dosage unit?
3. How helpful are they for you to prepare the pillbox?
4. How helpful are they for you on keeping you company at the pharmacist consultation?
5. How helpful are they for you on reading the medication label?
6. How helpful are they for you on making decision regarding the medication?
7. How helpful are they for you on providing medication information?
8. How helpful are they on encouraging you to take the medication?
9. How helpful are they on listening to your medication problem?
10. How helpful are they for you on helping pay the medication cost?

Patients responded to these questions by answering Not true, Somewhat true, or True. When the variables were analyzed, those who responded 'not true' were coded as 0 and those who responded 'somewhat true' or 'true' were coded as 1. Then all of the items were added up to form a caregiver help score ranging from 0-10.

The *clinical and medication* related variables included (1) when the disease was diagnosed, (2) the number of medications, (3) the types of prescribed medications, (4) when the patient was supposed to take their medication according to the prescription, (5) how many co-morbidities the patient had, and (6) the number of days in the hospital at baseline. These data were gathered from pharmacy profiles as well as from an official hospital chart.

G. BACK-TRANSLATION

A Thai native speaker translated the English original instruments into Thai. This Thai version was compared item by item against the English original and all the detected discrepancies were discussed in order to establish the first intermediary Thai version, which in turn was translated back into English. This preliminary version was then tested on a sub-sample of the target population during a pilot study. Some minor modifications were made, while our main intention was to keep the integrity of the first version.

H. LIMITATIONS

There are a number of limitations to this study methodology. First, the study is limited to one geographic location, which might limit the level of generalizibility for the findings.

Second, this is not a true experimental design. Potential biases could occur since the control and experimental groups were recruited at the different periods. The researcher divided the groups so that they were comparable socially and clinically. There might still be a number of unseen factors, which could affect the results.

A third limitation has to do with a relatively small sample size. The small sample size could affect the statistical power and therefore, reduce the possibility of finding significant results. It also prevents the researcher from exploring other factors since there might not be enough variability within those factors to do any further comparison.

Fourth, questions used in this study were originally developed in English and validated in the environment where they were created. The Thai-version, on the other hand, has not yet been validated. Whether these questions would transcend cultural boundaries and how they appeared or were perceived by the Thai as a whole might potentially be an issue.

Moreover, there is a lack of a direct measurement of some clinically related information such as severity of the illness. Proxy items (e.g. number of hospital days at baseline, number of medications) have been used instead. As a result, a careful interpretation of the findings is critical, given these limitations.

CHAPTER FIVE

PATIENT CHARACTERISTICS

A. RECRUITMENT PROCESS

During the 11-month recruitment process (from February to November 2001) pharmacists and nurses identified 137 recently hospitalized patients who (1) were admitted to the hospital primarily for congestive heart failure and (2) had a permanent address in Phitsanuloke or the nearby provinces. Out of 137 patients, 125 patients were deemed eligible and agreed to participate. Patients were deemed ineligible if they lived out of area, "ran-away" (left the hospital against medical advice), died, or refused to participate.

During the pre-intervention period (from February to mid May 2001), 45 patients were recruited and agreed to participate. Three of these 45 recruits became ineligible due to misdiagnosis and two others were referred to other hospitals. As a result, forty patients received standard discharge counseling from pharmacists and nurses. Of these patients, 38 (84.4%)completed the home interview; one patient died at home, and another one moved out of the area.

In the intervention period (from mid May to November 2001), eligible patients were randomly assigned to experimental group 1 or to experimental group 2 based on the last digit of his or her hospital identification number. Those with an "odd" number were assigned to group 1 and those with an "even" number were assigned to experimental group 2. Thirty-three of 38 (86.8%)enrolled patients in the experimental group 1 completed the home interview, while thirty-six of the 42 (85.7%) patients enrolled in experimental group 2 completed the home interview.

The informative consultation (IC) (described above) was then provided to those in experimental group 1 at the point of discharge. The collaborative consultation (CC) was provided to the patients in the experimental group 2 at discharge and then a follow up visit seven to twelve days later. Throughout the rest of the dissertation, I interchange experimental group 1 with 'IC group' and experimental group 2 with 'CC group'.

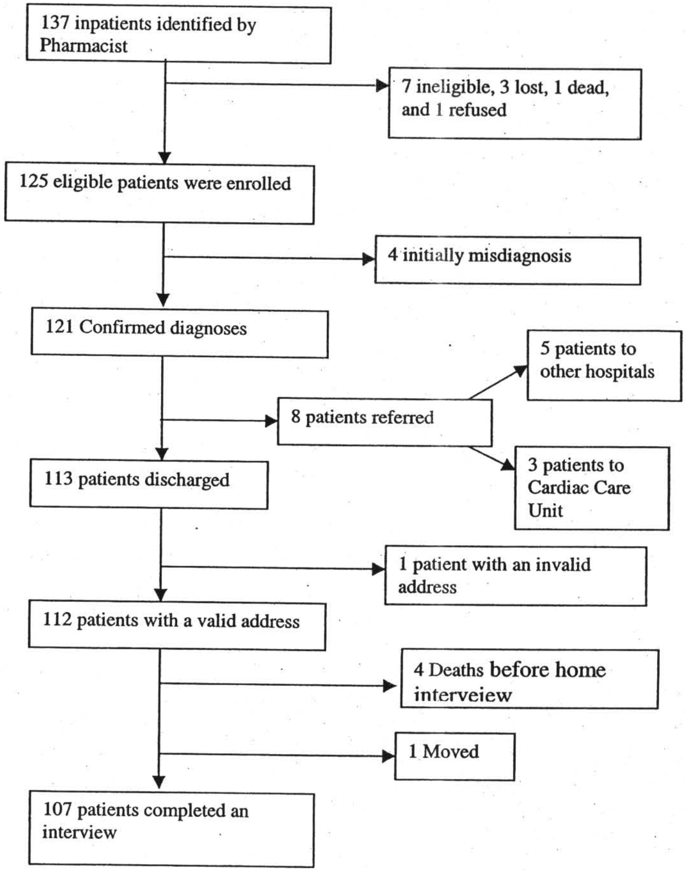


Figure 4 : Recruitment Diagram

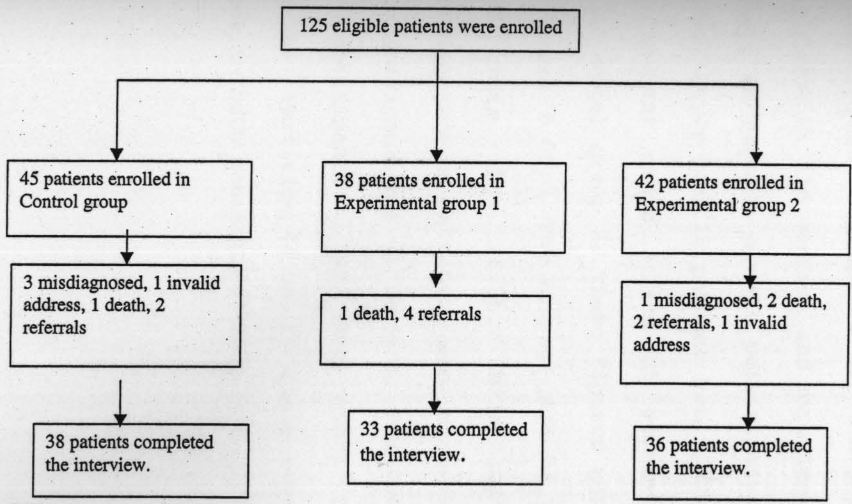


Figure 5: Recruitment diagram by group

B. COMPARISON OF GROUPS BY DEMOGRAPHIC CHARACTERISTICS

Patients' demographic characteristics such as age and education have been found to affect patient health outcomes. Table 5 compared the demographic characteristics of patient in the control and experimental groups. Overall, fifty-five percent of all participants were male, but the control group had 15 percent more female participants than experimental group 1 and 25 percent more females than experimental group 2. These figures were not significant at the level 0.05. The average age of all participants was 60.0 years (SD= 16.0). While patients who received collaborative consultation were somewhat younger, there was no significant age difference. The overwhelmingly majority of participants spent four years or fewer in school (82.2%). Participants in CC group were more educated than those in both control and IC groups.

Table 5: Patient background characteristics by group at time 1

Characteristics	Total	Control	Exp 1	Exp 2	Chi-squre/ F value
Male, %[a] (n)	55.1 (59)	42.1 (16)	57.6 (19)	66.7 (27)*	4.62
Female	44.9 (48)	57.9 (22)	42.4 (14)	33.3 (12)	
Age in years, mean (SD)[b]	60.0 (16.0)	62.5 (16.9)	62.8 (14.8)	57.8 (16.1)	1.09
Four year or less in school, %[a] (n)	82.2 (88)	84.2 (32)	93.9 (31)	69.4 (25)**	7.23
More than 4 years	17.8 (19)	15.8 (6)	6.1 (2)	30.6 (11)	
Newly diagnosed, %[a] (n)	31.8 (34)	15.8 (6)	48.5 (16)**	33.3 (12)**	8.77
Known case	68.2 (73)	84.2 (32)	51.2 (17)	66.7 (24)	
Having one or more co-morbidities, %[a] (n)	53.3 (57)	60.5 (23)	51.5 (17)	47.2 (17)	1.37
None	46.7 (50)	39.5 (15)	48.5 (16)	52.8 (19)	
Hospitalization at baseline, mean days (SD)[b]	5.3 (4.0)	5.6 (4.7)	4.8 (2.6)	5.3 (4.4)	0.41

Note: Table shows p level for chi-square test[a] and analysis of variance[b]: $^{*}p<0.10$, $^{**}p<0.05$ compared with control group. Number of cases varies due to missing data.

C. COMPARISON OF GROUP BY CLINICAL AND MEDICATION RELATED CHARACTERISTICS

Table 5 also shows that just over one third of the participants in this study were newly diagnosed with CHF. Overall, the average number of years since diagnosis for both the newly diagnosed patients and known cases combined was 2.44 years. While the average number of years since diagnosis was not significantly different among the control and intervention groups, there were significantly more newly diagnosed cases in the IC and CC group than in the control group.

About half of the participants were suffering from one or more co-morbidity. The most common conditions among these patients included diabetes, chronic renal failure, and COPD. There was no significant variation of these conditions among the control and intervention groups.

The average number of days stayed in a hospital at baseline was 5.3 days (SD=4.0). Table 6 shows that the average number of medications that each patient was currently taking was 5.85 (SD=2.3), which is similar to what had been reported in other studies with the same

Table 6: Patient medication characteristics by group at time 1

Characteristics		Total	Control	Exp 1	Exp 2	Chi-squre/ F value
Total number of medications, mean (SD)[b]		5.9 (2.3)	6.2 (2.1)	5.7 (2.4)	5.9 (2.3)	0.37
Medication Treatment, %[a] (n)						
Diuretics	Yes	86.0 (92)	78.9 (30)	87.9 (29)	91.7 (33)	2.62
	No	14.0 (15)	21.1 (8)	12.1 (4)	8.3 (3)	
Ace inhibitors	Yes	77.6 (83)	76.3 (29)	75.8 (25)	80.6 (29)	2.81
	No	22.4 (24)	23.7 (9)	24.2 (8)	19.4 (7)	
Dinitrate	Yes	40.2 (43)	57.9 (22)	21.2 (7)*	38.9 (14)	0.01
	No	59.8 (64)	42.1 (16)	78.8 (26)	61.1 (22)	
Digixin	Yes	32.7 (35)	23.7 (9)	39.4 (13)	36.1 (13)	0.32
	No	67.3 (72)	76.3 (29)	60.6 (20)	63.9 (23)	

Note: Table shows p level for chi-square test[a] and analysis of variance[b]:*$p<0.10$, **$p<0.05$ compared with control group.

patient population (Rich, 1996). Eighty-six percent of the patients (n=92) were prescribed diuretics and 78 percent of the patients (n=83) were prescribed ACE inhibitors. A little less than half of all patients were on dinitrate and aspirin. One third had been prescribed oral digitalis. There was no significant difference among groups regarding these variables.

D. COMPARISON OF GROUPS BY CAREGIVER HELP CHARACTERISTICS

In this study, caregivers were defined as members of a patient's nuclear or immediate family, or friends or neighbors whom the patients themselves had identified.

With a maximum score of 10, the mean caregiver help score for each group ranged from 4.2-4.6 with the average score of 4.5. There was no statistically significant difference among all groups regarding the mean score. However, when the scores were categorized into any caregiver help (caregiver help score>0) and none (caregiver help score=0), there was a higher percentage of patients who received caregiver help in the control group and CC group than in the IC group. About 75-85 percent of all patients in the CC group and the control group respectively identified someone at home or close to home as their caregiver who engaged in at least one type of medication related help. Again, only 64 percent of participants in IC group received similar assistance. Patients' spouses were the main source of help (50.0 percent), while a son or a daughter or a daughter-in-law accounted for approximately one-third of all sources. Over 70 percent of all caregivers in this study were women. For relatively younger patients, mothers became the main source of care. Only a small percentage of the patients reported having people other than their spouses or their offspring as primary caregivers. These other caregivers included sisters and other relatives. In this sample, neighbors and friends did not appear as main sources of care. These results somewhat reflected the living arrangements and cultural values of Thai people who believe in caring for a sick family member in the home.

Patients reported that caregivers provided emotional support by encouraging the patient to take his or her medication or by listening to the patient's problems more often than they provided informational support or helped the patient determine whether the medication is right for

Table 7: Caregiver help by group

	Total	Control	Exp 1	Exp 2
Any caregiver help, % (n)	74.8 (80)	84.2 (32)	63.6 (21)*	75.0 (27)
None	25.2 (27)	15.8 (6)	36.4 (12)	25.0 (9)
Who provided care, % (n)				
Spouse	50.0 (40)	40.6 (13)	57.1 (12)	55.6 (15)
Offspring or in-law	32.5 (26)	34.4 (11)	28.6 (6)	33.3 (9)
Others	17.5 (14)	25.0 (8)	14.3 (3)	11.1 (3)
Male	28.8 (23)	31.3 (10)	19.0 (4)	33.3 (9)
Female	71.3 (57)	68.8 (22)	81.0 (17)	66.7 (18)
Type of Caregiver help, % (n)				
Help remind when to take med.				
Not true =0	31.8 (34)	23.7 (9)	36.4 (12)	36.1 (13)**
True=1	63.9 (73)	76.3 (29)	63.6 (21)	63.9 (23)
Help prepare medication				
Not true =0	50.5 (54)	34.2 (13)	54.5 (18)**	63.9 (23)**
True=1	49.5 (53)	65.8 (25)	45.5 (15)	36.1 (13)
Help getting box or organizer				
Not true =0	56.5 (52)	86.8 (33)	63.6 (21)	72.2 (26)
True=1	43.5 (40)	13.2 (5)	36.4 (12)	27.8 (10)
Help pay for medication				
Not true =0	54.2 (58)	44.7 (17)	60.6 (20)	58.3 (21)
True=1	45.8 (49)	55.3 (21)	39.4 (13)	41.7 (15)

Table 7 (cont.): Caregiver help by group

	Total	Control	Exp 1	Exp 2
Help read medication label				
Not true =0	43.9 (47)	39.5 915)	51.5 (17)	41.7 (15)
True=1	56.1 (60)	60.5 (23)	48.5 (16)	58.3 (21)
Present at pharmacist consultation				
Not true =0	57.0 (61)	71.1 (27)	48.5 (16)*	50.0 (18)*
True=1	43.0 (46)	28.9 (11)	51.5 (17)	50.0 (18)
Help provide med information				
Not true =0	81.3 (87)	89.5 (34)	78.8 (26)	75.0 (27)
True=1	18.7 (20)	10.5 (4)	21.2 (7)	25.0 (9)
Help decide which med. is right				
Not true =0	87.9 (94)	94.7 (36)	87.9 (29)	80.6 (29)*
True=1	12.1 (13)	5.3 (2)	12.1 (4)	19.4 (7)
Help encourage to take medication				
Not true =0	29.0 (31)	18.4 (7)	42.4 (14)*	27.8 (10)
True=1	71.0 (76)	81.6 (31)	57.6 (19)	72.2 (26)
Help listening to med's problems				
Not true =0	42.1 (45)	34.2 (13)	57.6 (19)*	36.1 (13)
True=1	57.9 (62)	65.8 (25)	42.4 (14)	63.9 (23)
Mean Caregiver Help Score: (0-10) SUM_CS	**4.5 (3.1)**	**4.6 (2.5)**	**4.2 (3.7)**	**4.6 (3.3)**

Note: Table shows p level for chi-square test and analysis of variance :*p<0.10, **p<0.05 one-tailed compared with control group.

him or her. Caregivers also frequently helped patients remember to take medication or prepared medication for the patient. Both types of help accounted for half of the help caregivers provided. Some patients reported that caregivers helped them pay for medication or helped them read the medication labels. Approximately, half of the participants said their caregiver was with them when the discharge consultation took place.

E. SUMMARY

Overall, participants in this study had an average age of 60 years, and had relatively little formal education, generally less than four years in school. About half of the participants were females.

Quasi-experimental design and randomization resulted in somewhat of a balance of patient characteristics. However, there were some background characteristics (patient gender, education, and duration of diagnosis with CHF) that significantly differed among groups. Experimental group 1 and 2 consisted of more newly diagnosed patients than the control group. Patients in the control group and experimental group 1 had significantly less education compared with experimental group 2. The impact of these differences on the outcomes will be discussed later.

There were no difference among group regarding patient medication and clinical characteristics (number of medications, number of co-morbidities, and type of prescription medication).

Caregivers help in the home were different among groups. Patients in the control group were more likely to identify someone at home as their primary caregivers. The caregiver's effects on intermediate and behavioral outcomes will be explained in detail in the following chapter.

CHAPTER SIX

PATIENT MEDICATION COMPREHENSION, BELIEFS, AND RECALL BARRIERS AT HOME INTERVIEW

According to the study framework, five health-related outcomes were identified in order to evaluate the effects of the pharmacist interventions. These outcomes consisted of (1) three intermediate outcomes and (2) two final outcomes (adherence and hospitalization). This chapter mainly discusses how the intermediate outcomes were constructed, how each of these outcomes related to other independent variables, how they related to one another, and finally what impact the pharmacist interventions had on them.

A. PATIENT MEDICATION COMPREHENSION, BELIEFS, AND RECALL BARRIERS BY CONTROL AND INTERVENTION GROUPS

A.1 Comprehension of the Dosage Regimen

Patient's knowledge and comprehension were assessed using the following items; (1) what is the name of medication?, (2) what is the purpose of taking the medication?, (3) how long is the patient suppose to take the medication?, and (4) what is the prescribed medication dosage schedule? Those who responded correctly received 1 point for each item, while those who did not know or responded incorrectly received zero points. A patient who responded correctly for all items earned a maximum of 4 points. The lowest score possible was zero, assigned to patients who answered all questions incorrectly or do not know.

