CHAPTER 3

METHODOLOGY

This chapter describes the methodology used in the present study which was formulated to meet the study purpose. The descriptions comprise the research design, population and samples, setting, instruments, protection of human rights, and data collection. Finally, the data analysis is presented.

Research Design

A cross-sectional, descriptive correlational design was used to examine the hypothesized causal model of well-being among caregivers of persons with spinal cord injury.

Population and Sample

The target population of this study were caregivers and persons with spinal cord injury who had been admitted to one of five tertiary care hospitals in Thailand namely 1) Maharaj Nakorn Chiang Mai Hospital, Faculty of Medicine, Chiang Mai University, 2) Nakornping Hospital, 3) Lampang Hospital, 4) Srinagarind Hospital, Faculty of Medicine Khon Kaen University and, 5) Khon Kaen Hospital. The sample selection was done using a purposive sampling method.

Inclusion Criteria for Caregivers

1. Age between 18 - 60 years,
2. legally or biologically related to patients, such as a spouse, child, parent, sibling, niece, nephew or cousin,
3. be the primary caregiver for persons with a spinal cord injury at home and have provided care for at least three weeks (Gasemgitvatana, 1993),
4. caring for a patient without payment,
5. able to understand and communicate with others in Thai language,
6. be willing to participate in this study.

Inclusion Criteria for Persons With Spinal Cord Injury

1. Age between 18 - 60 years,
2. be diagnosed by physicians as a person with a spinal cord injury at the $T_{5\text{-up}}$ level.

Sample Size Determination

In the multivariate method, the sample size played an important role on the estimation and interpretation of the path analysis results. The estimated sample size in this study was based on Kline (2005). Kline (2005) suggested that the path model with 20 parameters should have a minimum sample size of 200 cases. In this study the hypothesized model contained 20 free parameters; therefore, the minimum sample size was set to be 200 subjects. The participants in this study were recruited at the

same time from five hospitals (Maharaj Nakorn Chiang Mai Hospital, Nakornping Hospital, Lampang Hospital, Srinagarind Hospital and Khon Kaen Hospital) until reaching 200 cases, at which time the recruitment was finished. However, the number of those participants from each hospital was not specified. Therefore, the sample recruitment depended on the chance of each patient who came to utilize the service at in-patients or out-patients department from those five hospitals. In summary, a sample of 205 pairs of caregivers and persons with spinal cord injury was recruited for this study.

Setting

This study was conducted at community settings in Thailand. The recruitment in this study was conducted in five hospitals in Chiang Mai, Lampang and Khon Kaen provinces, namely, the Maharaj Nakorn Chiang Mai Hospital, Nakornping Hospital, Lampang Hospital, Srinagarind Hospital and Khon Kaen Hospital. All of these hospitals are tertiary care hospitals, some of the spinal cord injury patients were referred from community hospitals which had less potential to give proper care and treatment. Spinal cord injury patients were admitted in these hospitals and had an average of four to six weeks duration of stay. Wards provided special care and rehabilitation for patients with spinal cord injury. Spinal cord injury patients received the treatment plan cooperatively from an interdisciplinary team including an orthopedist who was a spine specialist, a rehabilitation physician, nurses, physiotherapist, occupational therapist, nutritionist, and a social worker. Moreover, some patients got the treatment from a psychiatrist according to orthopedist's request. The caregivers

received training to care for their patients at home and also received a manual explaining the care of spinal cord injury patients. In addition, these hospitals gave caregivers a telephone number of the ward so that the caregivers could consult nurses at any time. The discharge process of the patients with spinal cord injury in these 5 places is similar. Follow-up appointments were set up after discharge between one week and one year. Only Maharaj Nakorn Chiang Mai Hospital and Srinagarind Hospital have a follow-up appointment every 1-2 years. The hospital giving the treatment for the patient out of its service areas have to refer the treatment data to the original hospital where that patient was treated. At Maharaj Nakorn Chiang Mai Hospital, Khon Kaen Hospital, and Lampang Hospital, a nurse who works at the ward and has experience of giving care for that patient will make a phone call to follow up the case after discharge between 1 week and 6 months. For home visiting, Maharaj Nakorn Chiang Mai Hospital, Khon Kaen Hospital, Lampang Hospital, and Nakornping Hospital visit specific patient with complications, disabilities, or patients with no caregivers. Only Srinagarind Hospital has no home visiting or follow-up by telephone call.

