CHAPTER 3

METHODOLOGY

This chapter describes parent study, research design, population and sample, instrumentation, protection of human subjects, risk adjustment, and data analysis.

Parent Study

The main purpose of The 2007 Thai Nurse Survey Data (Aungsuroch & Wanant, 2007) was to investigate the nurses' work environment and gather general data of registered nurses in public hospitals in Thailand. The questionnaires was translated and adapted from the Pennsylvania Nurse Survey developed by Linda H. Aiken, University of Pennsylvania. The 23-page survey included information about employment characteristics of nurses (12 items). The MBI-HSS(22 items) contained statements of job-related feelings. Job characteristics part (19 items) asked about their job as an RN and nurses' views about care in their nursing unit and in their hospital, and last shift (14 items) asked about nursing activities of nurses. RN were asked about demographic questions (7 items). Also, this survey included the Revised Nursing Work Index (NWI-R) (Aiken & Patrician, 2000), a 49-item, psychometrically established inventory used to assess nurses' perceptions of specific organizational characteristics in their hospitals. The translation of Pennsylvania Nurse Survey, back translation, pilot study, and data collection were conducted at hospitals under the

jurisdiction of the Ministry of Public Health including regional and general hospitals. The proportional stratified random sampling of general and regional hospitals from every public health region in Thailand was undertaken as described in Appendix A. There were 13 out of 25 regional hospitals and 26 out of 69 general hospitals participating in this study. Questionnaires with an accompanying cover letter explaining the purpose of the survey, its voluntary nature, and the strict protection of anonymity were distributed to all nurses within participating hospitals. The final response rate of nurse population was 92%, for a total of 8,222 nurses.

Research Design

A predictive correlational design with secondary data analysis was employed in this study to investigate the predictive ability of the nurses' work environment and nurse staffing levels for nurse and patient outcomes in public hospitals in Thailand. Moreover, levels of nurses' work environment, nurse staffing levels, nurse outcomes including job satisfaction of nurses and nurse burnout, and patient outcome including quality of nursing care are determined. The 2007 Thai Nurse Survey Dataset was used because it contains the latest information on variables important to addressing the questions in this study, and the data set includes a large number of respondents which involved registered nurses across Thai public hospitals that can reveal the huge picture of the Thai nurse situation.

Population and Sample

There are two populations of interest: 1) general and regional hospitals and 2) nurses. Sample of this study included

Hospitals

Hospital sample in this study included 13 general and 26 regional hospitals in the 2007 Thai Nurse Dataset. Hospitals in the 2007 Thai Nurse dataset were sampled by multi-stage sampling from 12 public health regions in Thailand. Then, the proportion sampling by 1 out of 3 was used to sampling hospital samples as described in Appendix A.

Nurses

The 2007 Thai Nurse Dataset included responses from 8,222 nurses which was sampled by simple sampling from hospital samples. However, nurse sample in this study included 5,247 nurses who provided direct care for patients and reported a valid number of patients cared for on their last shift. They were selected because of their close proximity to patients and their work brings them into contact with managerial policies and practices, physicians and other clinical care providers, and most of the hospital support services.

Statistical Power

The analyses in this study were performed on a sample of 5,247 nurses and 39 hospitals. The examination between the nurses' work environment and nurse staffing levels and job satisfaction of nurses, nurse burnout, and quality of nursing care used multilevel regression models at hospital levels. This study was multilevel research which the general concept was that individuals interact with their social contexts, and therefore the individual persons were influenced by the social groups or contexts to which they belong, and the properties of those groups were in turn influenced by the individuals who make up that group (Maas & Hox, 2005). In this study, nurses response in each hospital were aggregated to create a hospital-level score. Maas and Hox (2005) presented sufficient sample sizes for multi modeling that in multilevel regression model involving at least a minimum of 30 groups and 50 individuals per group, the simulated conditions such as the estimates of the regression coeffients, the variance components, and the standard errors were unbiased and accurate. The models in this study involved 39 hospitals within average of 500 nurses per hospitals; therefore, they fitted with the mentioned threshold.

