

Testing the Mediating Effect of Appraisal in the Model of Uncertainty in Illness

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Background. Although there have been a great number of research studies based on the model of uncertainty in illness, few studies have considered the appraisal portion of model.

Purpose. The purpose of this study was to test the mediating effect of appraisal in the model of uncertainty in illness. Additionally, this study aimed to examine the relationships among uncertainty, symptom severity, appraisal, and anxiety in patients newly diagnosed with atrial fibrillation.

Methods. This study employed a descriptive correlational and cross-sectional survey design using a face-to-face interview method. Patients diagnosed with atrial fibrillation within the previous 6 months prior to data collection were interviewed by Mishel Uncertainty in Illness Scale-Community Form, appraisal scale, Symptom Checklist-Severity V.3, and State Anxiety Inventory.

Results. A total of 81 patients with atrial fibrillation were recruited from two large urban medical centers in Cleveland, Ohio, U.S.A.. Symptom severity was the significant variable in explaining uncertainty ($r = -0.34$). Individuals with greater symptom severity perceived more uncertainty. Uncertainty was appraised as a danger rather than opportunity, and those with greater uncertainty appraised a greater danger ($p < .01$). While the appraisal of opportunity had the negative relationship with anxiety ($r = -0.25$), the appraisal of danger was positively associated with anxiety ($r = 0.78$). The measure of goodness of fit (Q) of the model was .7863, and the significant test (X^2) for the Q was statistically significant ($df = 3, p < .001$). Accordingly, the overall mediating model of uncertainty in illness was proven not to be fit to the empirical data of patients with atrial fibrillation. Consequently, the mediating effect of appraisal was not supported by the empirical data of this study.

Conclusion. The findings of this study were discussed in terms of their relevance compared with those of previous studies or theoretical framework and the plausible explanations on study findings. Lastly, in order to expand the present body of knowledge on uncertainty in illness model, recommendations for the future nursing studies were included.

Key Words: Uncertainty, Anxiety, Atrial fibrillation

BACKGROUND

Since the early 1980's, the nursing discipline has focused on uncertainty as a main theme of research as

well as an area needing assessment in clinical practice because the concept of uncertainty can be applied across diagnostic categories and may be worthwhile in explaining responses to illness (Jessup & Stein, 1985). With the development of instruments for measuring uncertainty

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in illness and the introduction of the mid-range nursing theory of uncertainty in illness by Mishel (1988), numerous nursing research studies on uncertainty not only in various clinical populations but also in family members of patients and in caregivers have been conducted. However, the majority of studies about uncertainty and adaptation conducted using Mishel's model of uncertainty in illness as a theoretical framework, directly linked uncertainty to either negative or positive outcome measures disregarding the process of appraisal of uncertainty. The underlying assumption of these studies was that uncertainty is always negative, and the potential dual role of uncertainty in the original theory by Mishel (1988) was ignored in these studies.

There has been a general agreement that research studies should be performed on the basis of theoretical framework, and throughout those studies the theory was empirically examined. Thus, in turn, those studies' findings are expected to reinforce theory itself by supporting/questioning its propositions or expected to revise the model by providing empirical data confuting propositions of theory (Kang, 2003). Therefore, it is apparent that the research studies that include the portion of 'appraisal of uncertainty' of the model as examining the relationship of uncertainty on its consequences are needed so as to fill the gaps in the previous literature.

The phenomenon of uncertainty was demonstrated as being part of patients' responses to atrial fibrillation, and the plausible explanations concerning its relevance and significance to the population were discussed in the previous study (Kang, 2002). Based on those findings, the investigation that examines the relationships among uncertainty and other associated variables of uncertainty model within the same population is appropriate and necessary as the next step of research.