Instrumentation

Demographic Questionnaire

The questionnaire has two parts:

Part 1: The personal data of caregivers included age, gender, educational background, religion, marital status, occupational status after taking on caregiver role, family income, income adequacy, relationship with the patient, whether caregiver

provided care for other family member besides the patient with spinal cord injury, health problems, duration of caregiving, caregiving hours per day and caregiving assistant.

Part 2: Personal data of spinal cord injury patients included age, gender, educational background, religion, marital status, and occupation after injury. Injury information included the cause of injury, diagnosis, and duration of illness. Treatment information included treatment payment method and complications.

World Health Organization-Five Well-being Index

World Health Organization-Five Well-being Index (WHO-5) was used for assessing well-being of caregivers. This instrument consists of five well-being index items (WHO, 1998). Each item of WHO-5 assesses the level of well-being over the past two weeks, and covers a positive mood (good spirits, relaxation), vitality (being active and waking up fresh and rested), and general interests (being interested in things). This measurement is scored on a six-point Likert scale ranging from 0 (not present) to 5 (constantly present). A total scores is obtained by summing across all items, with possible score range from 0 to 25. A higher score means greater well-being. A score below 13 indicates poor well-being. The English version of the WHO-5 was translated into Thai by Saipanish et al. (2009).

In this study, the internal consistency reliability of the Thai version of this instrument was tested with 10 caregivers of persons with spinal cord injury. The Cronbach's alpha coefficient in the pilot study was .86, indicating acceptable

reliability. The Cronbach's alpha coefficient in the 205 caregivers of person with spinal cord injury in the main study was .85.

Rewards of Caregiving Scale

Rewards of Caregiving Scale was used for assessing the positive feeling of caregivers in providing care to their patient. This questionnaire was translated and modified by Gasemgitvatana (2002, personal communication, March 8, 2010) from a 27-item Rewards of Caregiving Scale originally developed by Archbold et al. (1995). The new version of the Rewards of Caregiving Scale has 15 items divided into four categories as follows: rewards of meaning for oneself (4 items), rewards of family strengthening (2 items), rewards from spiritual fulfillment (4 items), and rewards of self-gratification (5 items). The questionnaire applies a five-point Likert Scale for the responses and these responses range from 0 (not at all) to 4 (a great deal). A total scores is obtained by summing across all items, with possible score range from 0 to 108. A higher score reflecting the perceived higher rewards gained from caregiving.

In this study, the internal consistency reliability of the Thai version of this instrument was tested with 10 caregivers of persons with spinal cord injury. The Cronbach's alpha coefficient in the pilot study was .98, indicating acceptable reliability. The Cronbach's alpha coefficient in the 205 caregivers of person with spinal cord injury in the main study was .91.

Social Support Questionnaire

Social Support Questionnaire was used for assessing caregivers' perception of support provision from people. This questionnaire was modified by Pipatananond (2001) from the Social Support Questionnaire (Schaefer et al., 1981). This questionnaire has three dimensions of social support as follows: information support (1 item), emotional support (4 items) and tangible support (2 items). The questions ask about the amount of support from five sources, these being: 1) families which include a spouse, parents and children; 2) siblings and relatives, 3) friends, co-workers and neighbors, 4) other providers in the community, such as traditional doctors, priests, police and others, and 5) health care providers. Questions for each source of social support have seven items and each source of social support uses the same questions. This questionnaire is rated from 0 (not receiving) to 4 (receiving most). A total scores from all sources of social support is obtained by summing across all items, with possible score range from 0 and 140. A high score means caregivers perceive a high level of social support.

In this study, the internal consistency reliability of the Thai version of this instrument was tested with 10 caregivers of persons with spinal cord injury. The Cronbach's alpha coefficient in the pilot study was .88, indicating acceptable reliability. The Cronbach's alpha coefficient in the 205 caregivers of person with spinal cord injury in the main study was .95.