Instrumentation

The Nurses' Work Environment

In the 2007 Thai Nurse Survey, nurses' work environment was measured by the NWI-R (Aiken & Patrician, 2000) which nurses were asked to indicate whether the organizational features were presented in current job. In this study, nurses' work environment was assessed by the PES-NWI (Lake, 2002), an instrument generated

from the NWI-R. In present study, the PES-NWI contain 29 items with five subscales; nurse participation subscale, nursing foundation subscale, nurse manager ability subscale, staffing and resource adequacy subscale, and N-MD relation subscale. Nurse participation subscale has nine items relating to the degree to which nurses perceive being valued within the hospital context such as being involved in internal governance, policy decisions, and committees. Nursing foundation subscale has 9 items measuring the degree to which nurses perceive a foundation for a high standard of patient care based on a nursing model. A formal quality assurance program is established, continuous learning opportunities are available, and new staff is well oriented. Nurse manager ability subscale has four items assessing the leadership and management skill of the administrative person directly supporting nursing. Staffing and resource adequacy subscale has four items assessing enough staff and registered nurses to provide quality patient care, adequate support services, and the time and opportunity to discuss patients care problems with other nurses. N-MD relation subscale has 3 items assessing a positive and collaborative working relationship. The potential score ranged on a four point Likert-scale of scale of 1 (strongly disagree), 2 (somewhat disagree), 3 (somewhat agree), 4 (strongly agree). Higher scores indicated more agreement that the subscale items were present in the current job. Nurse responses in each item were aggregated for each subscale to create a hospital-level mean of the subscales (Verran, Gerber, & Milton, 1995).

To analyze nurses' work environment in logistic models, only four nurses' work environment subscales including nurse participation in hospital affairs; nursing foundations for quality of care; nurse manager ability, leadership, and support for nurses; and collegial nurse-physician relations were calculated as a categorical

variable. The resource adequacy subscale was excluded because a direct measure of nurse staffing which was highly correlated with the resource adequacy scale was used in analytic modeling following the procedure outline in Aiken et al. (2008). A categorical variable of the 4 remain subscales was created using the method of Aiken et al. (2008); hospital above the median on all 4 subscales, on 1, 2, or 3 subscales, and on none of the subscales were classified as having "favorable" indicating the most supportive environment, "mixed" indicating moderate supportive environment, and "poor" indicating the least supportive environment, respectively.

Reliability of the PES-NWI questionnaires including nurse participation subscale was 0.64, nursing foundation subscale was 0.67, nurse manager ability subscale was 0.81, staffing and resource adequacy was 0.91 and N-MD relation subscale was 0.72 (Lake, 2002). Its discriminant validity had been shown in its ability to detect differences in the nurse practice environments of hospitals (Lake & Friese, 2006). With regards to the reliability based on 2007 Thai Nurse Dataset, the Cronbach's alpha coefficient of the PES-NWI including nurse participation subscale was 0.87, nursing foundation subscale was 0.90, nurse manager ability subscale was 0.87, staffing and resource adequacy was 0.91 and N-MD relation subscale was 0.85.

Nurse Staffing Levels

Nurse staffing levels were measured based on nurse reports of the number of patients assigned. Nurses were asked in the 2007 Thai Nurse Survey to indicate how many patients were assigned on their last shift. Nurse responses were calculated as the mean patient load across all nurses in a hospital who reported having responsibility for at least one but less than twenty one patients. The range of nurse

staffing levels was estimated based on nurse experts' opinion and the possible number of patients assigned for nurses in general and regional hospitals in Thailand. A mean number of patients care was aggregated to hospital level. Analyses of nurse staffing levels were conducted with a continuous measure. The predictive validity of using nurse reports in this manner to assess staffing levels has been shown previously (Aiken, Clarke, Slone, Sochaski, et al., 2002).

Job Satisfaction

Job satisfaction of nurses was measured by a single item which asks nurses' perception about their satisfaction with present job. Nurses were asked in the 2007 Thai Nurse Survey to indicate on the whole to what degree they were satisfied with their present job. The response categories were Likert-scale, ranging from 1 (very satisfied) to 4 (very dissatisfied). Higher scores indicated that nurses were dissatisfied with their current job. Lower scores indicated that nurses were satisfied with their current job. Reliability of published tests for single-item of job satisfaction of nurses was in the range of .70 (Wanous et al., 1997).