THEORETICAL FRAMEWORK

The theoretical framework of the study is based on Mishel's mid-range nursing theory of uncertainty in illness (Mishel, 1988; Mishel, & Sorenson, 1991; Mishel, Padilla, Grant, & Sorenson, 1991). The uncertainty in illness model explains how patients cognitively process illness-related events as stimuli and structure the meaning of those events (Mishel, 1988). In particular, this theory poses that there are antecedents of uncertainty; uncertainty is neutral until it is appraised as a danger or an opportunity; according to the effective coping strategies,

then, adaptation occurs (Mishel, 1988).

This model has guided many research studies, including both quantitative and qualitative nursing studies, since 1980's. Mishel (1981) has fully developed uncertainty in illness as a theoretical construct. Uncertainty is conceptually defined as a cognitive state that occurs in situations in which the decision maker is unable to assign definite values to events or objects and / or is unable to predict outcomes accurately, because the cues are vague, inadequate, unfamiliar, contradictory, numerous, or lacking information (Budner, 1962; Mishel, 1984). Therefore, uncertainty in illness can develop when a patient does not formulate a cognitive schema for illness events (Mishel, 1988).

OBJECTIVES

The objective of this study was to test the mediating effect of appraisal in the model of uncertainty in illness. Specifically, this study attempted to test the following research hypotheses: H_{a1} . Greater symptom severity had the effect on greater uncertainty in patients newly diagnosed with atrial fibrillation. H_{a2} . There would be the positive associative relationship between uncertainty and appraisal of danger and the inverse associative relationship between uncertainty and opportunity in patients newly diagnosed with atrial fibrillation. H_{a3} . There would be the positive associative relationship of appraisal of danger on anxiety and the inverse associative relationship of appraisal of opportunity on anxiety in patients newly diagnosed with atrial fibrillation. H_{a4} . The overall research model would fit to the date of this study. Symptom severity and anxiety were selected as an antecedent of uncertainty and a measure for adaptation respectively. Anxiety has been employed and shown to be significant as an outcome of uncertainty and a measure of adaptation in many previous studies that even disregarded appraisal portion of uncertainty model (Wong & Bramwell, 1992; Santacroce, 2002; Hommel, et al., 2003). In order to compare with those previous findings, anxiety was selected in this study. The subsequent research model of this study is shown in Figure 1.

METHODS

Design & Setting

This study employed a descriptive correlational and cross-sectional survey design using a face-to-face inter-

view method. The setting for the study was the cardiology outpatient clinic and the outpatient clinic for anticoagulation therapy in two large urban hospitals in Cleveland, Ohio, USA. A convenience sampling method was used to obtain subjects for this study.

Subject Inclusion & Exclusion Criteria

The subject must have been newly diagnosed with atrial fibrillation within 6 months prior to data collection. The subject must be able to speak and read English in order to understand the study questionnaires and to answer the questions. The subject must be an adult, age 18 or older. Patients who meet these inclusion criteria were screened for the following exclusion criteria. Excluded is anyone who is newly diagnosed with any disease other than atrial fibrillation within the previous 3 months, because being newly diagnosed with other diseases may affect the patient's uncertainty. Excluded is anyone who has terminal illness which leads to death within 1 year since it was assumed that there is no situation more serious and uncertain than death.

Instruments

Uncertainty was measured by the Mishel Uncertainty in Illness Scale-Community Form (MUIS-C). The MUIS-C measures uni-dimensional uncertainty in illness within the non-hospitalized community population; thus it provides only a total scale score (Mishel, 1997). The MUIS-C consists of 23 items, and each item on the MUIS-C represents uncertainty in terms of a 5 point Likert-format scale ranging from "strongly agree" to "strongly disagree." The higher the score on the MUIS-C, the higher the perceived uncertainty. The reliability for the MUIS-C has been shown to be in the moderate to high range ($=0.74$ to 0.92) (Mishel, 1997). In the present study, the reliability coefficient for the MUIS-C was $.86$. Validity of MUIS has been demonstrated by Misel's finding that the scale discriminated significantly among medical, surgical, and diagnostic patient populations as predicted (Mishel, 1981). The construct validity was also supported by

items clustering into two factors (multi-attributed ambiguity & unpredictability) consistent with theoretical predictions (Mishel, 1981; Mishel, 1984).