The Barthel Index

The Barthel Index was used for assessing functional ability of persons with spinal cord injury. Jitapunkul et al. (1994) translated and modified this questionnaire from the Barthel Index, originally developed by Mahoney and Barthel (1958). They used this questionnaire to measure the functional ability of patients who could live independently in their own homes during a 24-48 hour period. It measures ten activities: feeding, grooming, transfer, toilet use, mobility, dressing, going up and down stairs, bathing, continence of bowel, and bladder control. However, the score for each activity is not equal, but depends on the importance of each activity to the relevant patient's lives. A total scores is obtained by summing across all items, with possible score range from 0 to 20. High scores show that the patient can perform most of their own daily living activities.

In this study, the internal consistency reliability of the Thai version of this instrument was tested with 10 caregivers of persons with spinal cord injury. The Cronbach's alpha coefficient in the pilot study was .89, indicating acceptable reliability. The Cronbach's alpha coefficient in the 205 caregivers of persons with spinal cord injury in the main study was .92.

Caregiving Burden Scale, Thai Version

Caregiving Burden Scale, originally developed by Oberst (1991), was translated into Thai by Gasemgitvatana (1993). This questionnaire is composed of 15 questions to measure caregiving burden in three activity areas: 1) direct care (3 items),

2) interpersonal care (4 items), and 3) instrumental care (8 items). Each question in the questionnaire requires two kinds of answer, as follows:

Demands of caregiving. This measures a caregiver's perception about time spent on caregiving across various activities. Score ranged from 1 (activity requires no time) to 5 (activity requires the most time).

Difficulty of caregiving. This measures the complexity and effort required for each caregiving activity according to a caregiver's feelings. Score ranged from 1 (easy activity) to 5 (hard activity).

A total score is obtained by the square root of demand multiplied by difficulty. Then the scores of all items were added together, with possible score range from 15 and 75. A low score indicates a low caregiving burden.

In this study, the internal consistency reliability of the Thai version of this instrument was tested with 10 caregivers of person with spinal cord injury. The Cronbach's alpha coefficient in the pilot study was .85 for Demands of caregiving Subscale, .92 for Difficulty of caregiving Subscale and for the whole Caregiving Burden Scale was .92, indicating of acceptable reliability. The Cronbach's alpha coefficient in the 205 caregivers of person with spinal cord injury in the main study was .89 for Demands of caregiving Subscale, .91for Difficulty of caregiving Subscale and for the whole Caregiving Burden Scale was .94.

Preparation of Research Assistants

Data were collected by the researcher and ten research assistants. The research assistants chosen were registered nurses working at in-patient wards and OPDs who had been involved in caring for spinal cord injury patients and caregivers who participated in this study. They were the persons who selected participants for joining this study. These ward nurses were a person who recruit the caregivers who take care of those patients at home. Therefore, caregivers who participated in this study received specific knowledge and nursing skills for caregiving to the patient with spinal cord injury before the patients were discharged. All of research assistants were trained to collect the data from the researcher prior to data collection. They were trained in order to have better understanding regarding the objectives of the study, the inclusion criteria of the potential participants, the data collection procedure, the participants' human rights, and their role as research assistants. The researcher observed the research assistants closely during the first time of data collection and gave recommendations until they clearly understood the data collection procedure. During the data collection, the researcher phoned the research assistants every two weeks and visited them every month to assess the quality of the data collection.

Protection of Human Rights

The study was approved by the Research Ethics Review Committee of the Faculty of Nursing, Chiang Mai University, prior to data collection (see Appendix H). Ethical approval for the study was also obtained from the Research Ethics Committee of the Faculty of Medicine, Chiang Mai University, Nakornping Hospital, Lampang

Hospital, Srinagarind Hospital and Khon Kaen Hospital. All participants were informed about the purpose, procedures, risks and benefits of the study. They were informed that no invasive procedure was employed in this study, and were assured of the confidentially of their information; that it was only used for the purpose of this study. All data were reported in aggregate form. In addition, participation in the study was on a voluntary basis. The participants could refuse to participate or could withdraw from the study at any time, without any adverse impact on themselves, their patient or the hospital service. After the participants agreed to take part in the study, they were asked to sign a consent form and data collection began (see Appendix I). After collecting the data, the researcher gave an opportunity for the caregivers to obtain information about the caregiving of spinal cord injury patients at home.

