CHAPTER 1

INTRODUCTION

The first chapter describes background and significance of research problem, objectives of the study and research questions. Definitions of the term used in the study are also given in order to clarify their meanings.

Background and Significance of Research Problem

Health care costs have increased significantly in most countries including Thailand where the costs increased by 9.9% per annum between 1986 and 1996 (Charoenparij et al., 2000). A rapidly rise health care costs over the period of 10 years in Thailand might be due to changes in the age distribution of the population, increasing expectations for health care and increasing sophistication of health care delivery (Wibulpolprasert, 2002). There was evidence to suggest that high health care costs in Thailand might be due to inefficiency of resource utilization in public hospitals (Charoenparij et al., 2000). Before the recent cost containment policy in 1997, fee-for-service was used as the reimbursement method for the health benefit program provided by the government. Within this payment system, there were no rates or ceilings for curative care. Beneficiaries would reimburse whatever public hospitals charged them. Moreover, there had been no systematic auditing program for claims made by hospitals. Inefficiency in this system encourages hospital spending for all care, although there is little hope for a successful outcome.

The continuous rising cost of health care has forced decision makers to introduce cost containment policies in Thailand. One of the first actions by the Thai government was

to implement the Diagnosis Related Group (DRG) payment in 1997 (Pannarunothai, 2002). Based on DRG payment, hospitals are paid a predetermined rate, based on a patient's diagnosis, length of stay (LOS) guidelines and regardless of the actual cost of caring for the patient. Then, in 2001, the government lunched the 30 baht health policy for improving an access to care especially among the low-income population. It has been expected that this policy would be able to change the health care delivery system in the right way so as to reduce the problem of overlap and inequity of healthcare schemes, and improve efficiency and equity of budgeting planning (APHEN, 2001). Shifts to new era of health care reform and new payment system require that hospitals lower their resource consumption and maintain the quality of their patient care.

Intensive care cost is one of the largest components of inpatient care, accounting for about 20-34% of inpatient costs and for over 1% of the gross domestic product in the United States and about 0.2% in Canada, as various studies have been shown (Halpern, Bettes, & Greenstein, 1994; Metnitz & Lenz, 1995; Noseworthy, Konopad, Shustack, Johnston, & Grace, 1996; Parviainen, Herranen, Holm, Uusaro, & Ruokonen, 2004). Although ICUs account for less than 10% of total hospital beds in the United States, they contribute to rising health care costs because the care of critically ill patients relies upon the use of skilled personnel and sophisticated equipments with the expenditure of large amounts of time and money (Bonvissuto, 1994). Utilization of ICUs has generated a great deal of concern in several countries. Much of the attention was focused on resource consumption and the costs incurred as well as on the evaluation of the technology used and its impact on promoting health. In Thailand, studies regarding the economics and economic evaluation of critical care medicine are very few, despite the fact that the number of beds in ICUs is not adequate for the fluctuating demand and ICU beds constitute about 1.4% of total hospital

beds. The hospital sector in Thailand absorbed 7.6 % of national budget for fiscal year 2004 (MOPH, 2004) and critical care seemed to account for a large share of inpatient expenditure (Daranond, 1993). Therefore, studies concerning unit cost analysis, especially the cost of care in ICU, should be carried out to provide sound data for policy makers and health professionals to make more rational and clinical cost decisions.

The information on factors affecting the costs of intensive care and ICU lengths of stay is beneficial regarding cost reduction purpose. It provides valuable knowledge to nurses in understanding and developing of effective nursing care for preventing longer stay in ICU thereby reducing costs of intensive care. Previous studies demonstrated that patient age among adult patients was positively associated with length of ICU stay (Bunburaphong, Riyagoon, Ramdit, Werawatganon, & Techapichetvanich, 2001; Ruiz-Bailen et al., 2002). Although the reasons for correlation between patient age and length of ICU stay were not presented, it was well recognized that older patients required more time for functional recovery than younger patients (Brosseau, Philippe, Potvin, & Boulanger, 1996). In addition, increasing age was associated with increased risk of acquiring a nosocomial infection (Emori et al., 1991; Saviteer, Samsa, & Rutala, 1988; Smith, 1989). The consequence of ICU acquired nosocomial infection appeared to influence older patients to have prolonged stays in ICUs. Patient age also affected the costs of intensive care. A number of studies found that the costs of ICU care for older patients was lower than those for younger ones (Castillo-Lorente, Rivera-Fernandez, & Vazquez-Mata, 1997; Chelluri et al., 2003; Ely, Evans, & Haponik, 1999). Researchers hypothesized that this might be due to the fact that the patients and their families prefer less aggressive care and fewer treatments (Chelluri et al., 2003; Ely et al., 1999).