Symptom Severity was measured by Version 3 of the Symptom Checklists-Severity (SCLs). This scale was designed as a disease-specific instrument intended to measure the patient's perception of the severity of atrial arrhythmia-related symptoms. The content validity of the scale was determined by clinicians with expertise in caring for patients with atrial fibrillation (Bubien, Kay, & Jenkins, 1993). SCLs measure the severity of sixteen atrial fibrillation-specific symptoms. The higher the Severity score is, the greater the severity with which symptoms are experienced (Jenkins, 1993). In the present study, the Symptom Severity Scale showed Cronbach's alpha $.84$.

Appraisal was measured by the 15-item appraisal scale, which was originally derived from the Ways of Coping Checklist (Folkman, 1982). The appraisal scale consists of two subscales: a danger appraisal scale and an opportunity appraisal scale, and it has two scores for each subscale. The reliability for the appraisal scale was reported as $.87$ for the danger appraisal scale and as $.82$ for the opportunity appraisal scale (Mishel & Sorenson, 1991). This study showed that the Cronbach's alpha of both danger and opportunity appraisal scale was $.86$.

Anxiety was measured by State Anxiety Inventory, that is, the most widely used measure of anxiety. It is one of subscales of State-Trait Anxiety Inventory, and it measures a distinct anxiety concept, 'state.' State anxiety is defined as 'a transitory emotional state or condition.' State Anxiety Inventory is a 4-point self-report scale (from "not at all"= 1 to "very much so"= 4) and consists of 20 items. Test-retest reliability coefficients have been reported as $.83$ to $.92$ (Spielberger, Gorsuch, & Lushene, 1971). Cronbach's alpha reliability ranges from 0.83 to 0.92 (Weintraub & Hagopian, 1990). In the present study, alpha reliability was $.93$. Concurrent validity was established by correlating the STAI with other anxiety scales such as the Taylor and IPAT Anxiety Scales, and

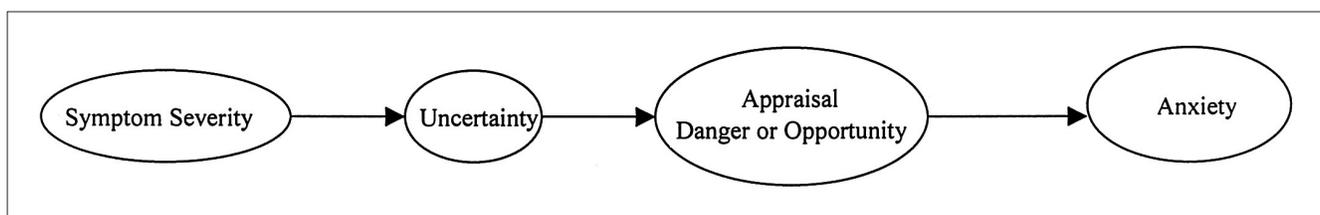


Figure 1. Research model.

the results showed moderate to high correlation (0.79 to 0.83 and 0.75 to 0.76, respectively).

Data Collection Procedure

The investigator identified patients newly diagnosed with atrial fibrillation by daily visiting or by calling nurses in the cardiology outpatient clinic. The investigator reviewed patients' charts to confirm subject eligibility based on subject inclusion and exclusion criteria. Once subject eligibility was determined, the subjects were approached by the investigator on the day of the subject's clinic appointment. At this time, the investigator briefly explained the purpose of the study, and the written summary of the study was given out. If subjects were interested in participating in the study, they were interviewed by the investigator in accordance with scales of the study.

Human Subjects Protection

The present study was approved by the University Human Subjects Review board and by the review board for protection of human subjects of the two hospitals used as study sites. Voluntary informed consent was obtained from all participants.