In table 8, about two-third of the all patients correctly identified the diuretic's name (63%), purpose to take it (62%), and how long they were supposed to take it (58.7%), while about half of the patients could recall dosage regimen without reading a label (43.5%). A significant number of patients in the IC and CC groups, compared to those in the control group, knew the medication name (69.0% versus 43.3% and 75.8% versus 43.3% respectively). The overwhelming number of participants in the CC group (79.0%) could tell how long they would have to take the medication but less than half of those in the control group (43.3%) knew how long they needed to take it. More patients in both intervention groups compared with the control group understood why they had to take it and were able to recall the medication dosage schedule without reading the label. However, these differences were not significant at the 0.05 level.

With this approach, the patient comprehension score was created. The overall mean score for diuretic is 2.2, which indicates that patients could only correctly identify 2 questions out of four. Both intervention groups have higher mean scores, while the control group demonstrated significantly less knowledge. As can be seen in table 8, the average scores of diuretic are 1.6 for the control group, 2.5 for IC group, and 2.7 for CC group ($P<0.05$).

The similar pattern was found for ACE inhibitors. The majority of all participants correctly identified the medication name (58.3%). However, fewer participants across all groups could correctly state why they were taking the ACE inhibitors than could identify why they were taking diuretics. Only one-fourth knew the purpose of taking the ACE inhibitors (28.6%). Participants also seemed to have a hard time recalling the medication schedule as only 12 percent of all participants could recall the dosage regimen without reading a label. Seventy percent of all participants knew how long they were supposed to take the medication.

While as many as 76 percent of the participants in the CC group could identify the medication's name only 47 percent of those in the control group could do so. More participants in IC and CC group knew how long they supposed to take the medication compared with the control group (80.0% versus 43.3% for IC and control group and 89.7% versus 43.3% for CC and control group). There were no significant differences among groups with regard to patients knowing the purpose of taking the medication and recalling the medication dosage regimen. The average mean score of ACE inhibitors is slightly lower than diuretics (1.7 versus 2.2). The patients in CC group had an higher mean score of ACE inhibitors compared with the control group and the IC group (2.1 versus 1.3 and 1.7 respectively). There was no difference between mean scores of the control group and IC group.

Table 8: Patient comprehension of the dosage regimen by group

	Total	Control	IC	CC
	Percent (n)	Percent (n)	Percent (n)	Percent (n)
DIURETICS				
Medication's name				
Incorrect/don't know =0	37.0 (34)	56.7 (17)	31.0 (9)[b]	24.2 (8)[f]
Correct=1	63.0 (58)	43.3 (13)	69.0 (20)	75.8 (25)
Purpose of taking it				
Incorrect/don't know =0	38.0 (35)	50.5 (15)	31.0 (9)	33.3 (11)
Correct=1	62.0 (57)	50.0 (15)	69.0 (20)	66.7 (22)
Recall dosage schedule				
Incorrect/don't know =0	56.5 (52)	66.7 (20)	44.8 (13)	57.6 (19)
Correct=1	43.5 (40)	33.3 (10)	55.2 (16)	42.4 (14)
How long to take the medication				
Incorrect/don't know =0	41.3 (38)	56.7 (17)	48.3 (14)	21.2 (7)[f]
Correct=1	58.7 (54)	43.3 (13)	51.7 (15)	78.8 (26)
Mean Comprehension Scores: (0-4) SUM_CRD	**2.2 (1.3)**	**1.6 (1.2)**	**2.5 (1.4)[a]**	**2.7 (1.1)[f]**

Note: Table shows p level for chi-square test and analysis of variance: [a] $p<0.10$, [b] $p<0.05$ 1-tailed (IC vs. Control); [c] $p<0.10$, [d] $p<0.05$ 1-tailed (CC vs. IC); [e] $p<0.10$, [f] $p<0.05$ 1-tailed (CC vs. Control).

Table 8 (cont.): Patient comprehension of the dosage regimen by group

	Total	Control	IC	CC
	Percent (n)	Percent (n)	Percent (n)	Percent (n)
ACE INHIBITOR				
Medication's name				
Incorrect/don't know =0	41.0 (34)	51.7 (15)	48.0 (12)	24.1 (7)^{e}
Correct=1	59.0 (49)	48.3 (14)	52.0 (13)	75.9 (22)
Purpose of taking it				
Incorrect/don't know =0	71.1 (59)	79.3 (23)	68.0 (17)	65.5 (19)
Correct=1	28.9 (24)	20.7 (6)	32.0 (8)	34.5 (10)
Recall dosage schedule				
Incorrect/don't know =0	88.0 (73)	86.2 (25)	92.0 (23)	80.2 (25)
Correct=1	12.0 (10)	13.8 (4)	8.0 (2)	13.8 (4)
How long to take the medication				
Incorrect/don't know =0	28.9 (24)	55.2 (16)	20.0 (5)^{b}	10.3 (3)^{f}
Correct=1	71.1 (59)	44.8 (13)	80.0 (20)	89.7 (26)
Mean Comprehension Scores : (0-4) SUM_CRA	**1.7 (1.1)**	**1.3 (1.1)**	**1.7 (1.2)^{a}**	**2.1 (1.0)^{f}**

Note: Table shows p level for chi-square test and analysis of variance: ^{a} $p<0.10$, ^{b} $p<0.05$ 1-tailed (IC vs. Control); ^{c} $p<0.10$, ^{d} $p<0.05$ 1 tailed (CC vs. IC); ^{e} $p<0.10$, ^{f} $p<0.05$ 1-tailed (CC vs. Control).

Overall, only a few patients thought the medication was supposed to be used as needed. Some patients did not know they had CHF and they believed that the diuretic was only for hypertension or to control renal disease. When asked about their CHF condition, participants offered vague responses.

- "I have a big heart (*Hua-Jai-To*) and the doctor wants to reduce the size."
- "My heart is weak and it made me exhausted every time I moved."
- "My lung was flooded (*Nam-Tuam-Pod*) so I cannot breath, like I was drowning."

Some patients believed that the medication was to be used on a short-term basis. This belief seemed to be especially common in this study for those who planned to have a follow up visit with his or her regular doctor in the next few days. In many cases, past experience led patients to believe that their regular doctors would change their medication at the follow up visits. They thus viewed the medication prescribed by an attending physician that they received from a hospital as a temporary remedy.

A.2 Patient Specific Beliefs and Motivation

Two items were added up to construct the patient-specific beliefs scores including (1) reporting how well the diuretics or the ACE inhibitors worked for the patient (NOT WELL=0, WELL=1, and VERY WELL=2) and (2) reporting any concern with the medication (ANY CONCERN=0 and NO CONCERN=1). A maximum of three points was granted to patients who reported that the medication worked very well and that they had no concern about it. Higher scores indicated more positive beliefs about the medications.

For diuretics, about two-third of all patients said the medication worked well or very well (63.0% and 5.4%, respectively). About one-fourth of all patients reported having some concerns regarding the medication. The average score was 1.4 out of 3 for patients with a diuretic. Patients in the CC group had the highest overall scores (1.6) but the score was not significantly different from the control and the IC groups.

Using the same scale, the overall scores of specific beliefs on ACE inhibitors was higher than those for diuretics. For individual items, there was a higher percentage of patients in the CC group who reported that the ACE inhibitors worked either well or very well (22.9% and 66.3% respectively). At the same time, a smaller percentage of those in the CC group stated concerns regarding the medication (31.0% versus 41.4%). The average score for ACE inhibitors is 2.2 indicating fairly positive beliefs about the medication. Slightly higher mean scores were found in the CC group (2.4) compared with the control (2.0) and the IC group (2.2). Responses also indicate that these differences were not significant at 0.05 level.

Most of patients' concerns involved frequent urination, medication efficacy and side effects. First, frequent urination caused inconvenience in everyday life and many patients reported having to wake up every hour or to run to the restroom during the day. Second, many patients questioned the efficacy and quality of the medication. Some were concerned that the medication was not working as it should be, while others believed that they received a relatively low quality drug, because it was free of charge as part of the coverage by government health insurance. Third, many patients had some physical responses, such as feeling dizzy, headache, and fatigue or weakness that they believed to be caused by the medication they were taking.

Table 9: Patient beliefs and motivation by group

	Total	Control	IC	CC
	Percent (n)	Percent (n)	Percent (n)	Percent (n)
DIURETICS				
Specific beliefs: Working				
Not well=0	31.5 (29)	36.7 (11)	37.9 (11)	21.2 (7)
Well=1	63.0 (58)	53.3 (16)	62.1 (18)	72.7 (24)
Very well=2	5.4 (5)	10.0 (3)	0.0 (0)	6.1(2)
Specific beliefs: Any concerns				
Yes=0	30.4 (28)	36.7 (11)	34.5 (10)	21.2 (7)
No=1	69.6 (64)	63.3 (19)	65.5 (19)	78.8 (26)
Mean Specific Beliefs Scores (0-3) SUM_SBD	**1.4 (0.8)**	**1.3 (0.9)**	**1.3 (0.8)**	**1.6 (0.8)**
ACE INHIBITOR	Percent (n)	Percent (n)	Percent (n)	Percent (n)
Specific beliefs: Working				
Not well=0	10.8 (9)	13.8 (4)	12.0 (3)	6.9 (2)
Well=1	22.9 (19)	31.0 (9)	20.0 (5)	26.3 (5)
Very well=2	66.3 (55)	55.2 (16)	68.0 (17)	75.9 (22)
Specific beliefs: Any concerns				
Yes=0	37.3 (31)	41.4 (12)	40.0 (10)	31.0 (9)
No=1	62.7 (52)	58.6 (17)	60.0 (15)	69.0 (20)
Mean Specific Beliefs Scores (0-3) SUM_SBA	**2.2 (1.0)**	**2.0 (1.1)**	**2.2 (1.0)**	**2.4 (0.9)**

Note: Table shows p level for chi-square test and analysis of variance: [a] $p<0.10$, [b] $p<0.05$ 1-tailed (IC vs. Control); [c] $p<0.10$, [d] $p<0.05$ tailed (CC vs. IC); [e] $p<0.10$, [f] $p<0.05$ 1-tailed (CC vs. Control).

A.3 Patient Recall Barriers

Depending on the types of medication, this construct was represented by two separate variables, RECA_BD and RECA_BA (recall barrier scores for diuretic and ACE inhibitors respectively). Those variables measured patient recall barriers that prevented them from remembering to take their medications. The scale developed to measure these barriers ranged from 0 to 3 and was derived at by summing up three sub-constructs: -regimen complexity, patient reminder technique, and patient forgetfulness. The higher the score, the more recall barriers the patient had. Even though diuretics generally are prescribed once daily, 35 percent of all patients were prescribed a diuretic more than once a day. More than half of the patients in the control group were prescribed diuretics more than once a day (55.2%) while a significantly lower proportion of those in IC and CC groups were prescribed this way (21.4% and 27.3% respectively). These differences were significant at the 0.05 level. Across the board, 62 percent were prescribed ACE inhibitors more than once a day. Slightly lower percentage of those in CC group were prescribed ACE inhibitors once a day (41.4%) compared with the control

(35.7%) and the IC group (37.5%). The differences among control and experimental groups were not significant at the 0.05 level.

For both medications, about half of all patients reported having difficulties remembering to take medication (56.6% and 56.1% respectively). For diuretics, a lower percentage of patients in the intervention groups (35.7% and 42.4%) reported having difficulty remembering, compared to 53.3 percent within the control group. Moreover, high percentage of all patients reported having at least one recall technique (92.3%). The recall techniques reported by the patients was showed in the appendix G. For both medications, there were more patients in the intervention groups (96.4% and 97.0%, for diuretics and 95.8% and 96.6% for ACE inhibitors) who reported at least one recall technique, while only 83.3% for diuretics and 86.2% for ACE inhibitors of patients in the control group reported using any recall technique. These figures are significant at the level of 0.05 for diuretics and 0.10 for ACE inhibitors. The average score of recall barriers for all patients taking diuretics was 0.9 out of 3.0. The IC and CC groups had significantly lower scores when compared with the control group (0.6 and 0.7 versus 1.2). The average score for ACE inhibitors was 1.1. There was no significant differences among control and experimental groups.

Table 10: Patient recall barriers by group

	Total	Control	IC	CC
	Percent (n)	Percent (n)	Percent (n)	Percent (n)
DIURETICS				
Complexity of the regimen				
Once a day =0	65.5 (59)	44.8 (13)	78.6 (22)[b]	72.7 (24)[f]
More than once a day=1	34.4 (31)	55.2 (16)	21.4 (6)	27.3 (9)
Difficulty Remembering				
No =0	56.0 (51)	46.7 (14)	64.3 (18)	57.6 (19)
Yes=1	44.0 (40)	53.3 (16)	35.7 (10)	42.4 (14)
Report at least 1 recall technique				
Yes =0	92.3 (84)	83.3 (25)	96.4 (27)[b]	97.0 (32)[f]
No=1	7.7 (7)	16.7 (5)	3.6 (1)	3.0 (1)
Mean Recall Barriers Scores (0-3) RECA_BD	**0.9 (0.8)**	**1.2 (0.8)**	**0.6 (0.8)[b]**	**0.7 (0.8)[f]**

Note: Table shows p level for chi-square test and analysis of variance: [a] $p<0.10$, [b] $p<0.05$ 1-tailed (IC vs. Control), [c] $p<0.10$, [d] $p<0.05$ 1-tailed (CC vs. IC), [e] $p<0.10$, [f] $p<0.05$ 1-tailed (CC vs. Control). Number of cases varies due to missing data.

Table 10 (cont.): Patient recall barriers by group

	Total	Control	IC	CC
ACE INHIBITOR	Percent (n)	Percent (n)	Percent (n)	Percent (n)
Complexity of the regimen				
Once a day =0	38.3 (31)	35.7 (10)	37.5 (9)	41.4 (12)
More than once a day=1	61.7 (50)	64.3 (18)	62.5 (15)	58.6 (17)
Difficulty Remembering				
No =0	56.1 (46)	51.7 (15)	58.3 (14)	58.6 (17)
Yes=1	43.9 (36)	48.3 (14)	41.7 (10)	41.4 (12)
Report at least 1recall technique				
Yes =0	92.7 (76)	86.2 (25)	95.8 (23)[a]	97.2 (35)[e]
No=1	7.3 (6)	13.8 (4)	4.2 (1)	2.8 (1)
Mean Recall Barriers Scores (0-3) RECA_BA	**1.1 (0.8)**	**1.3 (0.9)**	**1.1 (0.8)**	**1.0 (0.9)**

Note: Table shows p level for chi-square test and analysis of variance: [a] $p<0.10$, [b] $p<0.05$ 1-tailed (IC vs. Control), [c] $p<0.10$, [d] $p<0.0$ tailed (CC vs. IC), [e] $p<0.10$, [f] $p<0.05$ 1-tailed (CC vs. Control). Number of cases varies due to missing data.

B. THE BIVARIATE ANALYSIS BETWEEN INTERMEDIATE OUTCOMES AND CONTROL VARIABLES

The Analysis of Variance (ANOVA) was performed to determine if any selected control variables would significantly influence any of the six intermediate outcomes. Table 11 shows that only the caregiver help variable was significantly associated with the specific beliefs score for diuretics (SUM_SBD) and recall barrier scores of both medications (RECA_BD and RECA_BA). However, whether patients had a caregiver at home did not significantly affect patient comprehension of diuretic and ACE inhibitors, nor did it affect recall barriers for ACE inhibitors. None of the other control variables showed any relationship with the given measures. The newly diagnosed patients and those who had the condition for years did not show any significant differences in their knowledge about the diuretics or ACE inhibitors medication. Table 11 also shows that other demographic factors, gender and education, also did not contribute to these differences, nor did clinical variables such as the number or co-morbidities. Correlation matrix (Table 12) also shows that age, number of medications and the number of days stayed in the hospital at base line did not significantly correlate with any of these intermediate outcomes.

Table 11: Effects of control variables on intermediate outcomes

Control variable	Mean intermediate outcomes scores (SD)					
	Diuretics			ACE		
	Comprehension	Specific beliefs	Recall barriers	Comprehension	Specific beliefs	Recall barriers
Any caregiver help						
Yes	2.3 (1.3)	1.6 (0.8)**	0.8 (0.8)*	1.7 (1.1)	2.2 (1.0)	1.0 (0.8)**
No	2.2 (1.4)	1.1 (0.8)	1.1 (1.0)	1.8 (1.1)	2.2 (1.0)	1.5 (0.9)
Number of co-morbidities						
None	2.3 (1.2)	1.4 (0.8)	0.8 (0.8)	1.8 (1.0)	2.3 (1.0)	1.2 (0.8)
One or more	2.2 (1.4)	1.5 (0.9)	0.9 (0.8)	1.6 (1.1)	2.1 (1.0)	1.1 (0.9)
Newly diagnosed						
Yes	2.1 (1.4)	1.4 (0.8)	0.8 (0.9)	1.8 (1.2)	2.0 (1.2)	1.1 (0.9)
No	2.4 (1.2)	1.5 (0.9)	0.9 (0.8)	1.7 (1.1)	2.3 (0.9)	1.1 (0.8)
Number of years in school						
Four years or less	2.3 (1.3)	1.5 (0.9)	0.9 (0.9)	1.7 (1.1)	2.2 (1.0)	1.1 (0.9)
More than 4 years	2.2 (1.2)	1.3 (0.8)	0.8 (0.8)	1.9 (0.9)	2.0 (1.0)	1.1 (0.8)
Patient gender						
Male	2.3 (1.2)	1.4 (0.7)	0.8 (0.9)	1.8 (1.1)	2.3 (1.0)	1.2 (0.9)
Female	2.2 (1.4)	1.5 (1.0)	0.9 (0.8)	1.6 (1.1)	2.1 (1.0)	1.1 (0.8)

Note: Table shows p level for analysis of variance $*p<0.10$, $**p<0.05$ two-tailed.

Table 12: Pearson correlations among variables (n=107)

	1	2	3	4	5	6	7	8	9	10	11
1. Age	1.00	.16	-.27**	.12	.06.	.01	.12	-.12	-.19	.00	-.11
2. Female		1.00	-.28**	.24*	.13	-.06	.03	.04	-.09	-.10	-.03
3. Number of years in school			1.00	.04	-.04	.04	.02	-.10	.09	-.08	-.08
4.Number of medications				1.00	.23*	-.07	.22*	.12	-.06	.08	-.00
5.Number of days in the 1st hospital					1.00	-.07	.19	-.07	-.15	.12	-.09
6.Comrehension Scores (diuretics)						1.00	.04	-.04	.52***	.15	-.18
7.Specific Belief Scores (diuretics)							1.00	-.26*	.09	.59***	-.49***
8.Recall Barrier Scores (diuretics)								1.00	-.05	-.29*	.68***
9.Comprehension Scores (ACE)									1.00	.17	-.03
10.Specific Belief Scores (ACE)										1.00	-.33***
11.Recall Barrier Scores (ACE)											1.00

Note: Table shows p level for T-test: *p<0.10, **p<0.05, ***P<0.01.