Data Collection Procedures

Data collection was conducted after receiving approval from the Research Ethics Review Committee of the Faculty of Nursing, Chiang Mai University, and from the research ethics committee of the Faculty of Medicine, Chiang Mai University, Nakornping Hospital, Lampang Hospital, Srinagarind Hospital and Khon Kaen Hospital. Data collection took place from March 2011 to April 2012. The procedures for data collection were as follows:

1. The researcher contacted the head nurses of the spinal unit or ward or OPD of the five selected hospitals to introduce herself, and explained the purpose of the study and the data collection procedure.

2. The researcher and/or a research assistant recruited caregivers who meet the inclusion criteria from ward and OPD of hospitals.

3. All potential participants who were deemed eligible were individually approached by the researcher and/or a research assistant. The researcher and/or a research assistant informed participants about the objectives and protocols of the study, and their rights. The researcher collected the data as follows:

3.1 In case of inpatients in a ward, the researcher and/or a research assistant contacted the participants in the ward. The participants had a sign consent to join this study with the researcher and/or a research assistant at ward. The questionnaires were described to them by the researcher and/or a research assistant at the ward. The researcher and/or a research assistant asked permission to send the questionnaires to the participants by post three weeks after the spinal cord injury patients had been discharged from hospital. The researcher and/or a research assistant also sent an empty, stamped-addressed envelope, in order to allow the participants to return the questionnaires to the researcher by post.

3.2 In the case of outpatients in OPD, the researcher and/or a research assistant contacted the participants at OPD. The researcher and/or a research assistant explained to the participants how to answer the questionnaires at OPD before they received the questionnaire to answer at home. The researcher and/or a research assistant gave the questionnaires to the participants and gave an empty, stamped-addressed envelope, in order to allow the participants return the questionnaires to the researcher by post.

3.3 In case of patients who were not followed-up at OPD, the researcher and/or a research assistant contacted the participants by telephone. The

researcher and/or a research assistant sent the questionnaires to the participants by post and sent an empty, stamped-addressed envelope, in order to allow the participants return the questionnaires to the researcher by post.

4. The researcher and/or a research assistant emphasized to all of the participants that only they themselves should answer all of the questions in the questionnaires. In case the participants could neither read nor write, the relatives of the participants read the statement provided in the questionnaire and let the participants answer the questionnaire by themselves.

5. The researcher and/or a research assistant made a follow-up by telephone after the sending of questionnaires. If the participants had already sent the questionnaires back, the researcher expressed her thanks. If they had not sent back the questionnaire yet, the researcher asked the participant to answer the questionnaires again.

6. Two hundred and five participants were recruited in this study by meeting or talking by phone. All of them were willing to join this study. All questionnaires were returned with a response rate of 100%. After the researcher and research assistants received 205 questionnaires, they were examined for the completeness. If it was found that the questionnaire was incomplete, the researcher or the researcher assistants asked the participants to answer the questions by telephone until it was complete. Finally, all 205 questionnaires were completed, and the data were put into computer and organized for data analysis.

Data Analysis

Data analysis included preliminary and principle analyses, by applying descriptive and inferential statistics. The overall level of significance was set at an alpha of 0.05. The data analysis procedures were as follows.

Preliminary Analysis

1. Outliers were detected before data analysis. Visual inspection of histograms or frequency distributions were used to identify outliers. There was no outlier detected.

2. Descriptive statistics including frequencies, percentages, ranges, means and standard deviations were used to delineate the participants' characteristics and variables in this study.

3. The researcher checked the assumptions (normality, multicollinearity, homoscidasticity and linearity) underlying the multivariate statistics for path analysis, before testing the hypothesized model. The researcher examined each assumption as follows:

3.1 Testing normality. The assumption of statistics is that the variables in the model have a normal distribution which can be tested by using skewness and kurtosis values. Skewness and kurtosis values can be determined by Fisher's measure of skewness and the kurtosis coefficient. This Z-score is obtained by dividing skewness or kurtosis values with standard error for skewness or kurtosis, respectively. If the skewness and kurtosis coefficient are not beyond ±1.96, the distribution of data has a normal curve (Hair, Black, Babin, Anderson, & Tathem, 2006; Munro, 2005).