Sample Size Determination & Statistical Power Analysis

In order to obtain a proper sample size which can reveal significant results, power analysis for multiple regression was performed using Cohen's (1988) method. At the level of alpha 0.05, an effect size 0.15, a power 0.80, and three independent variables (symptom severity, uncertainty, & appraisal of uncertainty) and one covariate (health care provider), 55 subjects were needed. At the end of data collection, a total of 81 subjects were included for this study. Thus, power analysis was performed at the level of alpha 0.05, an effect size 0.15, a sample size of 81, 3 independent variables, and 1 covariate using the computer software for Power Analysis and Cohen (1988). In the present study, 81 subjects provided a power of 0.94. This level of power was high enough to detect the true relationships among variables and strongly supported the results of the study.

Data Analysis

The data were analyzed by the Statistical Package for Social Science (SPSS) software program. In order to perform multivariate inferential data analysis, the data set

was preliminarily analyzed. In addition to the examinations for multicollinearity and influential data, the tests for examining the statistical assumptions of multiple regression analysis and path analysis were conducted. Lastly, inferential analyses were performed so as to answer each research question.

RESULTS

The demographic characteristics of the sample for the present study are shown on Table 1, including age, gender, race, marital status, education, period since diagnosed, and health care provider. A total of 81 subjects were recruited for this study. Their mean age was 67.3 years old, and three-fourths (74.1%) were over age 60. Subjects were equally distributed by gender, and the majority (88.9%) were Caucasian. Most subjects (81.5%) were diagnosed with atrial fibrillation within 3 months previous to data collection. Three-fourths (76.5%) of the sample received their health care from Physician A, and the rest from Physician B. Because time since diagnosis and health care provider could respectively influence uncertainty, differences between groups in time since diagnosis (within 3 months and more than 3 months) and health care provider (Physician A and Physician B) were examined. There was no significant difference in uncer-

Table 1. Demographic Characteristics of Sample (N=81)

Characteristics	N (%)	Range
Age (years)		25 - 88
25 - 49	7 (8.6)	
50 - 59	14 (17.3)	
60 - 69	23 (28.4)	
70 - 79	26 (32.1)	
80 - 89	11 (13.6)	
Gender		
Male	41 (50.6)	
Female	40 (49.4)	
Race		
White	72 (88.9)	
Black	9 (11.1)	
Marital Status		
Single	11 (13.6)	
Married	35 (43.2)	
Widow	22 (27.2)	
Divorced	13 (16)	
Period since Diagnosis		
Within 3 months	66 (81.5)	
More than 3 months	15 (18.5)	
Health Care Provider		
Physician A in Site A	62 (76.5)	
Physician B in Site B	19 (23.5)	

tainty between those with a diagnosis of 3 months or less ($M=62.88$, $SD=10.85$) and those with a diagnosis of more than 3 months ($M=61.40$, $SD=10.91$). However, there was a significant difference in uncertainty between subjects from Physician A ($M=64.65$, $SD=10.95$) and those from Physician B ($M=55.95$, $SD=7.21$). Therefore, health care provider was considered as a covariate for uncertainty.

H_{a1}. Greater symptom severity had the effect on greater uncertainty in patients newly diagnosed with atrial fibrillation.

Using both hierarchical multiple regression and partial correlation, health care provider was entered at the first step to control its effect on uncertainty, followed by symptom severity. The amount of variance in uncertainty explained by symptom severity was 20.5%. Symptom severity was the significant variable in explaining uncertainty ($r=0.34$). Individuals with greater symptom severity perceived more uncertainty. According to the result from the partial correlation analysis, symptom severity and uncertainty were significantly correlated ($r=0.349$, $p=0.002$). Thus, the alternative hypothesis 1 was supported in this study.