Burnout

In the 2007 Thai Nurse Survey , nurse burnout was measured using the Maslach Burnout Inventory-Human Services Survey (MBI-HSS), a standardized instrument with published norms for medical personnel that has been used previously in international research (Aiken et al., 2001; Maslach & Jackson, 1986). The MBI-HSS has 22-items and three subscales: emotional exhaustion (EE), depersonalization

(DP), and personal accomplishment (PA). The EE subscale contains 9 items assessing feelings of being emotionally exhausted because of the work burden. The DP subscale contains 5 items measuring a detached and inhuman response to the clients. The PA subscale contains 8 items assessing feelings of beliefs of competence and successful achievement in work. The frequency with which nurse experiences feelings related to each subscale is rated on a scale ranging from 0 to 6 from never having those feelings to having those feelings a few times a week.

Maslach, et al. (1996) described an approach to analyses of the MBI-HSS scores that is a high degree of burnout is reflected in high score on the EE and DP subscales and in low score on the PA subscale. An average degree of burnout is reflected in average score on the three subscales. A low degree of burnout is reflected in low score on the EE and the DP subscales and in high score on the PA subscale. In studies among health professionals to develop and test the MBI-HSS suggested standardized norms for cut-off levels for each of the three MBI subscales; mean scores equal to or higher than 27 on the EE subscale, equal to or higher than 10 on the DP subscale and equal to or lower than 33 on the PA subscale, demonstrate evidence of high burnout. Mean score between 19 and 26 on the EE subscale, 6 and 9 on the DP subscale, and 34 to 39 on the PA subscale demonstrate evidence of average burnout. Mean score equal to or lower than 18 on the EE subscale, equal to or lower than 5 on the DP subscale, and equal to or higher than 40 on the PA subscale demonstrate evidence of low burnout.

The reliability coefficients were 0.89 for the EE subscale, 0.74 for the PA subscale, and 0.77 for the DP subscale (Maslach & Jackson, 1981b). Based on 2007

Thai Nurse Dataset, the Cronbach's alpha coefficient of the EE subscale was 0.87, the PA subscale was 0.77, and the DP subscale was 0.74.

Quality of Nursing Care

Quality of nursing care was measured by single item which ask nurses' perception about the quality of nursing care. Nurses were asked in the 2007 Thai Nurse Survey to indicate in general how they describe the quality of nursing care delivered to patients at last shift. The response categories were Likert-scale ranging from 1 (excellent) to 4 (poor) with higher scores indicating poorer levels of quality. The Cronbach's coefficients for previous quality of nursing care were in the range of .92-94 (Pearson et al., 2000).

Demographic Data

Demographic characteristics were examined including age, years as RN, years' as RN in the current unit, gender, the highest degree, having the dependent, employment status, hospitals, and public health regions.

Protection of Human Subjects

This research proposal was approved by the Graduate School at Chiang Mai University and the Research Ethical Committee of the Faculty of Nursing, Chiang Mai University. The use of the 2007 Thai Nurse Data was obtained by permission from the principal investigator for the parent study before the study began. After receiving the 2007 Thai Nurse Dataset file, the dataset was maintained on a

restricted access hard drive. All analyses were conducted and stored on a password-protected computer. The dataset included study identification codes; since participants were not identifiable by name. Nurses and their hospitals cannot be linked in the datasets. Hospitals were identifiable by code; hospital name were not included in the analytic dataset. Only aggregate characteristics of hospital were used in the analysis and dissemination of results.

Risk Adjustment

Kane (1997) stated that clinical outcomes are the result of several factors which can be classified as risk factors (baseline status, clinical status, and demographic/ psychosocial characteristics) and treatment characteristics. The goal of outcome analysis is to isolate the relationship between the outcomes of interest and the treatment provided by controlling for the effects of other relevant material which referred to as risk adjustment. Risk adjustment is a statistical process used to identify and adjust for variation in patient outcomes that stem from difference in patient characteristics (or risk factors) across health care organizations. Comparing outcomes across organizations without appropriate risk adjustment can be misleading. By adjusting for the risks associated with outcomes of interest, risk adjustment facilities a more fair and accurate inter-organizational comparison (JCAHO, n.d.).