C. THE EFFECTS OF INFORMATIVE AND COLLABORATIVE CONSULTATION ON INTERMEDIATE OUTCOMES

As noted earlier, patients in both intervention groups earned significantly higher scores than the control patients in the area of medication regimen comprehension for both medications. For diuretics, the patients in the CC and IC groups also had a significantly lower score than the control patients for recall barriers. However, whether or not the patient received the interventions had no effect on patient specific beliefs outcome. Since caregiver help was positively and significantly associated with several intermediate measures, it is necessary to reevaluate the effects of pharmacist intervention in the subgroups with and without caregiver help present in the home. Table 13 shows that only in the no caregiver help subgroup were the comprehension scores and the specific scores of diuretics significantly higher in the CC group versus those in the IC and control groups. Patients in IC group were not

significantly different from those in the control group as regards to the comprehension and specific belief scores. The IC group had, however, lower scores on recall barriers

Table 13: Intermediate outcomes by caregiver help and intervention group

DIURECTICS

	SUM_CRD		SUM_SBD		RECA_BD	
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
Without caregiver subgroup	24	2.2 (1.4)	24	1.1 (0.8)	23	1.1 (1.0)
Control group	4	1.5 (1.3)	4	0.5 (0.6)	4	2.0 (0.8)
Informative consultation	11	1.9 (1.7)	11	0.9 (0.8)	10	0.9 (1.0)[b]
Collaborative consultation	9	2.8 (0.7)[c,e]	9	1.6 (0.7)[d,f]	9	1.0 (0.9)
With caregiver subgroup	68	2.3 (1.3)	68	1.6 (0.8)	67	0.8 (0.8)
Control group	26	1.7 (1.3)	26	1.5 (0.9)	25	1.1 (0.8)
Informative consultation	18	2.8 (1.1)[b]	18	1.5 (0.7)	18	0.4 (0.7)[b]
Collaborative consultation	24	2.6 (1.2)[f]	24	1.7 (0.8)	24	0.6 (0.7)[d]

ACE INHIBITOR

	SUM_CRA		SUM_SBA		RECA_BA	
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
Without caregiver subgroup	20	1.8 (1.1)	20	2.2 (1.0)	18	1.5 (0.9)
Control group	4	1.8 (0.5)	4	1.8 (1.3)	3	2.0 (1.0)
Informative consultation	8	1.1 (1.2)	8	1.9 (1.2)	7	1.7 (0.8)
Collaborative consultation	8	2.4 (0.9)[d,e]	8	2.6 (0.5)[c,e]	8	1.1 (0.8)[c,e]
With caregiver subgroup	63	1.7 (1.1)	63	2.2 (1.0)	63	1.0 (0.8)
Control group	25	1.2 (1.1)	25	2.0 (1.1)	25	1.2 (0.9)
Informative consultation	17	2.0 (1.1)[b]	16	2.4 (0.9)	17	0.8 (0.6)[a]
Collaborative consultation	21	2.0 (1.0)[f]	21	2.3 (1.1)	21	1.0 (0.9)

Note: Table shows p level for analysis of variance [a] $p<0.10$, [b] $p<0.05$ 1-tailed (IC vs. Control), [c] $p<0.10$, [d] $p<0.05$ 1-tailed (CC vs. IC), [e] $p<0.10$, [f] $p<0.05$ 1-tailed (CC vs. Control).

Number of cases varies due to missing data and whether or not patient was prescribed with that medication.

compared with the control group. The same pattern was found for the ACE inhibitors.

For both medications, patients who received interventions and who also had a caregiver at home had significantly higher scores on comprehension of the drug regimen. The IC group had significantly lower scores on recall barriers compared with the control group. However, there was no effect of the interventions on the specific belief score for both medications in the patients in this subgroup.

D. SUMMARY

Overall, patients who received a discharge consultation and written information (the informative consultation) from the pharmacist demonstrated increased understanding about the medication regimen. When the total samples were broken down into two subgroups, we can see that most of these effects occurred in a group with caregiver help. Since the caregiver help by itself did not improve patient's comprehension, this result indicates that a caregiver might be needed as a facilitator in the process of obtaining and understanding medication information if this was given by the pharmacist at discharge only. With the follow up visit, the pharmacist was able to significantly improve patient comprehension especially among those in the subgroup without the caregiver help in the home.

Informative consultation (IC) alone had no effect on patient specific beliefs. However, the collaborative consultation (CC) significantly increased positive beliefs toward medication in the group without a caregiver in the home. The results from diuretics and ACE inhibitors seemed to confirm these findings.

Caregivers were also very important in helping pharmacists reduce patient recall barriers for patients in both IC and CC groups when compared to the control group. However, the difference of effectiveness between the collaborative consultation and the informative consultation on recall barriers could not be discerned.

CHAPTER SEVEN

THE EFFECTS OF PHARMACIST INTERVENTIONS ON PATIENT MEDICATION ADHERENCE AND HOSPITAL READMISSION

A. MEDICATION ADHERENCE AT HOME INTERVIEW:

A.1 The Pill Count Method: Percent missed doses of diuretics and ACE inhibitors

The percentage of missed doses was obtained by comparing the number of pills the patient was supposed to take (according to the prescription) with the number of pills the patient had actually removed and presumably taken.

The percent missed doses for the two medications, diuretic and ACE inhibitors, were chosen to represent medication use outcomes. The two medications were selected because they are commonly prescribed drugs for CHF condition and, if taken as recommended, can improve clinical outcomes (O'Connor et al., 1999; Kramer et al., 1999). In addition, for the purpose of statistical analysis, it increased the numbers of participants, which ultimately increased the overall statistical power. For all participants, the average percentage of missed doses

(16.2 % for the diuretics and 13.6 % for the ACE inhibitors) was somewhat lower than what was originally expected.

A.2 The Self Report Method

Using this method, nonadherence behavior was conceptualized as to what extent patients themselves reported that they, for various reasons, had not adhered to their recommended dosage regimen. Patients were asked two questions that were used to assess this behavior (1) how had the patient been taking the medication since they came back from the hospital? and (2) how difficult was it for them to remember to take their medication in general?. Adherence behavior was coded as 0 for anyone who responded that; (1) they intentionally decreased or increased doses without consulting the physician for question 1; or (2) they were confused and unsure for question 1, or (3) they often forgot to take their medication for question 2. Those who reported that they had taken the medication as prescribed and had no difficulty remembering to take the medication received a score of 1. Using this method, about

32 percent of all participants reported nonadherence for diuretics (32.6 %) and ACE inhibitors (31.3 %).

Table 14: Patient adherence: self-report and pill count methods.

Self report			Pill count
	n	Percent	Percent missed doses, mean
Diuretics			
Adherence	62	67.4	11.6
Non-adherence	30	32.6	23.2**
ACE inhibitors			
Adherence	57	68.7	7.7
Non-adherence	26	31.3	26.6***

Note: Table shows p level for analysis of variance, **p<0.05, ***p<0.01 one tailed.

In this study, self-report was also used to verify adherence data obtained by pill count method. The ANOVA was performed to determine if there was an association between adherence outcomes using these two different measurement methods. Using the pill count technique, as Table 14 shows, affirmed that those who reported nonadherence were also found to have a significantly higher percentage of missed doses. Even though this similarity was found, the self-report method seemed to also capture some other aspects of nonadherence such as overdosing the medication that was not detectable by the pill count method. Thus, the nonadherence rate reported by the patients was expected to be somewhat higher than the nonadherence rate uncovered by the pill count technique only.

B. HOSPITAL READMISSION AT THREE MONTHS

The readmission information was obtained from both a mail questionnaire and from a patient chart review. The response rate for the mail questionnaire was 60 percent (N=65). Ten additional cases were obtained from a chart review (this method was described in the methods section). Altogether the researcher successfully obtained readmission data for 75 patients. To ensure that these methods of obtaining the number of readmissions had not produced any bias, the respondents and non-respondents were compared on certain characteristics and clinical conditions. There were no significant differences (Table 15), suggesting that this subgroup is reasonably representative of the total sample.

Table 15: Characteristics of patients by availability of hospital readmissions data

	Availability of Hospital Readmissions Data			
	YES		NO	
	n	Mean (SD)[b]	n	Mean (SD)[b]
Percent missed diuretics	66	15.7 (22.7)	24	17.5 (22.4)
Percent missed ACE	56	12.5 (22.1)	24	16.0 (16.9)
Patient's age	75	60.1 (15.5)	32	63.3 (17.3)
Patient number of years in school	75	5.0 (2.8)	32	4.5 (1.7)
Caregiver help scores	75	4.5 (3.2)	32	4.5 (3.1)
Hospital days at baseline	73	5.3 (3.7)	28	5.3 (4.9)
Number of co-morbidities	75	0.7 (0.8)	32	0.7 (0.7)
Groups		Percent[a]		Percent[a]
Control group	24	63.2	14	36.8
IC	24	72.7	9	27.3
CC	27	75.0	9	25.0

Note: Table shows p level for chi-square test[a] and analysis of variance[b]: No significant differences were found. Number of cases varies due to missing data.

Two approaches were used to analyze these admission data and to illustrate this outcome: the number of hospital readmissions at three months and any hospital readmission during three months.

B.1 Number of hospital readmission at three months

There were a total of 70 admissions among 75 patients for whom data were available. The mean number of readmissions for each patient was 0.9 with a range of 0 to 4 times. The distribution of readmissions is shown in table 16. Descriptively, 56.0 percent of the 75 patients reported that they were readmitted to the hospital at least once during this three month period. The majority of patients were admitted 1 or 2 times. Only 8 percent were admitted more than twice. This method did not take into account the length of the hospital stay.

Table 16: Number of hospital readmissions among study participants

Hospital Readmissions	n	% patients (n=75)
0 (no readmission)	33	44.0
1 time	23	30.7
2 times	13	17.3
3 times	3	4.0
4 times	3	4.0

C. THE RELATIONSHIPS AMONG PERCENT MISSED DOSES, NUMBER OF HOSPITAL READMISSION AND CONTROL VARIABLES

As Table 17 shows, the only control variable found to be significantly related to a higher percentage of missed doses of diuretics was the caregiver help. Those who reported having at least one caregiver at home were significantly less likely to miss doses on both medications. As shown in Table 17, for diuretics, patients in the subgroup without a caregiver showed a little less than 29 percent of missed doses compared with only 11.5 percent missed doses reported in the subgroup in which caregivers were present. This pattern was similar when the same analysis was done with the ACE inhibitors.

There was no difference on percent missed doses for diuretics and ACE inhibitors by patient gender, patient education, number of co-morbidities, or whether patient was newly diagnosed with CHF.

Table 17: Effects of control variables on continuous behavioral and clinical outcomes

Control variable	Mean behavioral and hospital outcomes (SD)					
	n	Percent missed diuretics	n	Percent missed ACE	n	Number of Readmissions
Any caregiver help						
Yes	66	11.4 (17.9)	61	10.5 (16.8)	56	0.9 (1.1)
No	24	28.9 (28.7)**	19	23.6 (28.0) **	19	0.8 (0.9)
Number of co morbidities						
None	46	14.1 (20.8)	38	9.6 (17.3)	35	1.0 (1.1)
One or more	44	18.2 (24.2)	42	17.2 (22.8)	40	0.9 (1.0)
Newly diagnosed						
Yes	30	15.8 (19.6)	27	16.6 (25.1)	23	0.8 (0.9)
No	60	16.4 (24.0)	53	11.9 (18.0)	52	1.0 (1.1)
Number of years in school						
Four years or less	74	15.7 (22.2)	66	14.3 (21.9)	60	0.9 (1.0)
More than 4 years	16	18.2 (24.2)	14	10.1 (13.1)	15	0.9 (1.2)
Patient gender						
Male	51	15.9 (22.7)	43	10.8 (20.5)	40	1.0 (1.2)
Female	39	16.4 (22.5)	37	16.9 (20.6)	35	0.9 (0.9)

Note: Table shows p level for analysis of variance $^{**}p<0.05$ two-tailed. Number of cases varies due to missing data and whether or not patient was prescribed with that medication.

Table 18: Pearson correlations among variables (n=107)

	6	7	8	9	10	11	12	13	14	15	16	17
1. Age	.24*	-.13	-.07	.01	.12	-.12	-.19	.00	-.11	-.01	-.01	-.34***
2. Female	.21*	-.08	-.19*	-.06	.03	.04	-.09	-.10	-.03	.01	.15	-.07
3. Number of years in school	-.12	.25*	.10	.04	.02	-.10	.09	-.08	-.08	.12	-.07	-.08
4.Number of medications	.08	-.03	-.08	-.07	.22*	.12	-.06	.08	-.00	.05	-.05	-.04
5.Number of days in the 1st hospital	.18	.06	-.07	-.07	.19	-.07	-.15	.12	-.09	-.00	-.11	.14
6.Caregiver help scores	1.00	.07	-.07	.02	.20	.25*	-.08	.17	-.26*	-.25*	-.34*	-.03
7.CC vs. IC		1.00	.03	.07	.18*	-.04	.17*	.08	-.03	-.09	-.23*	-.04
8.IC+CC vs. Control			1.00	.31**	.06	-.32**	.29**	.14*	-.13	.04	.04	-.15*
9.Comrehension Scores (diuretics)				1.00	.04	-.04	.52***	.15	-.18	-.21*	-.12	-.01
10.Specific Belief Scores (diuretics)					1.00	-.26*	.09	.59***	-.49***	-.29**	-.20	-.12
11.Recall Barrier Scores (diuretics)						1.00	-.05	-.29*	.68***	.28**	.21	.21
12.Comprehension Scores (ACE)							1.00	.17	-.03	-.13	.22	-.04
13.Specific Belief Scores (ACE)								1.00	-.33***	-.25*	-.44***	.07
14.Recall Barrier Scores (ACE)									1.00	.31**	.19	.16
15.Percent missed doses: diuretics										1.00	.48***	.11
16. Percent missed doses: ACE											1.00	-.13
17.Number of hospital readmissions												1.00

Note: Table shows p level for T-test: *p<0.10, **p<0.05, ***P<0.01. Number of cases varies due to missing data.

The control variables shown in Table 17 were not associated with number of readmissions during the three month period.

The Pearson correlation matrix (Table 18) shows that the patient's age and number of days that she or he stayed in the hospital at baseline was significantly related to the number of readmissions. The younger the patients were or the longer the patient stayed in the hospital at base line, the greater the number of times they were readmitted. Age, number of medications, and number of days stayed at the hospital at baseline had no effect on percent missed doses of both medications.

D. THE EFFECTS OF THE INFORMATIVE AND COLLABORATIVE CONSULTATION ON PERCENT MISSED DOSES

Overall, informative consultation (IC) had no effect on any of the behavioral outcomes. These results were confirmed by two different methods of nonadherence measurement: pill count and self-report (Table 19).

Table 19: Effects of pharmacist intervention and caregiver help on behavioral outcome measures

	Self-report non adherence: diuretics		Self-report non adherence: ACE inhibitors		Pill count Percent missed diuretics		Pill count Percent missed ACE inhibitors	
	n	%	n	%	n	Mean (SD)	n	Mean (SD)
Total samples	92	32.6	83	31.3	90	16.2 (22.5)	80	13.6 (20.6)
Control group	30	36.7	29	34.5	30	14.9 (23.4)	28	12.6 (13.0)
Informative consultation	29	31.0	25	36.0	29	19.3 (26.9)	23	20.7 (31.9)
Collaborative consultation	33	30.3	29	24.1	31	14.5 (16.9)	29	8.9 (13.0)[b]
No caregiver help subgroup	23	43.5	20	50.0	24	28.9 (28.7)	19	23.6 (28.0)
Control group	4	50.0	4	50.0	4	36.5 (36.2)	3	15.8 (14.2)
Informative consultation	10	40.0	8	50.0	11	35.9 (33.3)	8	37.1 (37.1)
Collaborative consultation	9	44.4	8	50.0	9	17.1 (15.5)[c]	8	13.2 (15.1)[c]
Any caregiver help subgroup	69	29.0	63	25.4	66	11.5 (17.9)	61	10.5 (16.8)
Control group	26	34.6	25	32.0	26	11.5 (19.8)	25	12.2 (13.1)
Informative consultation	19	26.3	17	29.4	18	9.2 (15.8)	15	12.2 (26.1)
Collaborative consultation	24	25.0	21	14.3	22	13.4 (17.7)	21	7.2 (12.1)

Note: Table shows p level for chi-square and analysis of variance [a] $p<0.10$ one-tailed (IC vs. Control), [b] $p<0.10$ one-tailed (CC vs. IC), [c] $p<0.10$ one-tailed (CC vs Control + IC). Number of cases varies due to missing data.

Since there is no difference of the percentages of missed doses and the number of hospital readmissions between the control group and the IC group, the two groups were consolidated to increase the size of the sub-group for comparison with the CC group. The results (Table 19) shows that overall the group receiving CC was more adherent with ACE inhibitors than the group that did not receive the intervention (8.9% versus 12.6% missed doses, respectively). No effect was found in the case of diuretics. The results from the self report method somewhat reflected those found by using the pill count method; however, the differences did not reach a significant level (Table 19).

Table 19 also shows the impact of the pharmacists' follow up visit when controlling for caregiver help. As can be seen from the table, for both medications, patients who did not have caregiver help but who did have a follow up visit (CC) were significantly more adherent than patients in groups who did not receive the intervention. Even though somewhat similar results were found in the group with the caregiver help, the impact of pharmacists' follow up was much smaller and statistically insignificant. In short, the finding indicated that the effectiveness of the intervention varied and was influenced by family caregiver assistance.

E. THE EFFECTS OF THE INFORMATIVE AND COLLABORATIVE CONSULTATION ON THE NUMBER OF HOSPITAL READMISSIONS

Bivariate analysis shows that, overall, patients who received the interventions had no significant effects on number of hospital readmissions (Table 20). However, the lowest mean number of readmissions was found in the CC group (Table 20). These differences were not significant at the level 0.05. Since the interventions might affect rehospitalization after controlling for other factors, a regression analysis was carried out and will be presented in the next section.

Table 20: Effects of pharmacist interventions and caregiver help on hospital outcome measures

	Any hospital Readmission		Number of readmissions	
	N	%	n	Mean (SD)
Total samples	75	56.0	75	0.9 (1.1)
Control group	24	54.2	24	1.2 (1.4)
Informative consultation	24	62.5	24	0.9 (0.9)
Collaborative consultation	27	51.9	27	0.8 (0.9)
No caregiver help subgroup	19	57.9	19	0.8 (0.9)
Control group	4	75.0	4	0.8 (0.5)
Informative consultation	8	62.5	8	1.1 (1.1)
Collaborative consultation	7	42.9	7	0.6 (0.8)
Any caregiver help subgroup	56	55.4	56	1.0 (1.1)
Control group	20	50.0	20	1.3 (1.5)
Informative consultation	16	62.5	16	0.8 (0.7)
Collaborative consultation	20	55.0	20	0.9 (0.9)

Note: Table shows p level for chi-square and analysis of variance. No significant differences were found.