H_{a2}. There would be the positive associative relationship between uncertainty and appraisal of danger and the inverse associative relationship between uncertainty and opportunity in patients newly diagnosed with atrial fibrillation.

Uncertainty and appraisal of danger were significantly correlated ($r=0.53$). However, the relationship between uncertainty and appraisal of opportunity was not significant ($r= - 0.10$). Hence, uncertainty was appraised as a danger rather than opportunity, and there was a tendency and likelihood of those individuals with high uncertainty levels to have the appraisal of danger at high levels. Thus, the head portion of alternative hypothesis 2 was supported, and the tail portion was not supported in this study.

H_{a3}. There would be the positive associative relationship of appraisal of danger on anxiety and the inverse associative relationship of appraisal of opportunity on anxiety in patients newly diagnosed with atrial fibrillation.

Both appraisal of danger and appraisal of opportunity were significantly correlated with anxiety (Table 2). While the appraisal of opportunity had the inverse rela-

tionship with anxiety ($r= - 0.25$), the appraisal of danger was positively associated with anxiety ($r=0.78$). That is, individuals with higher appraisal of danger were likely to have higher anxiety while those with higher appraisal of opportunity to have lower anxiety. Thus, the alternative hypothesis 3 was supported in this study.

H_{a4}. The overall research model would fit to the date of this study.

Based on the findings from the above research questions, the regression analyses were performed only with the significant paths, and the beta for each path and adjusted R^2 were obtained. To test the goodness of fit of an overidentified model to data, it is necessary first to calculate R^2_m , which is defined as a generalized squared multiple correlation and “the ratio of the generalized variance explained by the causal model to the generalized variance which was to be explained by the model” for multistage path model (Specht, 1975, p.120). R^2_m of fully recursive model and R^2_m of the overidentified model (M) for the study were calculated based on the formula: $R^2_m=1 - (1 - R^2_1) (1 - R^2_2) \dots (1 - R^2_n)$. Secondly, the measure of goodness of fit, Q, was obtained by the formula: $Q= 1 - R^2_m / 1 - M$. Q may range from zero to one, and the closer Q is to one, the better the fit of the model to the data (Pedhazur, 1982). For the significance test of Q, W was calculated as follows: $W= - (N - d) \log_e Q$ (N =sample size; d =number of overidentifying restrictions, that is, the number of path coefficients hypothesized to be equal to zero; \log_e =natural logarithm). W has an approximate X^2 distribution with $df=d$, the number of overidentifying restrictions (Pedhazur, 1982). Thus, if X^2 is statistically significant, the model does not fit the data, and vice versa.

Consequently, the overidentified model and the fully recursive model with the beta for each path and adjusted R^2 in this study are shown in Figure 2 and 3 respectively. The measure of goodness of fit(Q) of the model was 0.7863, and the significant test ($X^2: 18.7525$) for the Q was statistically significant ($df=3$, $p<.001$). Accordingly, the mediating model for this study did not fit the data.

Table 2. Correlation Coefficients between Appraisal of Danger/ Opportunity and Anxiety

Variable	Anxiety
Appraisal of Danger	.78**
Appraisal of Opportunity	-.25*

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

Thus, the alternative hypothesis 4 was not supported in this study.

DISCUSSION

Uncertainty and Symptom Severity

Greater symptom severity was associated with higher uncertainty in this study. In previous literature, different relationships between symptom severity and uncertainty have been found with the use of different measurement methods for symptom severity in other populations. The finding of this study was congruent with that from previous research studies (Braden, 1990a, 1990b; Mishel, Hostetter, King, & Graham, 1984; Webster & Christman, 1988), where symptom severity was operationalized as perceived severity of illness. The present study also operationalized symptom severity as reported symptom severity. According to Mishel's theory (1988), uncertainty in illness is associated with four situations,