The objectives of this study were to investigate nurse and patient outcomes in multi-level of hospitals. This study was assessed both nurse and patient outcomes from perception of nurses, nurse characteristics were assumed as the risk factors. Prior evidences revealed that age and years of experience in current hospital position influenced outcomes as described in Appendix B. Therefore, the multivariate

regression models with adjusting for age and years of experience in current hospital position were investigated in this study. Those factors were included in model to facilitate a more fair and accurate inter-organization comparison.

Data Analysis

Before the 2007 Thai Nurse Dataset was analyzed, many issues such as accuracy of data file, missing data, outliers, and multicollinearity were carefully considered as described in Appendix C. According to data analysis, the preliminary activities indicated descriptive information on demographic data. Categorical variables were examined by frequency, percentage, and range. Mean and standard deviation were used to assess distribution and central tendency of continuous variables. Chi-square tests were used for testing relationship between categories of nurses' work environment and nurse and patient outcomes and between nurse staffing levels and nurse and patient outcomes as described on Appendix D. STATA version 10 were used to analyze the data. Statistical significance level was set at $< .05$. The next sections discuss specific analytic procedures to address the study questions.

Research question 1. What are the levels of the nurses' work environment, nurse staffing levels, job satisfaction of nurses, nurse burnout, and quality of nursing care in public hospitals in Thailand?

The nurses' work environment subscale scores were calculated for each hospital, taking the mean values of all items comprising the subscales for all nurses in each hospital, and statewide hospital-level mean were then computed for each subscale. Mean and standard deviation of study hospitals were calculated. In terms of

nurse staffing levels, nurse responses in each hospital were aggregated the mean of patients assigned across all nurses in study hospitals for hospital-level mean score.

According to outcomes, the frequency and percentage of job satisfaction of study nurses indicating very dissatisfied, a little dissatisfied, moderately satisfied, and very satisfied were calculated. The frequency and percentage of categorization of burnout score of burnout subscales were calculated. The mean, standard deviation, and categories of nurse burnout subscales were calculated. The frequency and percentage of quality of nursing care indicating excellent, good, fair, and poor were calculated.

Research question 2. To what extent the variability in the job satisfaction of nurses in Thai public hospitals can be explained by nurses' work environment and nurse staffing levels?

Before testing research questions 2-4, basic assumptions were tested of logistic regression, and recoding variables was analyzed as follows:

Testing basic assumption: the basic assumption of logistic regression was considered. Worster, Fan, and Ismaila (2007) stated that the predictor variables in logistic regression do not need to be linearly related, normally distributed, or have equal variance within each group. The outcome variable must be categorical (usually dichotomous, i.e., with 2 possible outcomes). The measure of association between the outcome of interest and the predictor variables was represented by odds ratio (OR). Comparisons of ORs between predictor variables help determine the factors of greatest importance, while their confidence intervals indicated their statistical significance. Therefore, the study variables had met the basic assumption.

Recoding variables: independent variables were converted into a set of dichotomous variables coded with 1 and 0. Job satisfaction of nurses score rated “very dissatisfied” and “a little dissatisfied” were examined as job dissatisfaction and “moderately satisfied” and “very satisfied” were examined as job satisfaction. For each of the three MBI subscales mean scores equal to or higher than 27 on EE, equal to or higher than 10 on DP, and equal to or lower than 33 on PA, demonstrated evidence of high emotional exhaustion, high depersonalization, and low personal accomplishment, respectively. Scores less than mentioned above demonstrated evidence of low emotional exhaustion, low depersonalization, and high personal accomplishment, respectively. The quality of nursing care rated “poor” and “fair” were considered as fair/poor and “excellent” and “good” were considered as excellent/good. The study variables were aggregated to be hospital level.

The coefficients from the model in research question 2-4 were exponentiated to produce the odds ratios, which were more readily interpretable and routinely reported in hospital outcomes research. These logistic regression models were estimated in STATA 10.0, with the “robust, cluster” option specified. This specification produced Huber-White sandwich estimators to adjust standard errors and account for clustering of observations in hospitals (Roger, 1993; White, 1984 as cited in Friese, 2005).