Severity of illness is another patient characteristic that seems to influence resource utilization in ICUs. Patients with lower severity of illness tend to spend a shorter time in the ICU. Conversely, patients with extremely high severities of illness are likely to demonstrate either rapid improvement with therapy or die early in the ICU stay (Arabi, Venkatesh, Haddad, Al Shimemeri, & Al Malik, 2002; Marik, & Hedman, 2000; Woods, MacKirdy, Livingston, Norrie, & Howie, 2000). Severity of illness seems to also affect the costs of intensive care. Higher severity scores would dictate high cost, especially at the first 24 hours of ICU admission (Edbrooke, Stevens, Hibbert, Mann, & Wilson, 1997; Jacobs, Edbrooke, Hibbert, Fassbender, & Corcoran, 2001; Noseworthy et al., 1996).

Malnutrition is a serious problem for critically ill patients. Giner, Laviano, Meguid and Gleason (1996) reported that 44 percent of patients in ICU were malnourished. More interestingly, Huang, Yen, Cheng, Jih and Kan (2000) studied patients admitted to the ICU of Taichung Veteran General Hospital in Taiwan and found that more than 90 percent of the critically ill patients with mechanical ventilation support were malnourished on the first day of patient admission. Malnutrition interferes with organs and systems of the human body and causes patients to present with impaired immune function, digestion and absorption (Bower, 1990; Christman & McCain, 1993; Rochester & Esau, 1984). These result in higher percentage of complications, longer lengths of stay and higher hospital charges than those who did not (Braunschweig, Gomez, & Sheean, 2000; Chima, Barco, Dewitt, Maeda, Teran, & Mullen, 1997; Epstein, Read, & Hoefer, 1987; Giner et al., 1996; Ritsri, 2002). Thus, if physicians, nurses and other staff can identify the nutrition status of patients and provide appropriate nutrition intervention early on, ICU length of stay and costs would be decreased. In addition, adequate nutrient intake during hospitalization in the ICU leads to fasten recover and discharge to home.

An additional factor that would affect the prolonged length of ICU stay and high costs of intensive care may be the management of treatments and care. Mortality rate, length of ICU stay and cost of intensive care increased if patients were admitted to an ICU on a weekend and out-of-office hour (Barnett, Kaboli, Sirio, & Rosenthal, 2002; Sheng, Ellrodt, Agocs, Tankel, & Weingarten, 1993; Uusaro, Kari, & Ruokonen, 2003). The first few hours after admission to a hospital are crucial because the initial diagnoses and treatment plans are formulated during these times. Limited access to laboratory or diagnostic tools during the weekend days and non office hours may lead physicians to delay diagnosis and treatments. Furthermore, personnel working in hospital during these times often have less seniority and experience than those who work during weekdays (Mckee & Black, 1992; Thorpe, 1990). Reduction in these resources may be vulnerable to adverse effects, increased length of ICU stay and costs.