including discomfort, incapacitation, and other symptoms of illness. Patients with severe symptoms of illness may be more concerned about illness and may be unable to assign a definite value to their symptoms. Thus, their interpretation of symptoms of illness might be altered, and the prediction of outcomes might also be effected. This cognitive state is uncertainty. Therefore, the finding from this study confirmed the theory and supported the relationship between symptom severity and uncertainty that has been found in the previous literature. In contrast, other previous studies have failed to support a significant relationship between uncertainty and symptom severity (Mishel, Hostetter, King, & Graham, 1984; Christman, 1990; Christman et al., 1988; Webster & Christman, 1988). These studies reporting no relationship between symptom severity and uncertainty were conducted in relatively small sample sizes, compared to those supporting a significant relationship, and this may explain the discrepant findings.

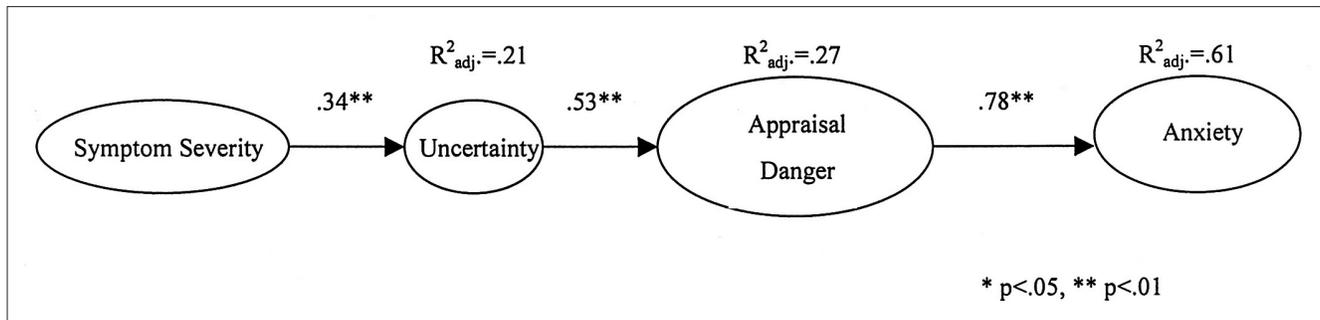


Figure 2. Overidentified model.