F. MULTIVARIATE ANALYSIS: THE CAUSAL MODEL

F.1 Contrast Coding

Contrast coding provides ways to test hypothese about relationships between assigned groups and continuous outcomes (Keppel, 1991). In this study, positive and negative sign of the weights assigned to the control and the intervention groups are compared or contrasted. The coding procedure is described as follows:

	Variable	Control group	IC group	CC group
H1	IC+CC vs control	-1	0.5	0.5
H2	CC vs. IC	0	-1	1

H1: Tests whether receiving any intervention differs from the control group

H2: Tests whether the CC group differs from the IC group

F.2 Pearson Correlations

To ensure that the multicolinearity assumption had been met, the zero-order Pearson correlation matrix was used to assess the correlation between 2 continuous variables. The results (shown in table 18) indicate that there were relatively weak correlations among independent variables. It also showed significant moderate to strong correlations between (1) intermediate and behavioral outcomes, and (2) the behavioral and hospital outcomes. These relationships were predicted by the model.

F.3 The relationships among control variables

As expected, the Pearson correlation matrix (table 18) shows that patient's age negatively related to number of years they were in school and in general, females spent comparatively fewer years in school than males. Age also related to caregiver help scores. The older the patients were, the more likely they had caregiver help.

F.4 Path analysis

The earlier section indicated a bivariate relationship between pharmacist interventions and several outcomes. In this section, I will discuss the process by which the effects of the pharmacist interventions occurred. This process is very important not only for research purposes but also for pharmacy practice application. Path analysis was selected as the method of analysis because of its ability to test the model and to establish the causal relationships among constructs embedded in the model. All variables in this study were considered interval except the assigned group variables. Categorical variables just like this one have been used in path analysis successfully elsewhere (Bush & Osterweis, 1978). Only continuous outcomes variables, percentage of missed doses by pill count and the number of readmissions, were entered in this multivariate analysis. To be parsimonious, only data on diuretics were analyzed and presented using this statistic method.

Based on the correlation matrices, the proposed model was tested with a path analysis using the series of simple linear regression analyses. Figure 6 presents the path diagram of the model with its respective path coefficient (beta) and squared multiple correlations (R^2) for the total sample. The number of patients included in each regression varied based on whether or not the data on that particular outcome were available. In this model, 10 percent of the total variance in comprehension and understanding of diuretics was explained by the effects of IC and CC groups vs. control group (F=3.26, df=3, p=0.03); 7 percent of the total variance in specific belief was explained by the effect of CC group vs. IC group and caregiver help scores ($F=2.19$, $df=3$, $p=0.10$); 17 percent of the total variance in recall barrier was explained by the effects of IC and CC vs. the control group, and caregiver help scores ($F=6.05$, $df=3$, $p=0.00$); 18 percent of the total variance of percent missed diuretics was explained by comprehension of the drug regimen, specific belief, and recall barriers ($F=2.86$, $df=6$, $p=0.01$); and 34 percent of the total variance in the number of hospital readmissions was explained largely by age, number of days stay in the hospital at base line, percent missed diuretics, and the effects of IC and CC groups vs. control ($F=2.91$, $df=9$, $p=0.01$).

Table 21: Linear Regression Analyses: The Causal Model

	Direct effect	Indirect effect	Total effect	R^2
Number of readmission (N=62)				0.34
Percent missed doses	0.30**	-	0.30	
Comprehension	-			
Specific beliefs	-			
Recall barriers	-			
Caregiver Help Score	-	-0.03	-0.03	
IC+CC vs. Control	-0.25**	-0.04	-0.29	
CC vs. IC	-	-	-	
Age	-0.44**	-	-0.44	
1st Hospital days	0.17*	-	0.17	
Percent miss doses: Diuretics (N=88)				0.18
Comprehension	-0.19**	-	-0.19	
Specific beliefs	-0.21**	-	-0.21	
Recall barriers	0.23**	-	0.23	
Caregiver Help Score	-	-0.10	-0.10	
IC+CC vs. Control	-	-0.14	-0.14	
CC vs. IC	-	-0.03	-0.03	
Comprehension (N=92)				0.10
Caregiver Help Score	-	-	-	
IC+CC vs. Control	0.31***		0.31	
CC vs. IC	-	-	-	
Specific beliefs (N=92)				0.07
Caregiver Help Score	0.19**	-	0.21	
IC+CC vs. Control	-	-	-	
CC vs. IC	0.16*		0.16	
Recall barriers (N=90)				0.17
Caregiver Help Score	-0.27***	-	-0.27	
IC+CC vs. Control	-0.33***	-	-0.33	
CC vs. IC	-	-	-	

Note: Table shows p level for T-test: *p<0.10, **p<0.05, ***P<0.01 one-tailed.
Number of cases varies due to missing data.

F.5 Hypotheses testing and causal models explanation

Results of simple regression analyses, presented in table 21, indicates support for hypotheses that comparing with the control group, receiving the interventions were positively associated with comprehension and negatively associated with recall barriers and number of hospitalizations after controlling for other variables. This finding, though, did not support the hypotheses that there was direct demonstrative effect of receiving interventions on patient adherence. In addition, only with the specific belief scores did the CC group demontrat an effect over the IC group after controlling for other variables.

Table 21 indicates support for our next hypotheses. These results showed that a higher score on patient comprehension and recall, patient specific beliefs, and a lower score on patient recall barriers were associated with a lower rate of non-adherence. The table also indicates that a higher rate of nonadherence was positively associated with the number of hospital readmissions.

The table also suggests that regardless of the type of pharmacist intervention, the caregiver help scores indirectly affected the outcomes by changing recall barrier and specific beliefs. The younger the patients were or the longer they stayed in the hospital at baseline, the more frequently they were readmitted during the three-month observation period.

G. ADDITIONAL ANALYSIS: PHARMACIST DIFFERENCES AND MATURATION

Two additional analyses were performed to ensure that the outcomes did not vary by (1) different pharmacists and (2) maturation during the intervetion. The first analysis was performed to compare the outcomes by each individual pharmacist. There were no significant differences on any intermediate and final outcomes among seven pharmacists (data not shown). Second, number of days between the intervention and the training were correlated with recall barriers for diuretics ($r=0.32$, $P<0.05$), but were unrelated with eight other outcomes. Therefore, it could be said with reasonable certainty that the improved outcomes found in this study were not influenced by these two factors.

H. SUMMARY

Considering the total samples, both types of pharmacist interventions did not have a direct affect on the percent missed doses of diuretics nor the number of hospital readmissions. However, when a subgroup of patients, those without any caregiver help at home, was taken into consideration, the effects of the collaborative consultation on reducing the percent of missed doses of diuretics became significant. The informative consultation alone was not enough to change any of these outcomes.

CHAPTER EIGHT

SUMMARY AND CONCLUSIONS

A. THE INTERVENTION AND RELATED ISSUES

Trained and experienced hospital pharmacists provided the interventions. Every pharmacist involved in this study graduated from a five year-program at various accredited schools of pharmacy in Thailand. Like much of their generation, they were rarely exposed to communication theories or any psychosocial aspects of pharmacy prior to the training provided by this study. At the time the study began, all of these pharmacists had worked at the hospital for at least one year. They routinely worked in one of the patient wards and so the researcher did not need to make extra arrangement in order to change the workflow or working environment.

Attending physicians usually discharged patients in the morning but patients normally had to wait for their family members to finish a discharge process that extended in the late afternoon. An afternoon hour was a better time for pharmacists to do discharge counseling because they had free time away from other routine work. Therefore, the discharge counseling part of the intervention was implemented easily. The follow up visit at patient's home was much more difficult. First, hospital administrators wanted to ensure that safety issues were not compromised and that they would not be legally responsible if unexpected happened. Second, travel time and cost associated with the follow up visit interfered with the pharmacist's routine work. The researcher addressed these issues by (1) issuing a letter to hospital administration, (2) giving incentives to both individual pharmacists and the pharmacy department, and (3) giving advance notice about when the trip would take place, so that pharmacists could manage their time accordingly.

Program fidelity was acheived by tape recording the consultations and interviewing the patients about the services they received. Even though all pharmacists could access the recorder and be asked to record the consultation, only two pharmacists managed to do so with some patients. Pharmacist failed to tape sessions if (1) they forgot to bring the tape recorder with them when the consultation took place, (2) they felt uncomfortable being taped, and (3) patients indicated their preference of not being taped.

At a home interview, the researcher also asked the patients about the discharge consultation and the written information provided by the pharmacist. Many of them could recall having received 2-3 yellow medication written information sheets and most of these patients kept them with the medication. Only a few patients, though, could recall what else was covered in the consultation.

It would be good for future research if researchers attempt to ensure the fidelity of the program by having every pharmacist document every step of the consultation and to assess whether they conformed to protocol and to recommended consultation strategies. Perhaps, what I would have done differently is to interview the pharmacist about what they did right after counseling.

Table 22: Finding summary: diuretics

bivariate	Comprehension		Specific beliefs		Recall barriers		Percent missed doses		Hospital readmissions	
	Total samples									
IC vs. Control	✓		ns		✓		ns		ns	
CC vs. Control	✓		ns		✓		ns		ns	
CC vs. IC	ns		ns		ns		ns		ns	
Any caregiver help	ns		✓		✓		✓		ns	
	Any caregiver help									
	No help	W/ help	No help	W/ help	No help	W/ help	No help	W/ help	No help	W/ help
IC vs. Control	ns	✓	ns	ns	✓	✓	ns	ns	ns	ns
CC vs. Control	✓	✓	✓	ns	✓	✓	✓ (control+exp 1)	ns	ns	ns
CC vs. IC	✓	ns	✓	ns	ns	ns		ns	ns	ns
multivariate										
CC+IC vs. Control	✓		ns		✓		ns		✓	
CC vs. IC	ns		✓		ns		ns		ns	

Table 23: Finding summary: ace inhibitors

bivariate	Comprehension		Specific beliefs		Recall barriers		Percent missed doses		Hospital readmissions	
	Total samples									
IC vs. Control	ns		ns		ns		ns		ns	
CC vs. Control	✓		ns		ns		ns		ns	
CC vs. IC	ns		ns		ns		✓		ns	
Any caregiver help	ns		✓		✓		✓		ns	
	Any caregiver help									
	No help	W/ help	No help	W/ help	No help	W/ help	No help	W/ help	No help	W/ help
IC vs. Control	ns	✓	ns	ns	ns	✓	ns	ns	ns	ns
CC vs. Control	✓	✓	✓	ns	✓	ns	✓ (control+exp 1	ns	ns	ns
CC vs. IC	✓	ns	✓	ns	✓	ns		ns	ns	ns

B. OVERVIEW OF THE FINDINGS

Overall, moderate effects of the interventions were found on patient comprehension of the drug regimen. These findings indicate that the quality of the health care provider providing medication information is not adequate and there is still room for an improvement. These low scores could be a result of patient's attitude toward seeking medication information as one study done in Thailand showed that in the rural areas, 32 percent of 1,150 Thai patients actually seek information from health personnel (Sooksriwong & Leelanitkul, 2001). Another reason might have to do with an underutilization of oral and written information in the relatively uneducated group of patients. The latter point is consistent with other findings in which the three highest comprehension scores were found in the group who either received CC or IC and have a caregiver in the home. The collaborative consultation provided pharmacists with a second chance at the patient's home to verify and clarify patient misunderstanding about the medication regimen and also to put written information to use more effectively. In this study, caregivers reported helping patients read the medication information provided by health care providers and they sometimes talked about patient understanding of the medication regimen. Because caregivers are more likely to be younger and better educated, I believe that in the group receiving IC a caregiver did some of what the pharmacist would have done if there were a follow up visit. Unfortunately, we do not have objective data on what the caregiver actually did in the home.

Considering the findings, pharmacist consultation is needed for everybody in order to enhance their understanding about their drug regimen, however, the first priority of having a follow up visit by a pharmacist might be given to those with no caregiver help in the home.

The highest specific belief scores were found in groups in which a caregiver was present in the home and those without a caregiver but who received CC. This finding indicates that giving a one time discharge consultation and written information (IC) could not help increase the positive beliefs toward the medication. The effects of the collaborative consultation on specific belief scores in a group with no caregiver in the home confirmed that a follow up visit by the pharmacist helped eliminate patient concerns or problem patients had. Without it, the patients had no other resources. The effect of this intervention compared with the control group, though, was not seen in the group with a caregiver in the home. The reason could be that caregiver help by itself already increased a patient positive belief about the medication regardless of any intervention groups. According to the framework, patient feedback, in terms of seeking more information or seeking help to ease concerns, may have been an important component. This study suggests that either a caregiver present in the home or a follow up visit by the pharmacist could enhance patient feedback and, in turn, increase the positive belief about the medication overall. Unfortunately, this study has no objective data on changes in patient feedback. Future studies should address and retest this line of reasoning.

The recall barrier score was significantly lower for groups receiving interventions when compared with the control group. This suggests that the interventions might have dealt with the complexity of the regimens either by changing the dosage schedule or by altering the patient's life-style to fit the schedule. Patients receiving the interventions mastered more medication tailoring or cueing techniques than those in the control group. Previous research also showed that patients receiving a comprehensive drug therapy management program (pharmaceutical care) compared with the control group were more likely to use two or more reminder methods (Fischer et al., 2000).

However, since most of the above effects occurred only in the group with a caregiver help in the home, the interventions did not appear to help reduce recall barriers in the subgroup without a caregiver. It is possible that some of the technique that pharmacists recommended might have to be handled or carried out by caregivers instead of by the patients themselves. Therefore, to achieve the full impact of the intervention, we need to have both parties working together. This finding indicates another example of the importance of caregiver involvement in the pharmacist intervention process.

The overall nonadherence rate was 16.2 for diuretics and 13.6 for ACE inhibitors. This rate is somewhat similar to the past study using the same measurement method which reported 15.4% overall nonadherence (Rich et al., 1996).

This might seem lower than a nonadherence rate for patients with chronic diseases in general (Haynes et al., 1996). There are number of explanations related to the finding. First, pill count method was found to underestimate nonadherence (Farmer, 1999). Second, we assessed adherence during the short period immediately following hospital discharge, when adherence rate might be expected to be higher than other time (Kruse et al., 1992).

Caregiver help in the home was found to be related with nonadherence. Previous studies suggested that person living alone were less likely to adhere with the medication regimen (Rich et al., 1996). The availability of local help and family cohesiveness during crises were found to be associated with increased levels of adherence (Eichhorn et al., 1958). Studies in social control suggested that member of social network, including family, can actively monitor and influence adherence behavior related to health (Burleson & Macgeorge, 2002). These studies, however, did not specify what type of adherence that would benefit from the social network. This unclear aspect of health behavior led to a difficulty in determining precisely the specific causal mechanism (Burleson & Macgeorge, 2002). In this study, adherence to the medication regimen was specified and the path diagram shows that caregivers may increase adherence through the patient's positive beliefs about medication regimens or they may help reduce recall barriers.

Informative consultation had no effect on the percentage of missed doses. This finding is consistent with several previous studies (Roter et al., 1998) which documented the unsuccessful impact of educational-only interventions on patient behavior. This study's finding somewhat confirms previous studies that demonstrated that a combination of strategies worked better than a single strategy intervention. Even though the percent of missed doses in this study were collected at the same time of the follow up visit took place, the effect of the intervention might still occur if the patients had anticipated pharmacist monitoring and reinforcement. Multivariate analysis suggests that the collaborative consultation affected the percentage of missed doses by increasing patient comprehension and enforcing positive beliefs. However, the bivariate analysis shows that the impact of follow up visit on patient adherence was not found in those with caregiver present in the home. It is possible that these patients already got more support and the adherence rates were, without any intervention, already higher than those without caregiver counterparts.

The interventions were somewhat designed to deal exclusively with behavioral factors that led to missed doses. However, other types of medication nonadherence such as discontinuation or overadherence was also reported. There was evidence of the latter type in this group of patients which pharmacists should be aware of.

Bivariate analysis showed no effect of any intervention on number of readmissions. However, when controlling for other variables, the collaborative consultation significantly reduced the number of readmissions. The effect of the intervention is independent from other variables included in the model. Three explanations might be worth considering. First, the collaborative consultation might have reduced the percent of missed doses after the follow up visit and those reductions might have led to a decrease in the number of readmissions. Second, it might encourage patients to keep their next clinic appointment, which some of the patients might not have otherwise planned to do. Third, it is possible that by having a follow up consultation with a pharmacist in turn empowered the patient to effectively communicate with his/her regular doctor. Unfortunately, we do not have the longitudinal data on medication adherence or clinic visits or what is going on at the visit; therefore, we cannot conclude this with absolute certainty.

A past intervention study reported that including a caregiver in an intervention process affected patient outcomes (Fisher & Weish, 2000; Mittleman et al, 1996). In another study, the odds of dying were 6.5 times greater for patients who needed much more help than for patients with adequate help (Woloshin et al., 1997). Caregiver help score in this study were not found to have any direct effect on number of hospital readmissions either before or after controlling for other variables. Two explanations are possible; (1) this caregiver help score used in this study only measured types of help related to medication, and (2) a caregiver in this study was not trained to properly deal with patient care management after discharge.

The second objective of this study was to investigate the relationship among variables. Comprehension scores and specific beliefs scores were negatively associated with the percentage of missed doses, while recall barrier scores were positively related to the percent of missed doses. The relationships between comprehension and beliefs have been found by previous studies (Svarstad et al., 1999).

It is quite surprising that there was no significant correlation between patient adherence and the number of medications or patient education level. Studies in the past have found that the greater the number of medications a patient took, the lower the adherence rate was (Momane et al., 1994; Sclar, 1991). Two factors might contribute to this unexpected finding. First, most patients in this study were on a large number of medication regimen (mean number of medication was 6.0). Thus, the effect of the medication number (3 medication or less) might have not been seen. Second, the adherence rate for this study was relatively high, so the effect of these factors might be diluted as a result of that.

This study shows that patient nonadherence was a predictor of hospital readmissions. These findings were consistent with two large prospective studies (Vinson et al., 1990; Ghali et al., 1988).

The younger the patients, the more often they were rehospitalized. Two explanations for this must be taken into consideration. First, the younger patients might have been in and out of the hospital several times while older ones stayed longer. We do not have valid data on how long patients stayed in the hospital each time. Many younger patients in this study had congenital heart disease or a heart defect that caused CHF. These conditions usually are more severe than those caused by hypertension or coronary heart disease.

The longer patients stayed in the hospital at baseline, the more often they were rehospitalized. This variable might somewhat represent a severity of the illness which the direct measure was not available in this study.

C. THEORETICAL CONTRIBUTIONS AND ISSUES

The interventions were designed using the framework modified from the Health Communication Model and the Interactive Approach to the pharmacist consultation. The health communication model has indicated two steps in patient-provider communication. The first part entails how comprehension and the ability to recall the regimen along with specific beliefs about the medication impact patient adherence and the second part emphasizes the dynamic process of the patient-provider relationships in the form of patient giving feedback and provider monitoring and problem solving with regard to medication use. One of the advantages of using a model like this one is that it emphasized on specific outcomes while recognizing the process in which it has occurred. Often times the outcomes we are considering are too far off from what we are doing and they might not necessarily be what others would expect. Without finding the process, pharmacists would have little evidence to convince other health care providers that what they do actually make a difference (Lipowski, 1996). In addition, if an intervention does not work as expected, pharmacists would have some idea as to what went wrong and what needs to be done differently.