In an era of dwindling reimbursement and rising health care costs, hospitals have been compelled to restructure the work environment in an effort to deliver care at a lower cost (Heinz, 2004). As a result of restructuring and increasing attention to costs, hospitals opted to decrease the number of full time equivalent nursing positions especially those of registered nurses (RNs) and replace professional nurses with the use of unlicensed assistive personnel (Behner, Fogg, Fournier, Frankenbach, & Robertson, 1990). However, the growing body of evidence linking hospital workforces to patient outcomes suggests that the cost of increasing the number of professional nurses would not be insignificant. The additional costs of having more nurses should be offset to some extent by the monetary and non-monetary benefits of reducing healthcare complications, while in turn decreasing length of stay and costs of patient care (Amaravadi, Dimick, Pronovost & Lipsett, 2000; Behner et al., 1990; Bloom, Alexander, & Nuchols, 1997; Cho, Ketefian, Barkauskas, & Smith, 2003;

McGrills, Doran, & Pink, 2004). This is particularly true in the realm of intensive care. RN availability and nursing skill may affect length of ICU stay. In studies that analyzed the relationship between nurse staffing and length of ICU stay, increasing the numbers of RNs and provision of more registered nurse hours per patient day in ICU were associated with a shorter length of ICU stay (Amaravadi et al., 2000; Dimick, Swoboda, Pronovost, Lipsett, 2001; Lassnigg, Heismayr, Bauer, & Haisjackl, 2002; Pronovost et al., 1999).

Although several previous studies had shown the effect of patient characteristics and the management of treatments on patient costs and length of ICU stays, none was conducted in the context of hospitals in Thailand. Instead, most of these studies had been conducted in hospitals which differed from those in Thailand in terms of the competency of nursing staff, technology and diagnostic equipment. It is known that these differences may affect patient outcomes besides patient characteristics and the management of care (Kaboli, Barnett, & Rosenthal, 2001). Consequently, studies in the context of hospitals in Thailand may yield different results. Furthermore, number of studies seeking to measure the cost and length of stay in adult ICU in Thailand are limited. The majority of studies focused on the unit cost of incurring particular diseases such as the cost of managing hypertension, stroke, and other diseases. Only one study reported the length of stay in surgical ICUs (Bunburaphong et al., 2001). Other two studies determined unit cost of intensive care in general hospitals (Cook, 2000; Daranond, 1993). In theory, the best approach for economic studies in ICU patients would be analytic and should be aimed at deploying the total patient's cost into its various components e.g., therapeutic intervention, diagnostic procedures, consumption of medical devices, lab test, nursing care, etc. However, a sufficient number of these analytic studies has not been published yet. Therefore, the present study was undertaken to determine costs of intensive care and length of ICU stay as well as linkages between patient characteristics,

types of ICU, day and time of patient admission, nurse staffing, patient cost and length of ICU stay in a teaching hospital of Thailand.

This study results will be helpful for nursing practices and improving the quality of care. Knowledge of identification of patients with prolonged ICU stay and relatively higher costs may stimulate an increased level of nurse's awareness of special efforts to care for those patients. The results will also be useful for nurse managers to allocate limited resources for optimizing patient outcomes and maximizing the benefits of their investment as well as providing data for administrators to develop hospital policy regarding human and facility allocation. In terms of contribution to nursing research, the results from the study will provide baseline data for further studies in the area of hospital cost analysis.

Objectives of the Study

The general objective of the study was to study patient costs and length of stay in adult ICUs. The specific objectives of the study were:

1) To assess health personnel cost per patient day and medical care cost per patient day in adult ICUs.
2) To assess nursing personnel cost per patient day in adult ICUs.
3) To assess length of stay in adult ICUs.
4) To explain the relationship among patient characteristics i.e., patient age, severity of illness and nutrition status, types of ICU, day and time of patient admission, nurse staffing, nursing personnel cost per patient day, medical care cost per patient day and length of stay in adult ICUs.

Research Questions

1) What are health personnel cost per patient day and medical care cost per patient day in adult ICUs?
2) What is nursing personnel cost per patient day in adult ICUs?
3) What is length of stay in adult ICUs?
4) How much variance of nursing personnel cost per patient day can be explained by patient characteristics i.e., patient age, severity of illness and nutrition status, types of ICU, day and time of patient admission, and nurse staffing in adult ICUs?
5) How much variance of medical care cost per patient day can be explained by patient characteristics i.e., patient age, severity of illness and nutrition status, types of ICU, day and time of patient admission, and nurse staffing in adult ICUs?
6) How much variance of length of stay in adult ICUs can be explained by patient characteristics i.e., patient age, severity of illness and nutrition status, types of ICU, day and time of patient admission, and nurse staffing in adult ICUs?