One can also test normality by using Kolmogorov-Smirnov statistics. If the value in the table of a One-Sample Kolmogorov-Smirnov Test has statistical non-significance, this means the data is distributed normally.

The results of the test pointed out that the skewness coefficient of two variables, reward of caregiving and the functional ability of persons with spinal cord injury, were not in the acceptable range. The kurtosis coefficient showed that two variables of caregiving hours and functional ability of persons with spinal cord injury were beyond acceptable values (see Table 1). However, when applying the Kolmogorov-Smirnov test, well-being, reward of caregiving, social support, and caregiving burden had a normal distribution. Two variables in the model, including caregiving hours and functional ability of persons with spinal cord injury, were not normally distributed. Therefore, these three variables (reward of caregiving, caregiving hours and functional ability of persons with spinal cord injury) were transformed into normal scores by PRELIS 8.52.

Post-transformation, reward of caregiving and functional ability of persons with spinal cord injury variables indicated an acceptable distribution (see Table 2). West, Finch, and Curran (1995) suggest that when the distribution begins to depart substantially from normality (e.g., skewness ≥ 2, kurtosis ≥ 7), the standard error of parameter estimation is underestimated. The result of statistical testing would be untrustworthy. The skewness and kurtosis of the caregiving hours variable was not substantially non-normal. In addition, maximum likelihood (ML) estimates provide by LISREL 8.52 was used in the model testing and it was fairly robust to the violation of normality. Therefore, the ML estimates are good even when the data has a slightly non-normal distribution (Chou & Bentler, 1995).

Table 1

Skewness and Kurtosis of Study Variables Pre-Transformation (n = 205)

Variables	Skewness	Kurtosis	Skewness Coefficient	Kurtosis Coefficient
Well-being	-0.017	-0.122	-0.105^{ns}	-0.246^{ns}
Reward of caregiving	-0.363	0.141	-2.121*	0.553^{ns}
Social support	-0.198	0.099	-1.176^{ns}	0.438^{ns}
Caregiving hours	0.127	-1.210	0.759^{ns}	-10.068**
Functional ability of persons with spinal cord injury	0.365	-1.145	2.131*	-8.443**
Caregiving burden	-0.194	-0.211	-1.152^{ns}	-0.567^{ns}

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

Table 2

Skewness and Kurtosis of Study Variables Post-Transformation (n = 205)

Variables	Skewness	Kurtosis	Skewness Coefficient	Kurtosis Coefficient
Reward of caregiving	-0.022	-0.106	-0.132^{ns}	-0.193^{ns}
Caregiving hours	-0.280	-0.589	-1.651^{ns}	-2.350*
Functional ability of persons with spinal cord injury	0.108	-0.463	0.645^{ns}	-1.659^{ns}

* p < .05.

3.2 Testing of multicollinearity. Multicollinearity means that the predicting variables highly intercorrelate. The assumption of statistics is that each variable in a model does not highly intercorrelate. Two indices for indicating multicollinearity, namely, the tolerance and VIF (variance inflation factor) are tested. Tolerance values can range from .00 (perfect multicollinearity) to 1.00 (no multicollinearity). Furthermore,

a value of VIF greater than 10 indicates multicollinearity exists among the predicting variables. Moreover, Pearson's Product Moment Correlation can test relationships between variables by calculating a Pearson correlation coefficient. A correlation coefficient more than .85 shows multicollinearity (Schroeder, 1990). The results in this study showed a tolerance range from .545 to .891, a VIF range from 1.121 to 1.836 (see Table 3), while the correlations among predictor variables ranged from .006 to .466 (see Table 4). These indicated that no multicollinearilty existed among predictor variables.

Table 3

Assessment of Multicollinearity Among Variables in the Model (n = 205)

Variables	Tolerance	VIF
1. The first equation (DV = Well-being)		
Rewards of caregiving	0.655	1.527
Social support	0.833	1.200
Caregiving hours	0.891	1.123
Functional ability of persons with spinal cord injury	0.545	1.836
Caregiving burden	0.632	1.583
2. The second equation (DV = Caregiving burden)		
Rewards of caregiving	0.673	1.485
Social support	0.891	1.122
Caregiving hours	0.892	1.121
Functional ability of persons with spinal cord injury	0.659	1.517

Note. DV = dependent variable, VIF = variance inflation factor.