This study attempted to add the recall barrier to the original HCM. The recall barriers were defined as when patients 1) were on a complex regimen, 2) had difficulties remembering, and 3) had no recall technique. These recall techniques included cueing, tailoring, and organizing medication regimens. A discussion of these techniques were included in the training given to the pharmacists in this study. In this study, the recall barriers were found to be one of the significant predictors of patient nonadherence (as predicted by the proposed model). But, the finding shows no direct effect of pharmacist interventions on this measure. Unlike the comprehension and specific belief measures, this variable was constructed with non specific medication items (difficulty remembering and recall technique). It might be useful in the future to explore further the operationalization, validity and reliability of this particular concept.

These findings somewhat reflect the HCM model with a few exceptions. According to the original HCM created by Svarstad (see figure in chapter 3), the quality of provider monitoring and other predisposing factors would explain the extent to which the patient is willing to give feedback or to share their concerns with a health care provider. These other factors, however, were not spelled out in detail. It is not clear from the model how these factors were conceptualized and operationalized. When the framework is used in a different country, population, and culture from which it was created these factors have to be taken into account.

Second, it is unclear whether the model should be used to predict a patient's adherence with a total medication plan or a specific medication regimen. Some concepts such as patient comprehension and motivation are identified and measured for each specific medication, but treatment outcomes, on the other hand, are defined as an aggregated consequence of the treatment process which might include a whole regimen instead of a specific medication. This concern posed a difficulty in terms of selecting a method of analyses whether to use a specific drug or a regimen.

The model places much importance on the collaborative relationship between patient and provider. But applying the model to a culture where discussing or complaining about personal matters to someone unfamiliar is somewhat socially unacceptable requires extra effort from both the healthcare providers and patients.

Third, the majority of the patients in this study are uneducated. This group of patient could have benefited from pharmacist clarifying any medication related misunderstanding; instead, the language and cognitive difficulties might have prevented them from effectively communicating and expressing their concerns. Third, in Thailand health care providers (including pharmacists) usually dress in a white coat similar to that worn by physician in the United States. Most of these patients came from the peasantry and they identify health care providers as authority figures. This perception might make patients afraid to reveal themselves or reluctant to express their concerns. In addition, in Thailand, the patient's role compared with health care providers is perceived to be very passive (Charupatanapong et al., 1996). Given these factors, pharmacists need to be aware of cultural differences and to be trained to really look for both verbal and nonverbal clues.

Fourth, the existing Thai health care system does not support a continuity of care process. Without continuity, hospital pharmacists cannot build long-term relationships with patients. This inability leads to difficulties both in establishing rapport and in facilitating a collaborative environment.

Fifth, the model itself does not specify how much time or how many follow up visits a necessary to produce the desired effects. It might depend on how much time providers need to spend managing patient's problems and concerns and also how much time the provider needs to elicit patient feedback and establish relationships. A longitudinal study is needed to find out both the tasks and strategies used in an intervention and time spent in the follow up visit.

Even though health care providers are major actors in HCM, in a boarder sense, this study demonstrates that the application of HCM might not be limited only to professionals. It can also be used to explain the effects that informal caregivers have on specific outcomes. Family care giving is considered a common practice for many Thai families. As discussed earlier, this study provides some evidence that family members can help patients monitor their regimens and they can reinforce positive beliefs and desired behavior probably, through increasing patient feedback. According to the HCM, the quality of provider monitoring would affect patient feedback. Using this perspective, a family caregiver could fulfill a part of the provider's monitoring and problem solving role in increasing patient feedback. How that actually occurs and what the differences between a caregiver and a health care professional are in this respect can be best explained through a number of social psychological perspectives. First, the functional perspective suggests that a caregiver can administer medication, help with personal care, and provide emotional support. These tasks traditionally define the role of a caregiver. A past study has discussed that family caregivers might be well suited for monitoring and reinforcing role since the patient could not relate to his/her health care provider with the same frequency and intensity as he/she could with family members (Davis, 1968).

Some tasks, on the other hand, involved the role of professionals. This study shows that pharmacist input is most needed to increase a patient's comprehension and recall of the drug regimen regardless of caregiver subgroups. Professionals have access to information and resources that are not available to family caregivers. According to the HCM model, understanding the drug regimen is necessary; because patient cannot adhere to a regimen if they do not know what that regimen was (Wolfe & Schirm, 1992). Second, according to the social exchange perspective, providers-lay person relationships are not defined by reciprocity and often involve power differences. Relationship among family members, on the other hand, are more often characterized by reciprocity (Ingersoll_Dayton et al., 2001) and patients therefore feel more comfortable disclosing their problems and concerns to family caregivers than to healthcare providers. In light of these results, future study is needed to explore the possibility of applying this model to caregiver research.

It cannot be denied that the relatively moderate effects of pharmacist interventions on the outcomes were observed in this study. The obvious explanation would be that the pharmacist training was inadequate (especially for improving their interviewing skills as suggested by the HCM) and that their understanding of a psychosocial aspect of the patients was insufficient. Moreover, the HCM does not specify that one visit would be able to change patient's adherence behavior. However, it might be worthwhile for us to explore some alternative theoretical models, before drawing conclusions about the predictive ability of the HCM. First, the transtheoretical model might explain some hidden impacts of the interventions. Some patients might not yet be ready to share their problems and concerns with the pharmacist despite the pharmacist's best efforts. The Transtheoretical model suggests that patients are in different stages of readiness (Prochaska & DiClemente, 1983), and that perhaps, the unseen success of the intervention might actually move patients one step closer to a collaborative environment.

Another psychosocial theory that could be used to understand these results is the self-regulatory theory. As discussed earlier in the theoretical framework chapter, patient's somatic experience is one of the core components of the theory. Given the visible symptoms related to congestive heart failure and the immediate effects of the diuretics, the self-regulation model would help us they determined whether their diuretics worked. With this in mind, patient behavior, regardless of provider contribution, was largely influenced by their symptoms and their experiences with the medication in the past.

In conclusion, using the HCM as a framework to understand and predict patient behavior has proven very useful. However, some factors in the model need to be conceptualized more clearly. The success of the model in terms of application and implementation depends a lot on the environment where the intervention is implemented.

D. METHODOLOGICAL CONTRIBUTIONS AND ISSUES

In the quasi-experimental design used in this study control and experimental groups were recruited from a single site at different periods of time and this presented the following advantages and disadvantages. First, some differences of patient characteristics were found among groups. These differences had to be taken into account especially when they impacted outcomes. Second, there might be some contamination, especially when patients in the control group were readmitted to the hospital, after pharmacists were trained. These patients might have unknowingly received an intervention which would have affected long-term outcomes. Using different sites for control and experimental groups could have prevented these biases. However, using multiple sites can be difficult to manage and monitor. And, unlike the pharmacist in the intervention sites, pharmacists assigned to the control site are less likely to be motivated because they would not necessarily benefit (e.g. training) from their participation. Moreover, site selection can potentially bias issues if it is not done in a scientific manner.

Inpatient recruitment was practical and can be done quite effectively in the Thai public health care system. One researcher could manage to enroll patients when the settings were limited to a few units in the hospital. In addition, this particular hospital had already assigned one pharmacist to each patient unit, which enabled researcher to follow up with the pharmacist without going through many management changes. Pharmacists and nurses could effectively help identify potential subjects. The researcher could rely on them without having to physically stay at the hospital at all times. The researcher usually had more time to talk with a patient and his or her family members in the afternoon when the physicians and other health care providers finished their rounds.

The randomization technique used in this study might have created some potential biases. Using the last digit of hospital identification numbers was practical for the researcher, however, these numbers were not randomly generated. In the future, all potential participants should be assigned a new number; and the researcher can then randomly assign those numbers to control or experimental groups.

The patient's socioeconomic status is missing from this study. Many Thai people have multiple sources of income such as a money allowance from family members, which makes it very difficult to find a reliable measure for this characteristic (Zimmer & Amornsirisomboon, 2001). Western-based methods cannot be used effectively and there was no practical Thai based method available at the time the study was conducted. Many available surveys have asked respondents in detail about the type of products they have in the households (e.g. TV set or radio) and judgment were often based on these findings. This method proved impractical for this study.

Living arrangement and household size especially when many adult children still live with their parents often poses critical issues for other measurements. For example, years of education might be captured not only for the individual patient but for the whole network of those who have been living with them.

The home interview proved to be more difficult than originally expected. Thai home addresses were sometimes not in any logical order; therefore, more time and effort was spent looking for the patient's home. It turned out that houses in the remote areas were easier to find than ones in the urban areas. This had to do with people in the rural community setting knowing each other quite well, especially person who have been sick or recently discharged from the hospital.

One of the arguments for utilizing the home interview is to have some privacy. Unexpectedly, privacy with the patient was rare in home settings in rural Thailand. Family members and sometimes a huge group of neighbors kept the patient company throughout the interview. Sickness is not considered confidential or a private matter in the country-especially in the rural areas. Most of the time those who get sick receive a tremendous amount of sympathy from family and friends and it is therefore, quite common to see many people turn up to show their support.

Many studies in the past have indicated that the pill count method was relatively inaccurate and sometimes unreliable due to the dosage form, packaging, an early refill, and patient's alternating unused portion (Farmer, 1999; Grymonpre, 1998). In this study, researcher attempted to gather the leftover medication. The diuretic and ACE inhibitors came in the form of pills or tablets, and home medications were usually to last for 10-15 days. Most of the time, these medications were dispensed in blister or plastic packaging. Therefore, the researcher was able to perform the pill count within a short period of time and hopefully with more accuracy. In addition, most of the time a researcher showed up in patient's home unannounced. A past study suggested that pill count appeared to be more accurate when conducted in that particular manner (Craig, 1985).

There are some limitations on utilizing mail questionnaires to collect the number of hospital readmission. Even though the length of the questionnaire was relatively short, the response rate was only 60%.

The majority of the questions in the structured home interview were taken from other study which have been validated in some way (Svarstad et al., 1999). However, these questions were used for the first time in the Thai language and with Thai patients. Some questions about the medication's name, purpose, and directions might be straightforward, while others were quite open to interpretation in different cultures and contexts.

Most patients could not recall how many days they spent in the hospital each time they were admitted. The reasons for readmission were reported vaguely and sometimes incomprehensibly. Chart reviews yielded useful information on the CHF conditions but not on the number of hospital readmissions. Since the system was neither computerized nor part of any network system, patients who were readmitted to other hospitals could not be documented. In addition, it is quite common to encounter incomplete readmission information.

According to the framework, a direction of causal relationships among constructs was predicted. Using One-tailed instead of two-tailed test enables us to investigate those relationships effectively. Path analysis was selected even though some assumptions were violated. It would have conformed with these assumptions if all the variables in the analysis were continuous variables or interval variables with larger range. However, the nature of some predictors in this study, such as group assignment, cannot be a continuous variable.

E. PHARMACY PRACTICE IMPLICATIONS

This study demonstrates that pharmacist consultations can improve patient outcomes. Eliciting patient feedback, monitoring, problem solving, and reinforcing are important components to the success of these interventions. Home visits were one way to achieve these goals. As discussed earlier, home visits were selected as a mean of carrying out these activities but they were found to be very impractical for pharmacists especially when patients lived outside of the metropolitan area. During the study, the researcher learned that patients who originally were thought inaccessible by phone could be contacted through a neighbor's home phone or through a village head master's phone line (a common arrangement in several rural settings). Using the phone does not always help in terms of building relationships, but it seems to help save time and effort on the provider's part. Another possibility is to create a buddy system where a regional hospital pharmacist would contact and send information regarding the patient to a community hospital pharmacist or a community pharmacist in the area where the patient lives. A community hospital pharmacist usually lives in the area or knows the area very well and would therefore be able to follow up with the patient with minimum resources and time. However, again the continuity of care might be compromised since (1) the method requires using different pharmacists and (2) information about the patient might be incomplete. As of this moment, a community pharmacy is not part of the government social security scheme network. Bringing a community pharmacist on board would thus require some state policy changes.

In short, if pharmacists could find a less resource-intensive way to do the follow up, the intervention would be more likely to be implemented successfully and to have a greater chance of being sustained for a long period of time.

It seems that physicians and nurses played no role in this study. However, they helped in terms of identifying patients and confirming a diagnosis. Moreover, the result shows that the complexity of the dosage regimen was lower in intervention groups. One can assume that physician's prescribing behavior could be influenced by pharmacist interventions. Unfortunately, we do not have a data on physician-pharmacist corporation. In the future, it would be useful to include other health care professionals as how they interact.

In a country where resources are scarce, targeting those in need is one way to allocate resources effectively. This study partly suggested that those without a caregiver in the home provide potential targets. First, they can be easily identified by a pharmacist or a nurse using a few pharmacist intervention than those with caregiver support.

Given the country's economic situation, caregiver help might be one of the best options and probably the only option some patients have at securing the best care possible. However, if healthcare providers decided to systematically depend on a caregiver for home care or simply to include them in the overall care process, it could potentially over burden the caregiver. Therefore, how and to what extend the caregiver should be involved in the care process is another issue health care providers will have to work on.

F. FUTURE RESEARCH IMPLICATION

Methodologically, long-term assessment of patient adherence is needed to confirm the impact of the interventions and to establish a link between this outcome and hospitalization outcome. What kind, when where and how should the written information be implemented most successfully needs further investigation. A future study could also focus more on the measurement of patient feedback both objective and subjective measures. In addition, patient satisfaction with pharmacist services needs to be compared with patient perceptions of other services and their expectation about the services provided as part of the intervention.

Theoretically, a modified construct such as recall barriers need more exploration. This study suggests the need to somehow include this variable in the model, however, a further study might be needed to look specifically at how to conceptualize and operationalize it effectively. Many findings from this study suggest potential uses of the model in different areas. A future study might be needed to look into an alternative application of the model especially in the field of informal caregivers and collaboration between caregivers and health care professionals.

G. LIMITATIONS

The greatest concern is the lack of validity and reliability studies of the instruments especially when they were used in different cultures. Some items on the comprehension, specific beliefs, and self-report nonadherence measures were borrowed from the Brief Medication Questionnaire (BMQ). The BMQ was tested and found to have high validity and reliability against adherence measured by the specially designed container (MEMS). However, without using all of the items indicated in the BMQ, a careful interpretation of its validity and reliability needs to be taken into account. In addition, when the items were used in different languages and cultures, translation differences and cultural boundaries could become a major concern.

Another limitation is a lack of construct validity and content validity for the recall barriers scale. Considering construct validity, the variable has never before been conceptualized and measured systematically. It is possible that an agreement between a theoretical concept and a specific measure used in this study might not be reached. Steps were taken to achieve an acceptable level of construct validity. First, the researcher made an attempt to specify theoretical relationships with other well constructed variables. Second, the empirical relationships between the measures of the concept were examined and explained. Content validity is based on the extent to which a measurement used in this study reflects the specific intended domain of its content. The limitation derived at when the researcher must define what constitutes a relevant domain of that particular concept (which in this case, the recall barriers). The final definition used in this study might be incomplete.

A lack of direct measures on severity of CHF, such as the New York Heart Association Classification and renal function, is one of the important limitations of this study. The study did not control for type of CHF conditions nor have any information on quality of prescribing, which might have had an impact on patient outcomes. Therefore, the study results should be interpreted with careful consideration.

We do not know whether these patients had been on diuretics or ACE inhibitors before they entered the study. Many of these participants had a CHF condition derived from uncontrolled hypertension or untreated heart disease. They could have been on diuretic and ACE inhibitors before and past experience with these medications could influence their behavior now.

The stûdy was not a true experimental design. Subjects in the control group and experimental groups did not come from the same sampling frame. This created some imbalance between patient characteristics among groups, which were discussed earlier.

The study was conducted at a particular setting, which was unique in terms of its size and its relatively sufficient human resources. Moreover, the site was selected based partly on a personal connection. Seven highly motivated pharmacists were voluntarily involved in the study; therefore, the selection of the site and the self selected pharmacist would affect the level of generalizibility of the results.

APPENDIX A

TRAINING MATERIALS: LECTURE PRESENTATION AND ROLE PLAY

Collaborative consultation

Piyarat Nimpitakpong, R.Ph., M.S

Agenda

- **Patient behavior and outcomes**
- **How to change patient behavior?**
- **Interventions**
- **Role play**

Patient behaviors and hospital outcomes

- **Previous studies found that 27-47% of hospitalized patients with CHF were rehospitalized within 90 days.**
- **About 15-43% of the rehospitalized reported nonadherence with medication regimens as a primary cause of rehospitalization.**
- **The prevalence of nonadherence in CHF patients ranges from 25%-58%.**
- **Factors affecting adherence: move from patients' characteristics to the effects of patient-provider relationships and communication.**
- **Previous studies investigated the effect of patient-provider relationship on several health outcomes**

How to change patient behavior?

- Health Collaboration model
- Patients' comprehension and recall, beliefs and motivation, and (medication management skills) are the key components needed to improve patient adherence.
- Patients will benefit from the care process and are more likely to achieve better outcomes when they actively collaborate in the process.(patient feedback is important)
- Model suggests several strategies.

Type of interventions: Definitions

- Educational = designed to enhance patient *knowledge* via information
- Behavioral = designed to enhance patient *memory/motivation* by simplifying, tailoring, monitoring, reinforcing behavior
- Organizational = designed to enhance pt adherence via *provider* training, scheduling, tracking systems, follow-up, teamwork

Type of interventions: examples

- *Educational*: oral and written
- *Behavioral*: reminders, tailoring, packaging, self-monitoring, goal setting, reinforcement
- *Organizational*: RPh scheduling and follow-up

Our goals

- Increase patient understanding about medication
- Increase patient's motivation
- Increase patient's feedback
- Monitoring and reinforcing patient's behavior
- Help solve problems

Our activities

- **The discharge consultation:**
  - Providing Participatory and collaborative approaches discharge consultation:
  - Prime questions and Show and Tell questions
  - Written information sheet
- **The follow-up consultation:**
  - home visit

Prime questions

- What did your doctor tell you the medication is for?
- How did your doctor tell you to take the medication?
- What did your doctor tell you to expect?

Show and Tell questions

- What do you take the medication for?
- How do you take it?
- What kind of problems are you having?

Educational strategies

- giving specific, explicit, repeated, and direct information
- Medication name, purpose, direction, how long patient is supposed to take the medication.
- written information

Motivational strategies

- provide and discuss potential benefits and the value of a therapeutic regimen
- pharmacists encouraged the patients to self-monitor their own conditions in order to make the benefits more salient and observable.