This question was examined by two sets of logistic regression for predicting job satisfaction. First, the univariate logistic regression was used to study the association between nurses’ work environment categories and job satisfaction and between nurse staffing levels and job satisfaction. Thus, equation was modified as follows:

$$\text{logit}(y) = a + bx \text{ ; where} \quad [1]$$

logit(y) was the natural logarithm of the odds of experiencing job satisfaction; a was a constant term; x was the nurses' work environment categories or nurse staffing levels; and b was vector of coefficients.

Second, the multivariate logistic regression analyses account for age and years on unit, the nurses' work environment categories, and nurse staffing levels simultaneously. The equation of such models was as follows:

$$\text{logit}(y) = a + bx + ew + fv \text{; where} \quad [2]$$

logit(y) was the natural logarithm of the odds of experiencing job satisfaction; a was a constant term; x was the vector of variables describing control variables; w was the vector of variables describing the nurses' work environment categories; v was the vector of variables describing nurse staffing levels; and b, e, and f were vector of coefficients.

Then, equations 1 and 2 were used to model the univariate and multivariate regression analysis of nurses' work environment subscales and nurse staffing levels on job satisfaction.

Research question 3. To what extent can the variability in nurse burnout subscales in Thai public hospitals be explained by nurses' work environment and nurse staffing levels?

This question was examined by two sets of logistic regression for predicting high emotional exhaustion. First, the univariate logistic regression was used to study the association between nurses' work environment categories and high emotional exhaustion and between nurse staffing levels and high emotional exhaustion. Thus, equation was modified as follows:

$$\text{logit}(y) = a + bx \text{ ; where} \quad [1]$$

logit(y) was the natural logarithm of the odds of experiencing high emotional exhaustion; a was a constant term; x was the nurses' work environment categories or nurse staffing levels; and b was vector of coefficients.

Second, the multivariate logistic regression analyses account for age and years on unit, the nurses' work environment categories, and nurse staffing levels simultaneously. The equation of such models was as follows:

$$\text{logit}(y) = a + bx + ew + fv \text{; where} \quad [2]$$

logit(y) was the natural logarithm of the odds of experiencing high emotional exhaustion; a was a constant term; x was the vector of variables describing control variables; w was the vector of variables describing the nurses' work environment categories; v was the vector of variables describing nurse staffing levels; and b, e, and f were vector of coefficients.

Then equation 1 and 2 were used to model the univariate and multivariate logistic regression analysis of the nurses' work environment categories and nurse staffing levels on high depersonalization and low personal accomplishment.

Additionally, equation 1 and 2 were used to model the univariate and multivariate logistic regression analysis of nurses' work environment subscales and nurse staffing levels on high depersonalization, and low personal accomplishment.

Research question 4. To what extent can the variability in quality of nursing care in Thai public hospitals be explained by nurses' work environment and nurse staffing levels?

This question was examined by two sets of logistic regression for predicting quality of nursing care as fair/poor. First, the univariate logistic regression

was used to study the association between nurses' work environment categories and quality of nursing care as fair/poor and between nurse staffing levels and quality of nursing care as fair/poor. Thus, equation was modified as follows:

$$\text{logit}(y) = a + bx \text{ ; where} \quad [1]$$

logit(y) was the natural logarithm of the odds of experiencing quality of nursing care as fair/poor; a was a constant term; x was the nurses' work environment categories or nurse staffing levels; and b was vector of coefficients.

Second, the multivariate logistic regression analyses account for age and years on unit, the nurses' work environment categories, and nurse staffing levels simultaneously. The equation of such models was as follows:

$$\text{logit}(y) = a + bx + ew + fv; \text{ where} \quad [2]$$

logit(y) was the natural logarithm of the odds of experiencing quality of nursing care as fair/poor; a was a constant term; x was the vector of variables describing control variables; w was the vector of variables describing the nurses' work environment categories; v was the vector of variables describing nurse staffing levels; and b, e, and f were vector of coefficients.

Then equations 1 and 2 were used to model the univariate and multivariate regression analysis of nurses' work environment subscales and nurse staffing levels on quality of nursing care as fair/poor.