Table 4

Correlation Matrix of Study Variables (n = 205)

	1	2	3	4	5	6
1. Well-being	1.000					
2. Rewards of caregiving	.393**	1.000				
3. Social support	.358**	.346**	1.000			
4. Functional ability	.180**	.098	.006	1.000		
5. Caregiving hours	.039	.046	.051	-.466**	1.000	
6. Caregiving burden	-.278**	-.092	.176*	-.356**	.226**	1.000

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

3.3 Testing of homoscidasticity. Homoscidasticity is defined as a constant error variance between predicted and observed scores. In other words, the variance of errors remains the same across all levels of the independent variables (equal variance). To check this assumption, one uses a residual scatter plot. When plotting standardized predicted values against observed values, the data scatters around a straight line from the lower-left corner to the upper-right corner, indicating it meets this assumption. In addition, equal scatter of points around the zero axis of the residual plot also indicate homoscidasticity. In this study, a plot of standardized residuals of five dependent variables including rewards of caregiving, social support, caregiving hours, functional ability of persons with spinal cord injury and caregiving burden between standardized predicted values and observed values showed no violation of this assumption (Appendix J).

3.4 Testing of linearity. The assumption of statistics is that a relationship among the variables in a model is linear. A residual plot on a graph using a standardized residual (y axis) versus the predicted values (x axis) can show linearity.

If the distribution is linear, the standardized residual should scatter randomly along a horizontal line. The residual plot of five dependent variables including rewards of caregiving, social support, caregiving hours, functional ability of persons with spinal cord injury and caregiving burden showed no violation of this assumption (Appendix J).

Principal Analysis: Testing the Hypothesized Model

A Linear Structural Relationship Program (LISREL) was used to analyze the variables of the causal relationship model to predict the well-being of the caregivers. LISREL was used to explain the relationships among variables of a hypothesized model. The procedures were as follows:

1. The covariance matrix of variables were analyzed using the PRELIS program.

2. The parameters of the hypothesized model were examined; multiple regression equations were used to estimate the path coefficients and structural effects through the total effects (direct and indirect effects).

3. The hypothesized model fit was tested and evaluated by adjusting it to be the best fit to answer the hypotheses. The model was tested through the maximum likelihood (ML) procedures. To evaluate the model, the researcher examined the overall model-fit-index to determine how well the model fit the observed data. Even though about 30 indicators of model evaluation are available in the LISREL package, only the important indicators were employed to use in combination in this investigation. The four indicators (Chi-square, Goodness of Fit Index, Comparative

Fit Index, and Root Mean Square Error of Approximation) determine the overall model fit indices as follows.

3.1 Chi-square statistics (χ^2). The results in which the chi-square is at a non-significant level correspond to p values > .05, and preferably close to 1.00 is recommended, though its associated degree of freedom (df) also needs to be accounted for. A Chi-square and degree of freedom ratio (χ^2/df) of less than two is also accepted as an alternative indicator of goodness-of-fit.

3.2 The Goodness of Fit Index (GFI). GFI measures the squared residuals from predictions with actual data. GFI values range from 0 to 1 where GFI values closer to one indicate a better fit (Hair et al., 2006).

3.3 The Comparative Fit Index (CFI). The CFI represents comparisons between an estimated model and a null or independent model. The CFI values range from 0 to 1 and a large value (>.90) indicates a good fit (Hair et al., 2006).

3.4 The Root Mean Square Error of Approximation (RMSEA). The RMSEA indicates the overall degree of fit to data. A value of less than .05 indicates a good fit, between .05 and under .08 indicates a reasonable fit, between .08 and .10 indicates a medium fit and a greater value than .10 indicates a poor fit (Diamantopoulos & Siguaw, 2000).

4. The results of the hypothesized model testing showed the fit indices, which demonstrated the initial model did not fit with the data (Chi-Square = .00, *df* = 1, *p*-value = 1.00, RMSEA = .00). The hypothesized model was modified based on the statistical criteria and theoretical meaning (Kline, 2005; Singchungchai, 2005). Then the modified model was tested for goodness of fit. The results indicated that the final

model fit well with the data (Chi-Square = .23, *df* = 1, *p*-value = .63, GFI = 1, CFI = 1, RMSEA = .00).