Reinforcing value of therapy

- What stimulates or drives him/her to act? (Relieve tiredness, shortness of breath while sitting, and ankle swelling)
- What directs his/her choice about how to meet this goal?
- What maintains his/her behavior (e.g. stop or continue Rx)

Medication recall management

- Reduce complexity of the regimen
- Reminder systems
  - Meal time
  - Exact time
  - Daily routine
  - Vision cues
- Tailoring: life styles
- Packaging, Medication box or organizer

Follow up visit

- Clarifying misunderstanding
- monitoring patient feedback
- Problem solving
- Goal setting
- Self-monitoring
- Reinforcement

Major concerns	Problem-Solving
Patients have problems with water pills due to an inconvenient life style	Tailor administration time to accommodate patient lifestyle
Patients experience dizziness due to low blood pressure	Change administration time to bedtime.
Patients experience severe cough as a result of taking ACE inhibitor	Acknowledge the causes. Inform physician and adjust the regimen.
Patients cannot remember the regimen and when to take medication	Simplify medication dosage regimen. Tailoring , Cueing, and Reminding system
Patients doubt medication efficacy	Reinforce value of therapy, encourage self-monitoring
Patients having difficulty reading the medication label	Change label, clarify the direction
Patients having difficulty opening a medication container	Change medication package

Role-play

- 5 real cases (pharmacists workup of drug therapy and scenarios)
- Pair up with your partner
- Switch when you finish consultation

References

- UW. Lecture S&A 652 (2000) Svarstad, BL
- Interactive approach manual developed by Gardner, M, Boyce, RW and Herrier, RN

Scenarios #1

- Male age 72 years old
- Lives with grand son and grand daughter
- Has heart conditions for 3 years
- Does not work, but used to work in the paddy field for many years

If asked	Answer
Medication name and purpose	Do not know
How do you take a medication?	On time, never missed doses
How does the medication work?	Well, very good, (if asked specifically which one, answer don't know)
What problems you have about medication ?	No
What other concerns you have?	Always run out of medication before coming to see a doctor
If asked closed ended questions	Answer only yes or no.

Problems

- Does not understand anything about medication; do not know names and purpose
- Lives far away from the hospital (another town)
- Does not trust local doctor, so refer himself to our hospital
- Afraid of running out of medication before next visit
- Has so many medications at home from last clinic visit
- Ends up taking wrong medication received from other hospitals

PHARMACISTS WORKUP OF DRUG THERAPY

Buddhachinaraj Phitsanuloke Hospital

Pt. Name............ HN [redacted]

Age.... ปี ...Wt.... ก. Ht........ Drug allergy... –

CC: หอบเหนื่อย มา 3 วัน PTA

HPI: Underlying cardiomegaly มา 3 ปี [illegible] 1 wk PTA [illegible]

Medication history: [illegible]

Drug used before admission........

OTC drugs / Herbs........

Social / recreation drug... [illegible]

Compliance... [illegible] ...Risk factors........

Bed ....

Ward ....

Admission date........

Physician........

Pharmacist........

เบิกได้ (เบิกไม่ได้) ประกันสังคม

Problem:

CHF

Date	One day regimens	Σ	Date	One day regimens	Σ	Date	One day regimens	Σ
1/3	Lasix 40 mg	2						

Date start	Continuous regimens	Σ	Date													
			1	2												
28/2	Lasix (40) ½×1 OD เช้า	1	/	/												
	Isordil (10) 1×3 pc	3	/	/												
	Isordil (5) 1 tab prn chest pain	5	/	2												
	Enalapril (5) ½×1 OD เช้า	1	/	/												
	ASA gr I 1×1 pc เช้า	1	/	/												
	Home med = → [illegible] 1 mo															
2/1	Lasix (40) ½ × 1 OD เช้า # 15 tab															
	Isordil (10) 1 × 3 pc # 90 tab															
	Isordil (5) 1 tab for chest pain	# 20 tab														
	Enalapril (5) ½ × 1 OD เช้า # 15	tab														
	ASA gr I 1 × 1 pc เช้า # 30	tab														

Scenarios #2

- Male age 66 years old
- Lives with daughter
- Has been working in the paddy field for many years

If asked	Answer
Medication name and purpose	Know water pill , do not know the purpose
How do you take a medication?	Miss some when go to work, no regular schedule what time would leave home
How does the medication work?	Good feeling better, (if asked specifically which one, answer don't know)
What problems you have about medication ?	No, not now
What other concerns you have?	Always good the first few days and get worse again
If asked closed ended questions	Answer only yes or no.

Problems

- Knows drug name but nothing else taken diuretic before
- Believes that the medication will stop working after a while
- Has life style problems: works in the field, does not want to bring medication along

PHARMACISTS WORKUP OF DRUG THERAPY

Buddhachinaraj Phitsanuloke Hospital

Pt. Name.................. HN...

Age.. ...Wt.... -Ht.... -Drug allergy... ปฏิเสธ

CC: 3 วันก่อน มีอาการหอบเหนื่อย นอนราบไม่ได้

HPI: มี PND ไม่มีอาการ N/V, มีอาการเวียนหัว

มี น.น. ลดลง 2 kg / 1 เดือน, ไม่มีไข้

Medication history:
Drug used before admission: Minipress (2) 1 tab bid, lasix (500) 1 tab ร,ท
ASA gr V, lasix (500) 1x2

OTC drugs / Herbs: ไม่ได้กินยาหม้อ, ยาชุด, ยาลูกกลอน

Social / recreation drug: สูบบุหรี่ วันละ ครั้ง / ดื่มเหล้าขาว ทุกวัน (ดื่มมา 4-5 ปี)

Compliance: ... Risk factors: NIDDM on NPH 15 ū ⓢ ac เช้า

Bed

Ward อช. 2

Admission date.

Physician.....

Pharmacist.....

เบิกได้ | เบิกไม่ได้ | ประกันสังคม

Problem:

CHF

C.R.P.

Date	One day regimens	Σ	Date	One day regimens	Σ	Date	One day regimens	Σ
7/3	lasix 160 mg ⓥ stat	/	13/3	Unison enema	1			
	Ped KCL 30 cc q bid	60	18/3/44	RI 10 ū	10			
8/3	ORS ค่อยๆ ดื่มทีละน้อย	2						
11/3	Ped KCl 15 ml qid	60						

Date start	Continuous regimens	Σ	7	8	9	10	11	12	13	14	15	16
6/3	~~Lasix (500) 1 tab ⓢ od~~	1	/	/	/	off						
	NPH 15 ū ⓢ ac เช้า	15 ū	/	/	/	/	/	/	/	/	/	
	Minipress (2) 1 tab bid	2	/	/	/	/	/	/	/	/	/	
	Theodur (200) 1x2 opc	2	/	/	/	/	/	/	/	/	/	
9/3	ORS ดื่มแทนน้ำ	5 ซอง	/	/	/	/	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8/3	~~Perlactin 1x2 ac~~	2		/	off							
	Promethazine 1x4 pc	4		/	/	/	/	/	/	/	/	
	Motilium 1x3 ac	3		/	/	/	/	/	/	/	/	
	~~Cyproheptadine 1x3 pc~~	3			/	/	/	/	off			
	"Review treatment."		16	17	18							
16/3	Minipress (2) 1x2 opc	2	/	/	/							
	HM 19/3/44		19									
	~~Minipress (2) 1x2 pc - 30 tab~~	2	/									
	~~Actrapid 5 ū ac เช้า - 1 ขวด~~	1 ขวด	/									
	~~Lasix (40) 1x1 OD - 15 tab~~	1	/									
	~~ASA gr. I 1x1 OD (ß) #30~~	1	/									

Scenarios #3

- Female age 67 years old
- Lives with a son and daughter in law at a small retail store in Wang-thong district
- Son is a caregiver but having a little bit of cognitive disability
- Bedroom is in the second floor but a bathroom is downstairs
- Has swollen legs

If asked	Answer
Medication name and purpose	Know water pill and how it work
How do you take a medication?	Miss some
How does the medication work?	Good feeling better, (if asked specifically which one, answer don't know)
What problems you have about medication ?	Don't want to take wather pill, difficult to go to the bathroom. Having to walk down the stair with swollen legs
What other concerns you have?	Swollen legs
If asked closed ended questions	Answer only yes or no.

Problems

- Knows drug name and purpose, however, cannot associate swollen legs with not taking medication.
- Has difficulties walking to the bathroom, so stopped taking medication
- Concerns so much about swollen leg

PHARMACISTS WORKUP OF DRUG THERAPY

Buddhachinaraj Phitsanuloke Hospital

Pt. Name.......... ....HN..............

Age..........Wt...........Ht.......-...*Drug allergy*........ [illegible]

CC: [illegible] ~ 1/2 [illegible]

HPI: [illegible] FC II stable, [illegible] DM, HT

Bed

Ward

Admission date..........

Physician..........

Pharmacist..

เบิกได้ เบิกไม่ได้ ประกันสังคม

Medication history:

Drug used before admission...... Lasix (40) 1x1, Esidrex [illegible] 1x1, Bco 1x3

OTC drugs / Herbs...... [illegible]

Social / recreation drug...... [illegible]

Compliance...... [illegible] ......Risk factors...... [illegible]

Problem:

Pitting edema (Anasarca)

~~[illegible]~~ CHF.

LV sys. dysfunction

Mild MR

Date	One day regimens	Σ	Date	One day regimens	Σ	Date	One day regimens	Σ

Date start	Continuous regimens	Σ	Date													
			14													
13/3/44	Lasix (40) 1 tab ē [illegible]	1	✓													
	Bco 1x3 ē pc	3	✓													
14/3/44	$FeSO_4$ 1x3 ē pc	3	✓													
	MTV 1x3 ē pc	3.	✓													
	Enalapril (5) 1x1 ē pc	1	✓													
15/3/44	H/M.		15.													
	Lasix (40) 1x1 ē pc # 30.		✓													
	Bco 1x3 ē pc # 90		✓													
	Enalapril (5) 1x1 ē pc # 30		✓													
	$FeSO_4$ 1x3 ē pc # 90.		✓													

Scenarios #4

- Muslim Female age 45 years old
- Lives alone
- Has to pray 5 times a day
- Sell coffee at a cart at a fruit market about 15 minutes walk to her home
- Has CHF conditions as a result of drug induced cardiomyopathy (patient knows)

If ask:	Answer:
Medication name and purpose	Know water pill and how it work
How do you take a medication?	Never miss..(sound not sure) if probe, answer miss some
How does the medication work?	Good feeling better,
When do you take the medication?	Would go home to take them Don't usually bring medication to the coffee cart. If it is very busy at work, miss the medication
What problems you have about medication ?	Afraid of taking several medications, they might cause other conditions Having no hope of getting better.
What other concerns you have?	no
If asked closed ended questions	Answer only yes or no.

Problems

- Knows drug name and purpose, however, afraid it will cause problems
- Has life style problems, no bathroom where she works, have to walk home 5 times a day to pray.
- Has no motivation to get better.

PHARMACISTS WORKUP OF DRUG THERAPY

Buddhachinaraj Phitsanuloke Hospital

Pt. Name.................................... HN.... ....

Age............Wt.........1..Ht ....*Drug allergy*...ไม่มี...........

CC:...[illegible]...........

HPI:...Case NHL (CHT [illegible]) c̄ Adriamycin induced cardiomyopathy.....

......มา admit ด้วย CHF [illegible] [illegible] DX CHF c̄ NHL........

Bed

Ward

Admission date:..........

Physician..........

Pharmacist..........

เบิกได้ เบิกไม่ได้ ประกันสังคม

Problem:

CHF c̄ Underlying NHL

Medication history:

Drug used before admission...Apresoline (25) 1x2 Lasix (40) 1x2, Isordil 1x3,......

......ASA gr V [illegible] 3/4/43 → LV syst. dysfunction

OTC drugs / Herbs...[illegible]...

Social / recreation drug...ไม่มี...

Compliance...ดี.......Risk factors...Drug induced (Adriamycin)......

Date	One day regimens	Σ	Date	One day regimens	Σ	Date	One day regimens	Σ

Date start	Continuous regimens	Σ	Date 21	22												
21/3	Isordil (10) 1x3 ac		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	ASA gr V 1x OD.		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Lasix (40) 1x2		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]							
	Isordil (5) 1 tab. (SL) prn		[illegible]	[illegible]	[illegible]											
	Apresoline (25) 1x2 pc		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]								
	Ranitec (5) ½x2 [illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Quinine Sg 1x OD.	1	[illegible]													
	Mrgesic 1x4 pc	4														
	D5 1x hs	1														
	HM 23/3/44 1600 น.		23													
	Quinine Sg 1x1 pc # 20	1	[illegible]													
	Isordil (10) 1x3 ac # 50	-	[illegible]	[illegible]												
	ASA gr V 1x1 [illegible] # 20	1	[illegible]													
	Isordil (5) 1 tab. (SL) # 20	-	[illegible]	[illegible]												
	Apresoline (25) 1x2 pc # 35	2	[illegible]	[illegible]												
	Renitec (5) ½x2 pc # 20	—	[illegible]	[illegible]												
	Mrgesic 1x4 pc # 30	4	[illegible]													
	D5 1 tab. hs. # 20	1	[illegible]													
	Lasix (40) 1x2 [illegible] # 35	—	[illegible]	[illegible]												

Scenarios #5

- Male age 86 years olds
- Lives with a wife and a son
- Not currently working
- Has CHF conditions for many years
- Cannot walk, feeling very weak

If ask:	Answer:
Medication name and purpose	Do not know anything
How do you take a medication?	Never miss..(sound not sure) if probe, answer miss some
How does the medication work?	Feeling very weak, Don't think the drug works (don't have to go to the restroom as often as it should
When do you take the medication?	Read a label cannot remember so many medications
What problems you have about medication ?	No
What other concerns you have?	Coughing, doctor didn't prescribe any cough medication Plan to have a short at nearby private clinic for cough
If asked closed ended questions	Answer only yes or no.

Problems

- Does not understand about medication and its side effects
- Associates coughing with having a cold
- His wife is also ill, miss doses because no one helps prepare and administer the medication during the day when a son went to work
- Has no motivation to get better.

PHARMACISTS WORKUP OF DRUG THERAPY

Buddhachinaraj Phitsanuloke Hospital

Pt. Name..... HN.....	Bed
Age.... Wt. [illegible] Ht. – Drug allergy [illegible]	Ward
CC: [illegible] gangrene [illegible]	Admission date..........
HPI: [illegible]	Physician..........
[illegible]	Pharmacist..........
[illegible]	เบิกได้ เบิกไม่ได้ ประกันสังคม
Medication history:	Problem:
Drug used before admission [illegible]	
....	HT
OTC drugs / Herbs [illegible]	CHF
Social / recreation drug [illegible]	CVA
Compliance [illegible] Risk factors [illegible]	Rt foot gangrene

Date	One day regimens	Σ	Date	One day regimens	Σ	Date	One day regimens	Σ

Date start	Continuous regimens	Σ	23	24	25	26	27	28	29	30	1	2	3	4	5	6
23/4	B1-6-12 1x3 pc	3														
	ASA เด็ก 1x2 pc	2														
	Rocephin 1 gm. IV q 12 hr.	2														
	Pletaal 1x3 pc	3														
	HCTZ 1x1 OD.	1														
	Panenteral 100 cc. x 6 feed															
	FBC 1x3 pc.	3														
24/4	Tritace (2.5) 1x1 [illegible] OD.	1														
	Review. Rx		7	8												
	B1-6-12 1x3 pc	3														
	ASA เด็ก 1x2 pc #30	2														
[illegible]	~~Rocephin~~ 1 gm. IV q 12 hr.	2	off													
[illegible]	Pletaal 1x3 pc #90	3														
	HCTZ 1x1 OD.	1														
[illegible]	Panenteral 100 cc x 6 feed															
	FBC 1x3 pc #90	3														
NED	Tritace (2.5) 1x1 OD. #30	1														
	D/C 9/5/44															

APPENDIX B

WRITTEN MEDICATION INFORMATION SHEETS

Written medication information sheets

Characteristics

- One page user friendly (yellow color)
- Four medications: Isosorbide dinitrate, ace inhibitors, digoxin, and furosemide

Contents

- Generic name
- Brand name
- Common uses
- How to use this medication?
- What to do when you miss doses?
- Precautions
- What to do if you have these side effects?

ชื่อยา ไอ-โส-ซอ-บายด์ (Isosorbide)
ชื่อการค้า ไอ-ซอร์-ดิล (Isordil)

ยานี้จะช่วยคุณอย่างไร?
ยานี้ทำให้หลอดเลือดขยายตัว ซึ่งจะทำให้หัวใจสูบฉีดเลือดได้ง่ายขึ้น และ ทำให้เลือดไหลเข้าหัวใจได้มากขึ้น ยานี้ใช้รักษาโรคหัวใจ และป้องกันการเกิดหัวใจวายเฉียบพลัน

คุณควรใช้ยานี้อย่างไร?
ทานยานี้ตามขนาดที่แพทย์แนะนำ ทานยาตอนที่นั่งหรือนอนอยู่ เพื่อป้องกันการหกล้มเนื่องจากอาการการวิงเวียนหรือเป็นลม ควรทานยานี้ขณะท้องว่าง ก่อนอาหารครึ่งชั่วโมง <u>หรือ</u> หลังอาหาร 1-2 ชั่วโมง

ทำอย่างไรถ้าลืมทานยา?
ถ้าลืมทานยาให้ทานทันทีที่นึกได้
แต่ถ้านึกได้ใกล้กับเวลาทานยามื้อต่อไป ให้ทานเฉพาะของมื้อนั้น ไม่ต้องทาน เป็น 2 เท่า

ข้อควรระวัง เมื่อทานยานี้
- เพื่อไม่ให้เกิดอาการวิงเวียน หน้ามืด ขณะลุกขึ้นยืนหรือลุกจากที่นอน ให้ลุกขึ้นช้าๆ
- งดดื่มเหล้า หรือเครื่องดื่มที่แอลกอฮอลล์
- ควรปรึกษาแพทย์ ถ้าคุณใช้ยาอื่นๆนอกเหนือจากที่แพทย์ท่านนี้สั่ง หรือ ซื้อใช้เองจากร้านขายยา เพราะยาบางประเภทเมื่อใช้ร่วมกับยาตัวนี้อาจทำให้เกิดอันตรายได้

ทำอย่างไรถ้าคุณมีอาการเหล่านี้?
- อาจมีอาการปวดหัว, วิงเวียน, และ อาเจียน ถ้ามีอาการเหล่านี้ ควรปรึกษาแพทย์ แต่อย่าหยุดยาเอง
- ถ้ามีอาการแพ้ หายใจลำบาก บวมที่ปาก หรือลิ้น มองไม่เห็น ให้หยุดยาแล้วไปพบแพทย์ทันที

ชื่อยา อี-นา-ลา-พริ้ว (Enalapril)

ยานี้จะช่วยคุณอย่างไร?
ยานี้ทำให้หลอดเลือดคลายตัว โดยยับยั้งการทำงานของสารชนิดหนึ่งในร่างกาย ที่ทำให้เส้นเลือดหดตัว ผลคือทำให้เลือดไหลเวียนดีขึ้น ความดันเลือดลดลง และช่วยให้หัวใจบีบตัวดีขึ้น ยานี้ใช้รักษา โรคความดันโลหิตสูง
โรคหัวใจล้มเหลวเรื้อรัง หรือ ช่วยป้องกันโรคไตในคนไข้ที่ป่วยเป็นโรคเบาหวาน

ผู้ที่ไม่ควรใช้ยานี้

- ตั้งครรภ์ หรือ วางแผนที่จะตั้งครรภ์ในอนาคตอันใกล้
- ให้นมบุตร

คุณควรใช้ยานี้อย่างไร?
ควรทานยานี้ตามขนาดที่แพทย์แนะนำ ยานี้ควรทานเวลาท้องว่าง
ก่อนอาหารครึ่งชั่วโมง <u>หรือ</u> หลังอาหาร 1-2 ชั่วโมง
อย่าหยุดยาเองถึงแม้จะรู้สึกสบายดีแล้ว เพราะอาจทำให้อาการกำเริบได้

คุณควรทำอย่างไรถ้าลืมทานยา?
ถ้าลืมทานยาให้ทานทันทีที่นึกได้ แต่ถ้านึกได้ใกล้กับเวลาทานยามื้อต่อไป ให้ทานเฉพาะของมื้อนั้น ไม่ต้องทาน เป็น 2 เท่า

ข้อควรระวัง เมื่อทานยานี้

- เพื่อไม่ให้เกิดอาการวิงเวียน หน้ามืด ขณะลุกขึ้นยืนหรือลุกจากที่นอน ให้ลุกขึ้นช้าๆ
- งดดื่มเหล้า
- ระมัดระวังถ้าต้องการออกกำลังกาย หรือ อยู่ในที่มีอากาศร้อนมาก อาจทำให้เกิดอาการวิงเวียนหน้ามืดได้
- ควรบอกแพทย์ ถ้าคุณใช้ยาอื่นๆนอกเหนือจากที่แพทย์ท่านนี้สั่ง หรือ ซื้อยาใช้เองจากร้านขายยา
  เพราะยาบางประเภทเมื่อใช้ร่วมกับยาตัวนี้อาจทำให้เกิดอันตรายได้

ทำอย่างไรถ้าคุณมีอาการเหล่านี้?