Definition of Terms

The following key terms are defined:

Patient cost is the average value of resource consumption spent directly on a patient per day. Cost categories consisted of two major kinds of costs: health personnel costs and medical care costs. Patient cost per patient day was determined by the summation of health personnel cost per patient day and medical care costs per patient day.

Health personnel cost per patient day refers to a monetary value attached to hours of care delivered to an individual patient for one day. Health personnel costs per patient day were calculated by multiplying the daily total care hours providing to individual patient with ICU personnel's hourly money allowance. In the current study personnel who provide

nursing care in an ICU consisted of RNs, practical nurses (PNs), helpers (HPs), intensivists and residents. Daily hours of care by RNs were measured by using a research instrument namely therapeutic intervention scoring system-28. Daily hours of care by other nursing staff (PNs and HPs) as well as medical staff (intensivists and residents) were determined by using the average ratio of other nursing staff to patients and the average ratio of medical staff to patients respectively. The sum of salaries, overtime and fringe benefits was as a proxy for ICU personnel compensation. Hourly ICU personnel compensation was computed by dividing the sum of salaries, overtime and fringe benefits by working hours.

Medical care cost per patient day refers to a monetary value attached to medical care which is provided to an individual patient for one day. The medical care includes radiological investigation, laboratory, life- supporting therapies, nutrition, blood, drugs and medical supply usage. Calculation of medical care cost per day in the present study required two steps as follows. First, the average charges of medical care for one day were computed by multiplying usage of each care activity with hospital price, totaling these and then dividing this total by length of ICU stay. Lastly, cost of an individual patient for one day was computed by multiplying the average charge for one day with the cost to charge index i.e., expressed as the ratio between total hospital operating cost and hospital revenue.

Nursing personnel cost per patient day is defined as a monetary value attached to nursing care delivered to an individual patient for one day. A method for assigning nursing personnel costs includes three steps: (a) calculation of nursing personnel hourly money allowance, (b) calculation of nursing care hours consumed by an individual critically ill patient, and (c) the multiplying the nursing personnel hourly money allowance (from step a) with the average nursing care hours delivered to an individual patient for one day (step b).

Length of stay in adult ICUs is defined as the number of day spent in an intensive care unit from admission to discharge. It was calculated by subtracting day of discharge from day of patient admission.

Factors are defined as structural elements that contribute to change in patient costs and length of stay in adult ICUs. They include patient characteristics, types of ICU, day and time of patient admission and nurse staffing in adult ICUs.

Patient characteristics included patient age, severity of illness and nutrition status. Nutrition status is defined as the levels of serum albumin and lymphocyte counts in the human body. It was performed within 48 hours of admission. Severity of illness is defined as the degree of change on health status as a result of illness or injury. This was measured by Simplified Acute Physiology Score II (SAPSII) instrument and performed in the first 24 hours of admission. Patient age was measured as years in the first 24 hours of admission to an ICU.

Types of ICU are intensive care units where a patient is admitted to. This may be either medical or surgical ICUs. Medical ICU is an intensive care unit of the selected hospital where it is used to provide intensive care for medical patients. Surgical ICU is an intensive care unit of the selected hospital where it is used to provide intensive care for surgical patients.

Day and time of patient admission is the day and time that patients are admitted to the ICUs. Days of admission were divided into weekends and weekdays. A weekday is any day except Saturday and Sunday. A weekend day is a day either Saturday or Sunday. Times of admission were divided into office hour and non-office hour. Office hours are defined as the period from 8.00 a.m. to 4.00 p.m. All other time is considered to be non-office hour.

Nurse staffing refers to the number and mix of nurses that are necessary to meet workload demands for care in an ICU. It was determined by the average ratio of RN to patient on an 8 hour nursing shift and the average ratio of RNs to other nursing staff (practical nurses and helpers) on an 8 hour nursing shift.