- ช่วงแรกอาจมีอาการ ปวดศีรษะ, ท้องเสีย, ท้องผูก, คลื่นไส้, อ่อนเพลีย, หรือ ไอแห้งๆ ถ้าไม่หายไป ควรปรึกษาแพทย์
- ถ้ามีอาการเจ็บหน้าอก, ตัวเหลือง, มีไข้, วิงเวียนมาก, หรือ เจ็บคอเรื้อรัง ควรปรึกษาแพทย์

ชื่อยา ดิ-จ็อก-ซิน (Digoxin)
ชื่อการค้า ลา-น็อก-ซิน (Lanoxin)

ยานี้จะช่วยคุณอย่างไร?
ยานี้จะออกฤทธิ์โดยตรงที่กล้ามเนื้อหัวใจ โดยจะควบคุมการเต้นของหัวใจ ทำให้หัวใจบีบตัวได้แรงขึ้น เลือดไปเลี้ยงส่วนต่างๆ ของร่างกายได้ดีขึ้น ลดอาการบวมที่มือและเท้าในคนไข้ที่มีปัญหาโรคหัวใจ

ผู้ที่ไม่ควรใช้ยานี้
- ตั้งครรภ์ หรือ วางแผนที่จะตั้งครรภ์ในอนาคตอันใกล้
- ให้นมบุตร

คุณควรใช้ยานี้อย่างไร?
ทานยานี้ตามขนาดที่แพทย์แนะนำ
ควรทานหลังอาหารเพื่อหลีกเลี่ยงการระคายเคืองกระเพาะอาหาร
ไม่ควรหยุดยา หรือ เพิ่มขนาดยาเองก่อนปรึกษาแพทย์

ทำอย่างไรถ้าลืมทานยา?
ถ้าลืมทานยาให้ทานทันทีที่นึกได้ แต่ถ้าเกินไปแล้ว 12 ชั่วโมง ไม่ต้องทานยามื้อนั้น ให้ทานยาของครั้งต่อไปตามขนาดปกติเลย ห้ามทานเป็น 2 เท่า ถ้าขาดยามากกว่า 2 วันควรแจ้งให้แพทย์ทราบ

ข้อควรระวัง เมื่อทานยานี้
- ถ้าต้องเข้ารับการผ่าตัด รวมทั้งการผ่าตัดเกี่ยวกับการทำฟัน ควรบอกแพทย์ว่าใช้ยานี้อยู่
- ควรบอกแพทย์ ถ้าคุณใช้ยาอื่นๆนอกเหนือจากที่แพทย์ท่านนี้สั่ง หรือ ซื้อใช้เองจากร้านขายยา
  เพราะยาบางประเภทเมื่อใช้ร่วมกับยาตัวนี้อาจทำให้เกิดอันตรายได้

ทำอย่างไรถ้าคุณมีอาการเหล่านี้?
- ช่วงแรกอาจมีอาการ ปวดศีรษะ, ท้องเสีย, เบื่ออาหาร, กล้ามเนื้อไม่มีแรง, หรือ อ่อนเพลีย, ถ้าไม่หายไป ควรปรึกษาแพทย์
- ถ้ามีอาการสับสน มองภาพไม่ชัด มองภาพเห็นเป็นแสงสีเหลือง หรือ เขียวรองๆ ภาพ, หัวใจเต้นเร็ว, อาการหายใจลำบาก, ชีพจรเต้นช้า, ผื่นแดง, หน้าอกใหญ่ขึ้น หรือ ท้องอืดรุนแรงเวลาทานยา หยุดยาและไปพบแพทย์ทันที

ชื่อยา ฟู-โร-ซี-ไมด์ (Furosemide)
ชื่อการค้า ลา-ซิก (Lasix)

ยานี้จะช่วยคุณอย่างไร?
ยานี้เป็นยาขับปัสสาวะ ซึ่งจะลดปริมาณน้ำในร่างกาย โดยเพิ่มการขับออกมาเป็นปัสสาวะ ยานี้ใช้รักษาอาการบวม หรืออาการหายใจติดขัด จากการคั่งของน้ำเนื่องจากสาเหตุต่างๆ เช่น โรคหัวใจ, โรคไต, โรคตับ ยานี้ยังใช้รักษาอาการความดันโลหิตสูงด้วย

คุณควรใช้ยานี้อย่างไร?
ทานยานี้ตามขนาดที่แพทย์แนะนำ เนื่องจากยานี้ทำให้ปัสสาวะมากขึ้น ถ้าทานยานี้ในช่วงบ่ายๆ หรือช่วงเย็นอาจทำให้ต้องตื่นมาปัสสาวะบ่อยๆ ในตอนกลางคืน

ทำอย่างไรถ้าลืมทานยา?
ถ้าลืมทานยาให้ทานทันทีที่นึกได้ แต่ถ้านึกได้ใกล้กับเวลาทานยามื้อต่อไป ให้ทานเฉพาะของมื้อนั้น ไม่ต้องทาน เป็น 2 เท่า

ข้อควรระวัง เมื่อทานยานี้
- เพื่อไม่ให้เกิดอาการวิงเวียน หน้ามืด ขณะลุกขึ้นยืนหรือลุกจากที่นอน ให้ลุกขึ้นช้าๆ
- งดดื่มเหล้า
- ควรบอกแพทย์ ถ้าคุณใช้ยาอื่นๆนอกเหนือจากที่แพทย์ท่านนี้สั่ง หรือ ซื้อใช้เองจากร้านขายยา เพราะยาบางประเภทเมื่อใช้ร่วมกับยาตัวนี้อาจทำให้เกิดอันตรายได้

ทำอย่างไรถ้าคุณมีอาการเหล่านี้?
- ช่วงแรกอาจมีอาการ มึนงง, ปวดหัว โดยเฉพาะช่วง 2-3 วันแรก ถ้าไม่หายไป ควรปรึกษาแพทย์
- ควรปรึกษาแพทย์ทันที ถ้ามีอาการปวดกล้ามเนื้อ, อาเจียน,หรือหายใจลำบาก

APPENDIX C

METHOD MATERIALS: RECRUITING MATERIALS AND PATIENT CONSENT FORM,

Identify Potential Subjects Form
PCAP (Participation and Collaboration Approach Project)

Primary Screening criteria	1) Diagnosed with CHF and admit with the condition related to CHF 2) Having valid address in Phitsanolok or nearby provinces

Date____________________**Reporter's name** ____________________________
Patient's name______________________H.N_____________**Age**________
Female Male **Patient unit** male1 male 2 male 3 female1 female 2 female 3
Bed number_____ **by** newly admitted referral from _______**Date**_______________
Physician's name________________________ **Pharmacist's name**______________________
CC:____
____

For Researcher

1 Screening interview date_______________by_______________________________
2 Criteria Checklist
- The reason for the recent admission is CHF related conditions.
- He/She expected to survive for at least six months.
- He/She does not have marked dementia or another psychological disorder.
- He/She can speak and understand Thai.
- He/She can self-administer medication.
- He/She lives in the metropolitan area and has legitimate address.

3. Overall eligibility Yes (go to 4) No
4. Agree to participate Yes (Date of signing a consent form_______________)
No reason____

Assigned ID______________ assigned group: Control Exp I Exp. II
5. How long have he/she been diagnosed with CHF___________________________
6. Functional Class Class I Class II Class III Class IV
7. Co-morbidities____
____
____

**For researcher **

8. Patient brings let over medication from home Yes (go to 9,10 and 11) No (go to 12)
9. Patient had been using leftover medication Yes No
10. Where are the left over medication Patients Nurse Pharmacist
11Possibility of using leftover medication when discharge Yes No Not sure

12. Date of Discharge______________________ Time______________
13 Follow up date by physician ____________Physician's name____________
14. Follow up date (Pharmacist)____________Pharmacist's name____________
13. Home interview days________________Time______________
14. Address____
____
____
____
____
____
____
____
Tel.____
15. Map

Patient Consent Form to Participate in a Research Study

You are invited to participate in a research study conducted by researchers at the University of Wisconsin, School of Pharmacy. The general purpose of this study is to gain a better understanding of how patients take their medication, their possible needs for information and assistance, and ways to improve pharmacist communication. You were selected for this study, because you are taking medication for Congestive Heart Failure and being admitted to Buddhachinaraj hospital for Heart condition. Your participation in this study is voluntary. About 120 subjects will participate in this study.

<u>What will this study involve?</u>

A. An authorized researcher will review your medical and pharmacy records to verify your current regimen and diagnosis.

B. One third of the patients who participate will receive standard pharmacy services, and two third of the patients will be offered a new consultation service at the point of discharge. One half of the latter group will be randomly assigned to receive follow up at one week after initial discharge. Whether or not you receive the services will depend on a period you are admitted to the hospital and group you are randomly assigned to. You will be randomly (by chance) assigned to one of these groups.

C. If you are in the group of patients who receive the new pharmacy service, your pharmacist will talk to you about your medication for about 15 minute before you leave the hospital and will give you written medication information sheets. The new consultation services also give you a daily card which you will write down symptoms that might relate to your medication. If you are randomly assigned to the follow up group, you will receive a phone call or home visit depending on your telephone availability. This call or visit to your home will take about 15 minutes. The discussion might be tape recorded as for quality control purposes. If you request it, your pharmacist will provide a brief report to your physician on a regular or as needed basis.

Do you want us to give a report about your medication use to your doctor?
_____ Yes, My doctor's name is_______________________
_____ No

All patients will continue receiving care from their regular physician in the usual fashion.

D. Subjects in both groups will receive home interviews and mail back questionnaires at two weeks and three months after initial discharge respectively. The home interview will take about 30 minutes. It will include questions about your medications, satisfaction with treatment, and communication with pharmacists and other providers. You will receive $10 for completing the interview.

Are there any cost to participating in this study?

There are no additional costs to you for participating in this study. Your heart medicine and other medications will still be paid for by you or your insurance in the usual fashion.

What are the risks of participating?

The risks of participation include the extra time you might have to take at the point of discharge and follow up if you are in the group receiving the new consultation services and the time you will spend completing home interviews and mail back questionnaires. There is also a chance of a breach of confidentiality. However, we will take steps to prevent this.

What are the benefits of participating?

We cannot guarantee that you will benefit directly from participating in this study. We hope that your participation will help us to take better care of patients with heart disease in the future.

Who will see my records?

There is a risk of breach of confidentiality as researchers will be looking at your records. However, steps will be taken to minimize these risks. When you enter the study you will be assigned a identification number. Patient names and numbers will be kept in a locked file. Your name will not be attached to any instruments or questionnaires or information pulled from your records. Reports will not contain details that can identify you, your hospital, or your providers.

What are my alternatives?

You can continue receiving you heart medication without participating in this study.

Is my participation voluntary? What if I change my mind?

Your participation in this study is voluntary. You are free to withdraw your consent and to stop participating at any time without influencing your care. You have the right to be given answers to your questions about this study. If you have a question, you can contact the principal investigator of this study at the number listed below.

Authorization: I, ________________________, have read the above and decide to participate in the research study described above. My signature also indicates that I have received a copy of this consent form.

______________________________ ____________________

Your Signature Date

______________________________ ____________________

Signature of Principal Investigator Date

Piyarat Nimpitakpong, M.S.
Researcher and Lecturer
Naresuan University, Phitsanulok
Telephone: 055-244-911

APPENDIX D

METHODS MATERIALS: PHARMACIST WORKUP OF DRUG THERAPY

PHARMACISTS WORKUP OF DRUG THERAPY

Buddhachinaraj Phitsanuloke Hospital

Pt. Name.... .... HN.... [illegible]

Age............Wt.........[illegible] Ht ....*Drug allergy*...ไม่มี

CC:...... [illegible]

HPI: Case NHL c (CHF [illegible]) c Adriamycin induced cardiomyopathy .... [illegible] admit [illegible] CHF [illegible] Dx CHF c NHL ...

Bed

Ward อายุรกรรมหญิง

Admission date:...........

Physician.... ....

Pharmacist..................

เบิกได้ เบิกไม่ได้ ประกันสังคม

Problem:

CHF c Underlying NHL

Medication history:

Drug used before admission... Apresoline (25) 1x2, Lasix (40) 1x2, Isordil 1x3, ASA gr V [illegible]

OTC drugs / Herbs.... [illegible]

Social / recreation drug...... ไม่มี

Compliance...... ดี ....Risk factors..... Drug induced (Adriamycin)

Date	One day regimens	Σ	Date	One day regimens	Σ	Date	One day regimens	Σ

Date start	Continuous regimens		Σ	Date													
				21	22												
21/3	Isordil (10)	1x3 ac		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	ASA gr V	1x OD.		[illegible]	จ่าย	จ่าย	จ่าย	จ่าย	จ่าย	จ่าย	จ่าย	จ่าย	จ่าย	จ่าย	จ่าย	จ่าย	จ่าย
	Lasix (40)	1x2		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]							
	Isordil (5)	1 tab. (SL) prn		[illegible]	[illegible]	[illegible]											
	Apresoline (25)	1x2 pc		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]								
	Ranitec (5)	½x2 [illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Quinine SO4	1x OD.	1	[illegible] 1 [illegible] 1													
	Mygesic	1x4 pc	4														
	D5	1x hs	1														
	HM 23/3/44 [illegible]			23													
	Quinine SO4	1x1 pc # 20	1	[illegible]													
	Isordil (10)	1x3 ac # 50	~	[illegible]	[illegible]												
	ASA gr V	1x1 [illegible] # 21	1	[illegible]													
	Isordil (5)	1 tab. (SL) # 20	~	[illegible]	[illegible]												
	Apresoline (25)	1x2 pc # 35	[illegible]	[illegible]	[illegible]												
	Ranitec (5)	½x2 pc # 20	—	[illegible]	[illegible]												
	Mygesic	1x4 pc # 30	4	[illegible]													
	D5	1 tab. hs. # 20	1	[illegible]													
	Lasix (40)	1x2 [illegible] # 35	~	[illegible]	[illegible]												

APPENDIX E

METHODS MATERIALS: HOME STRUCTURED INTERVIEW INSTRUMENT AND PILL COUNT RECORD INSTRUMENT

HOME INTERVIEW

THE EFFECTS OF PHARMACIST INTERVENTION ON PATIENT ADHERENCE AND REHOSPITALIZATION IN CHF PATIENTS IN THAILAND

PIYARAT NIMPITAKPONG
SCHOOL OF PHARMACY
NARESUAN UNIVERSITY

A. Patient comprehension and recall of the regimen

[INTERVIEWER ASKS PATIENT TO BRING THEIR MEDICATION TO THE TABLE] I understand that there are a large number of medications you have to take everyday. Given this large number of medication, some patients can remember what the regimen is, while it is common that many patients cannot. Now, I would like to ask you some questions about those medications.

A1.What disease or condition are you having?	A2. Would you identify each of the medication the physician prescribed?	A3. How is it going to help you?	A4. What did the doctor tell you to take it?	A5. How exactly have you been taking it after you came back from the hospital?	A6. For how long will you have to take it?	A7. Are you supposed to take this every day or just when you need it?	A8. How the medication working for you?
						as needed every day Don't know	Very well Well Not well at all
						as needed every day Don't know	Very well Well Not well at all
						as needed every day Don't know	Very well Well Not well at all
						as needed every day Don't know	Very well Well Not well at all
						as needed every day Don't know	Very well Well Not well at all
						as needed every day Don't know	Very well Well Not well at all

Patient beliefs and motivation (general-perceived outcomes)

B. Now, I would like you to tell me what you think. Overall your medication regimen you received from the hospital, Do you think this statement is true, somewhat true or not true?

	Not true	Somewhat true	True	Not sure
B1. Heart condition is curable	04	03	02	01
B2. My doctor is really competent in trateing heart disease	04	03	02	01
B3. You have worries or concerns about this medication that have not been dealt with by your health care providers	04	03	02	01
B4. This is a good option for you (This medication is right for me)	04	03	02	01
B5. Side effects of this medication are likely to be bothersome	04	03	02	01
B6. If you take your medication as you are told, you will decrease your chances of being hospitalized	04	03	02	01
B7. Taking your medication will help you maintain your quality of life	04	03	02	01
B8. When you take your medication you will not have to worry as much about your disease	04	03	02	01

Patient beliefs and motivation (specific- diuretic medication)

C. Are you currently taking a water pill [ ] Yes [ ] No

If yes, now I would like to ask you specifically about the water pill you are taking. [INTERVIEWER SHOWS THE PATIENT THE MEDICATION AND READ C1-C4 ONE AT A TIME].Would you Strongly Disagree, Disagree, Agree, or Strongly agree?

	Strongly disagree	Disagree	Agree	Strongly agree
C1. Taking the water pills will help you breathe more easily	04	03	02	01
C2. Taking water pills will lessen your swelling	04	03	02	01
C3. Taking water pills makes it too hard to go away from ho	04	03	02	01
C4. Taking water pills causes you to wake up at night to go to the bathroom	04	03	02	01

Patient medication taking skills and resources

D. Some patients have problems with their medicines. I would like to ask you, **in the last 7 days**, would you say_____________[INTERVIEWER READ D1.-D6. ONE AT A TIME] was not at all hard, somewhat hard, or very hard?

	Very hard	Somewhat hard	Not hard at all	Comments (Which medicine)
D1. Reading the print on the medication container	03	02	01	
D2. Opening the medication container	03	02	01	
D3. Swallowing the medication	03	02	01	
D4. Taking so many pills at the same time	03	02	01	
D5. Paying for the medication	03	02	01	
D6. Remembering to take all the pills	03	02	01	

Probe: which medication have you had problem remembering_______________________________
____

Why and wehn_______________________________

E. Do you have any method to help you remember to take your medication?

Yes.......................................

No.......................................

Not sure.................................

F. Below is a list of some methods people use to remember to take their medicine. I would like you to tell me **in the last 7 days**: How often_______________[INTERVIEWER READ F1.-F6 ONE AT A TIME] Is it all the time, often, sometimes, or never?

	All the time	Often	Sometimes	Never	Comment
F1. Do you take the medication at the exact time of the day according to your watch or clock	01	02	03	04	
F2. Do you take the medication in relation to meals	01	02	03	04	
F3. Do you take the medication in relation to your other daily activities such as get up, take a shower, go to work, or go to bed	01	02	03	04	
F4. Someone reminds you to take the medication	01	02	03	04	
F5. Do you keep your medicines in a pill organizer box	01	02	03	04	
F6. Do you keep the medication where you can easily see	01	02	03	04	

G. Do you keep your medications at one place or several places?

One place......................

More than one place..........

G1. Where do you keep them?

1.______________________ Why do you keep them there?______________________

2.______________________ Why do you keep them there? ______________________

3.______________________ Why do you keep them there? ______________________

H. What would you do with your medication when you are not at home?

____

____

I1. Do you keep a list of your medication?

Yes...............................

No...............................

J1.In the past two weeks, has your physician ever changed the regimen?

Yes...............................

No...............................

J2.In general, what have you done to keep track with the regimen changes?

____

____

Patient satisfaction with pharmacy services

K. Now, I would like to ask you about hospital pharmacist services you have received over these few weeks starting the day you were discharged from the hospital. I would like you to tell me whether you strongly agree, agree, not sure, disagree, or strongly disagree with each of these statements.

	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
K1. You have some complaints about the pharmacy services	05	04	03	02	01
K2. The pharmacist spends as much time as is necessary with you	05	04	03	02	01
K3. The pharmacist should be more friendly	05	04	03	02	01
K4. The pharmacist is good at explaining things in a way that you understand	05	04	03	02	01
K5. The pharmacist hardly ever explains what the medication does	05	04	03	02	01
K6. Sometimes the pharmacist is too busy to spend enough time with you	05	04	03	02	01
K7. The pharmacist is always thorough	05	04	03	02	01
K8. The pharmacist are always courteous and respectful	05	04	03	02	01
K9. The pharmacist seems to have a genuine interest in you as a person	05	04	03	02	01
K10. Pharmacist asks if you have any questions or concerns about the medication	05	04	03	02	01
K11. Pharmacist listens to your concerns about the medication	05	04	03	02	01
K12. Pharmacist encourages you to express concerns with taking medication	05	04	03	02	01
K13. Pharmacist helps you solve problems related to your use of the medication	05	04	03	02	01
K14. You are very satisfied with the pharmacy services that you receive	05	04	03	02	01

Family involvement in medication uses

L. Who do you consider as your primary caregiver?______________________________

____

____

M. I would like you to think about your family member and tell me how helpful they are for you regarding the medication issue?

	Very helpful	Somewhat helpful	Not at all helpful	Who has provided help?
M1.Remind you to take the medication				
M2. Prepare each dosage unit				
M3. Prepare the pill box each day or each week				
M4. Pay for the medication				
M5. Keep you a company at the pharmacist consultation				
M6. Read the medication label				
M7. Help you make decision regarding medication				
M8. Provide medication information				
M9. Encourage you to take the medication				
M10. Listen to your medication problem				

FOR INTERVIEWER: Does family member present? YES.......[ ] NO.......[ ]

N. How satisfied or unsatisfied would you say you feel about your caregiver in helping you with your medication?

Very satisfied.................
Pretty satisfied................
Pretty dissatisfied.............
Very dissatisfied...............
[IF VOLUNTEER]Neither satisfied nor dissatisfied.............

Program fidelity

O1. Have you received written medication information sheet (the green sheet) from the pharmacist?

Yes...............................
No...............................

O2. Have you received a phone call from the pharmacist this past week?

Yes............................... When_______________________
No...............................

O2. Have the pharmacist visited you at your home this past week?

Yes............................... When_______________________
No...............................

P. Patient demographics

P1. What is your date of birth?

[ ][ ] [ ][ ] [ ][ ][ ][ ]
Mo Day Year

P2. Are you male or female?

FEMALE .... [ ]
MALE.......................... [ ]

P3. What is your origin?

Thai.......................... [ ]
Chinese .... [ ]
Other........................ [ ] specify_______________

P4. What is a speaking language do you usually speak at home?

Thai............................ [ ]
Chinese........................... [ ]
Others............................ [ ]please specify__________

P5. What is the highest grade or year of school you have completed?

____

P6. I would like a general estimate of the total family income for you and for all family members who would be responsible for paying your medical expesenses during last month. Considering income from all sources-from job, interest, rents, and so forth-for you and all the family members, what would you say was your total family income for last month -less than 3,000bht, 3,001bht to 6,000bht, 6,001bht to 10,000bht, 10,001bht to 50,000, or 50,001 or more?

Less than 3,000................ [ ]
3,001-6,000..................... [ ]
6,001-10,000................... [ ]
10,001-50,000...................[ ]
50,001 or more..................[ ]

Thank you for taking your time to answer the questionnaire. We are appreciated your help.

Time interview ends___________

Patient ID____________________ Name______________________________________

A. Medication's names (from medical and pharmacy record)	B. Doses /day	C. Number of dosage unit at discharge Date:________			D. Number of dosage unit at home Date: ________	E. Number of days (D.date-C.date)	F. Number of dosage unit patient suppose to take (E x B)	G. Number of dosage unit have been taken (C. total-D)	H. Adherence rate (%) (G x100/F)	I. Dosage changes And who report?
		Left over	Newly dispensed	Total						

APPENDIX F

METHOD MATERIALS: MAIL QUESTIONNAIRE AND CHART REVIEW INSTRUMENT

Front

Since _______________, have you ever been admitted to hospital?

No

Yes.........How many times? ________ (Please fill out a table below)

	Date of admission	Name of the hospital	Number of days stay	Reason for admission
1st				
2nd				
3rd				
4th				
5th				

What problems you encountered when taking medication?________________

____

____

Back

PREPAID POSTCARD
THAILAND

STAMP

Sender's name

Recipient's name

Piyarat Nimpitakpong

PO Box 94
Amphur Meuang
Pitsanulok, 65000

Review Patient Medical records

งานวิจัย Effect of Pharmacist Interventions on Medication Adherence and Rehospitalization in Patients with Congestive Heart Failure in Thailand

ชื่อผู้ป่วย______________ H.N______________
วันที่ review______________ ผู้ review______________

A. Comobidities (เฉพาะ chronic diseases) (เมื่อวันที่ review)
1.______________ 2.______________
3.______________ 4.______________

B. Diagnosis: CHF เมื่อ ______________

C. New York Heart Association Classes (เมื่อวันที่ review)

Class I	☐	อื่นๆ	☐
Class II	☐	ไม่ทราบ	☑
Class III	☐		
Class IV	☐		

D. สาเหตุของการเกิด CHF

- High blood pressure (hypertension) ☑
- Coronary artery disease ☑
- Valvular heart disease ☐
  - Narrow (stenotic) valves ☐
  - Leaky (regurgitant) valves ☐
  - Endocarditis ☐
- Abnormal heart rhythms (arrhythmias)
  - Bradycardia ☐
  - Tachycardia ☐
- Overactive thyroid gland (hyperthyroidism) ☐
- A severe decrease in red blood cells (anemia) ☐
- Diseases that affect the heart muscle itself (cardiomyopathy) ☐
- Diseases that affect the pericardium (the sac surrounding the heart) ☐
- Birth defects in the formation of the heart (congenital heart disease) ☐

E. Precipitation factors (ตั้งแต่วันที่ recruit ถึงวันที่ review) (ตอบได้หลายข้อ)

- Stopping prescribed medications ☐
- Excessive intake of fluids or salt ☐
- Uncontrolled hypertension ☐
- Infection ☐
- Heart attack ☐
- Ischemia (lack of blood to heart muscle) ☐
- Cardiac arrhythmia (abnormal heart rhythm) ☐
- Anemia. ☐
- Pulmonary embolus (blood clot in lung) ☐
- Hyperthyroidism (overactive thyroid) ☐
- Hypoxia (low level of oxygen in blood usually due to lung disease ☐
- New heart valve malfunction ☐

F. อาการ (ตั้งแต่วันที่ recruit ถึงวันที่ review) (ตอบได้หลายข้อ)

- Shortness of breath or difficulty breathing (dyspnea) ☐
- Cough ☐
- Edema ☑
- Weight gain ☐
- Fatigue ☐
- Chest pain ☐
- Acute pulmonary edema ☐

G. Diagnostic test (ตอบได้หลายข้อ)

☐ A chest X-ray (CXR) Results ______________________

☐ An electrocardiogram (EKG) Results ______________________

☐ An echocardiogram EF______% Results ______________________

H. การรักษา

a. *การผ่าตัด*

- Heart valve replacement ☐ เมื่อ ______________
- Congenital heart defect correction ☐ เมื่อ ______________
- Coronary artery bypass ☐ เมื่อ ______________
- Heart transplant ☐ เมื่อ ______________

Medications ตั้งแต่ วันที่ ____________________ (เฉพาะยาโรคหัวใจ)

Medication name	Doses	Start date	Discontinue date	หมายเหตุ

เข้าพักในโรงพยาบาล [Hospital Readmissions]

1. ตั้งแต่วันที่_______________ ผู้ป่วยเข้าพักรักษาตัวที่โรงพยาบาลหรือไม่, กี่ครั้ง, นานเท่าไร และ ด้วยสาเหตุอะไร?

เข้าโรงพยาบาล.......☐ กี่ครั้ง? _______________(กรุณาเติมข้อ 1.1-1.5)

ไม่.......................☑ (ข้าม ข้อ 1-1.5 ไปที่ ข้อ 2)

1.1. ครั้งที่	1.2 Admission date	1.3 Discharge date	1.4 จำนวนวัน	1.5 สาเหตุที่เข้า ร.พ ?
ครั้งแรก				
ครั้งที่ 2				
ครั้งที่ 3				

2. ตั้งแต่วันที่_______ ผู้ป่วยเข้าห้องฉุกเฉิน หรือห้องพักดูอาการของโรงพยาบาลหรือไม่, กี่ครั้ง, นานเท่าไร และ ด้วยสาเหตุอะไร?

ใช่.............☐ กี่ครั้ง? _______________(กรุณาเติมข้อ 2.1-2.5)

ไม่.............☑

2.1. ครั้งที่	2.2 Admission date	2.3 Discharge date	2.4 จำนวนวัน	2.5 สาเหตุที่เข้า?
ครั้งแรก				
ครั้งที่ 2				
ครั้งที่ 3				

Note:

APPENDIX G

RESULTS: FREQUENCY DISTRIBUTIONS OF INTERMEDIATE, BEHAVIORAL, AND HOSPTIAL OUTCOMES

Frequency Distributions

Comprehension score: diuretic

	SUM_CRD	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	11	10.3	12.0	12.0
	1.00	17	15.9	18.5	30.4
	2.00	17	15.9	18.5	48.9
	3.00	30	28.0	32.6	81.5
	4.00	17	15.9	18.5	100.0
	Total	92	86.0	100.0	
Missing	System	15	14.0		
Total		107	100.0		

Specific beliefs score: diuretic

	SUM_SBD	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	17	15.9	18.5	18.5
	1.00	22	20.6	23.9	42.4
	2.00	49	45.8	53.3	95.7
	3.00	4	3.7	4.3	100.0
	Total	92	86.0	100.0	
Missing	System	15	14.0		
Total		107	100.0		

Recall barriers score: diuretic

	RECA_BD	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	36	33.6	40.0	40.0
	1.00	34	31.8	37.8	77.8
	2.00	17	15.9	18.9	96.7
	3.00	3	2.8	3.3	100.0
	Total	90	84.1	100.0	
Missing	System	17	15.9		
Total		107	100.0		

Comprehension score: ace inhibitors

	SUM_CRA	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	13	12.1	15.7	15.7
	1.00	24	22.4	28.9	44.6
	2.00	23	21.5	27.7	72.3
	3.00	20	18.7	24.1	96.4
	4.00	3	2.8	3.6	100.0
	Total	83	77.6	100.0	
Missing	System	24	22.4		
Total		107	100.0		

Specific beliefs score: ace inhibitor

	SUM_SBA	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	7	6.5	8.5	8.5
	1.00	14	13.1	17.1	25.6
	2.00	17	15.9	20.7	46.3
	3.00	44	41.1	53.7	100.0
	Total	82	76.6	100.0	
Missing	System	25	23.4		
Total		107	100.0		

Recall barrier: ace inhibitor

	RECA_BA	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	20	18.7	24.7	24.7
	1.00	34	31.8	42.0	66.7
	2.00	23	21.5	28.4	95.1
	3.00	4	3.7	4.9	100.0
	Total	81	75.7	100.0	
Missing	System	26	24.3		
Total		107	100.0		

Percentage of missed doses: diuretic

	P_MISDUI	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	39	36.4	43.3	43.3
	3.20	1	.9	1.1	44.4
	3.60	1	.9	1.1	45.6
	3.85	1	.9	1.1	46.7
	5.50	1	.9	1.1	47.8
	8.40	2	1.9	2.2	50.0
	9.00	1	.9	1.1	51.1
	9.09	3	2.8	3.3	54.4
	9.10	2	1.9	2.2	56.7
	10.00	1	.9	1.1	57.8
	11.11	1	.9	1.1	58.9
	11.20	1	.9	1.1	60.0
	13.33	1	.9	1.1	61.1
	14.30	2	1.9	2.2	63.3
	15.91	1	.9	1.1	64.4
	16.67	2	1.9	2.2	66.7
	16.70	1	.9	1.1	67.8
	17.50	1	.9	1.1	68.9
	18.18	2	1.9	2.2	71.1
	20.84	1	.9	1.1	72.2
	23.08	1	.9	1.1	73.3
	23.10	1	.9	1.1	74.4
	25.00	2	1.9	2.2	76.7
	27.30	1	.9	1.1	77.8
	30.77	1	.9	1.1	78.9
	30.80	1	.9	1.1	80.0
	32.14	1	.9	1.1	81.1
	33.33	2	1.9	2.2	83.3
	37.50	2	1.9	2.2	85.6
	40.91	1	.9	1.1	86.7
	42.31	1	.9	1.1	87.8
	42.60	1	.9	1.1	88.9
	44.50	1	.9	1.1	90.0
	45.40	1	.9	1.1	91.1
	46.15	1	.9	1.1	92.2
	55.00	1	.9	1.1	93.3
	64.30	1	.9	1.1	94.4
	70.00	1	.9	1.1	95.6
	71.50	1	.9	1.1	96.7
	83.33	1	.9	1.1	97.8
	88.89	1	.9	1.1	98.9
	100.00	1	.9	1.1	100.0
	Total	90	84.1	100.0	
Missing	System	17	15.9		
Total		107	100.0		

Percentage of missed doses: ace inhibitor

	P_MISACE	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	40	37.4	50.0	50.0
	5.60	1	.9	1.3	51.3
	6.00	1	.9	1.3	52.5
	6.10	1	.9	1.3	53.8
	7.70	1	.9	1.3	55.0
	9.00	1	.9	1.3	56.3
	9.09	1	.9	1.3	57.5
	9.10	2	1.9	2.5	60.0
	10.00	1	.9	1.3	61.3
	12.50	1	.9	1.3	62.5
	13.33	1	.9	1.3	63.8
	15.00	1	.9	1.3	65.0
	15.15	1	.9	1.3	66.3
	15.38	1	.9	1.3	67.5
	15.40	1	.9	1.3	68.8
	16.67	1	.9	1.3	70.0
	16.70	1	.9	1.3	71.3
	20.00	1	.9	1.3	72.5
	20.24	1	.9	1.3	73.8
	21.21	1	.9	1.3	75.0
	23.08	2	1.9	2.5	77.5
	23.50	1	.9	1.3	78.8
	27.30	1	.9	1.3	80.0
	28.58	1	.9	1.3	81.3
	28.89	1	.9	1.3	82.5
	30.00	1	.9	1.3	83.8
	30.77	1	.9	1.3	85.0
	33.33	2	1.9	2.5	87.5
	34.10	1	.9	1.3	88.8
	34.62	1	.9	1.3	90.0
	36.36	1	.9	1.3	91.3
	38.50	1	.9	1.3	92.5
	38.90	1	.9	1.3	93.8
	40.80	1	.9	1.3	95.0
	62.00	1	.9	1.3	96.3
	66.60	1	.9	1.3	97.5
	100.00	2	1.9	2.5	100.0
	Total	80	74.8	100.0	
Missing	System	27	25.2		
Total		107	100.0		

Number of hospital readmissions at three months

	NO_HOS	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	33	30.8	44.0	44.0
	1.00	23	21.5	30.7	74.7
	2.00	13	12.1	17.3	92.0
	3.00	3	2.8	4.0	96.0
	4.00	3	2.8	4.0	100.0
	Total	75	70.1	100.0	
Missing	999.00	32	29.9		
Total		107	100.0		

Frequency distributions

Recall technique: mealtime

MEALTIME	Frequency	Percent	Valid Percent	Cumulative Percent
Valid .00 Never	4	3.7	3.7	3.7
1.00 Sometimes	5	4.7	4.7	8.4
2.00 Often	15	14.0	14.0	22.4
3.00 All the time	82	76.6	76.6	99.1
99.00 Missing data	1	.9	.9	100.0
Total	107	100.0	100.0	

Recall technique: exact time according to clock

ON_TIME	Frequency	Percent	Valid Percent	Cumulative Percent
Valid .00 Never	75	70.1	70.1	70.1
1.00 Sometimes	7	6.5	6.5	76.6
2.00 Often	9	8.4	8.4	85.0
3.00 All the time	15	14.0	14.0	99.1
99.00 Missing data	1	.9	.9	100.0
Total	107	100.0	100.0	

Recall technique: daily activities

ACTIVITI	Frequency	Percent	Valid Percent	Cumulative Percent
Valid .00 Never	98	91.6	91.6	91.6
1.00 Sometimes	2	1.9	1.9	93.5
2.00 Often	5	4.7	4.7	98.1
3.00 All the time	1	.9	.9	99.1
99.00 Missing data	1	.9	.9	100.0
Total	107	100.0	100.0	

Recall technique: vision cue

VISION_C	Frequency	Percent	Valid Percent	Cumulative Percent
Valid .00 Never	59	55.1	55.1	55.1
2.00 Often	31	29.0	29.0	84.1
3.00 All the time	14	13.1	13.1	97.2
99.00 Missing data	3	2.8	2.8	100.0
Total	107	100.0	100.0	

Recall technique: having medication box or organizer

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid .00 Never	73	68.2	68.2	68.2
1.00 Sometimes	3	2.8	2.8	71.0
2.00 Often	8	7.5	7.5	78.5
3.00 All the time	22	20.6	20.6	99.1
99.00 Missing data	1	.9	.9	100.0
Total	107	100.0	100.0	

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