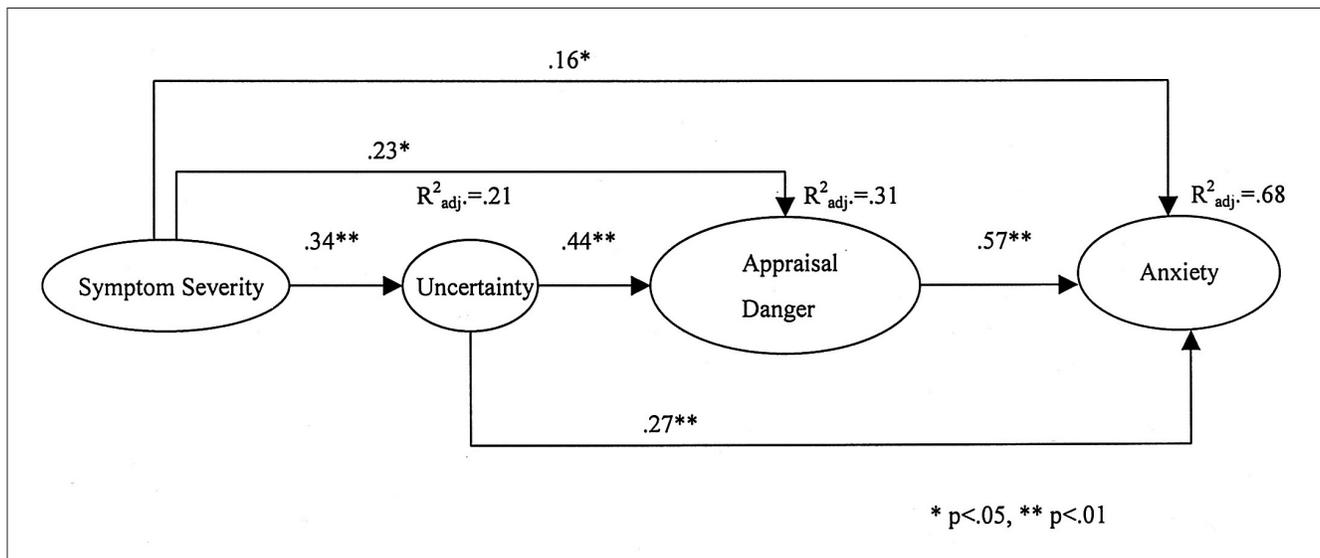


Figure 3. Fully recursive mode.

Uncertainty and Appraisal of Danger or Opportunity

In considering the negative or positive consequence of uncertainty, uncertainty is evaluated through a person's thought process. This process includes appraisal of uncertainty as either danger or opportunity (Mishel, 1988). Appraisal of uncertainty as a danger means that uncertainty is perceived as a threat to well-being based on previous personal experiences, and appraisal of uncertainty as an opportunity is explained as construction of a positive meaning for an event or situation based on beliefs or purposeful misinterpretation (Mishel, 1990). In this study, patients with atrial fibrillation appraised uncertainty as a danger rather than opportunity, and those with greater uncertainty appraised a greater danger. This result was congruent with most previous studies (Mishel & Sorenson, 1991; Mishel, Padilla, Grant, & Sorenson, 1991; Bailey & Nielsen, 1993) that examined the relationship of uncertainty and appraisal of danger or opportunity. According to Mishel's uncertainty theory (Mishel, 1988), uncertainty is likely to be appraised as an opportunity in a hopeless situation, a downward trajectory, or a situation in which the alternative is negative certainty. Accordingly, uncertainty in atrial fibrillation patients was more likely to be appraised as danger rather than opportunity. Atrial fibrillation is unlikely to be seen as a hopeless situation, but rather simply with an unclear view of the future in relation to treatment and prognosis. Therefore, the appraisal of uncertainty as opportunity is not likely to occur in atrial fibrillation.

Appraisal and Anxiety

Previous research has indicated that the consequences of uncertainty are influenced by the appraisal of uncertainty as a danger or an opportunity (Mishel & Sorenson, 1991). When uncertainty is evaluated as a danger, it is associated with a pessimistic view of an event and of the future in general, and it results in harmful outcomes such as anxiety, depression, distress, etc (Mishel, 1988). In the present study, as expected, greater appraisal of danger was associated with the perception of greater anxiety and greater appraisal of opportunity was associated with less anxiety. This finding confirmed the proposition of Mishel's uncertainty theory and was congruent with those of previous studies where greater emotional distress and poorer psychosocial adjustment resulted from the appraisal of danger (Mishel & Sorenson, 1991; Mishel, Padilla, Grant, & Sorenson, 1991; Bailey & Nielsen, 1993).

Validity of Mediating Model of uncertainty in Illness

As shown in the results section, the overall model of this study was not supported by empirical data in terms of its statistical significance of paths. Thus, in this specific sample of the study, the mediating effect of appraisal was not significant; rather the direct effects of uncertainty, symptom severity, and appraisal of danger on anxiety were significant. Since this study was the first trial to examine the mediating model of uncertainty in patients with atrial fibrillation, it could not be considered as conclusive that the mediating model of uncertainty was invalid.

Suggestions for Future Study

Further research studies on the uncertainty in illness model are needed to expand the existing body of knowledge concerning how patients cognitively process illness-related events as stimuli and structure the meaning of those events, and to relate them to nursing practice. Accordingly, specific recommendations for future nursing studies are suggested as follows:

- 1) Confirm the findings related to the level of uncertainty in the population of atrial fibrillation patients through replication.
- 2) Conduct the studies including other outcome variables of adaptation as consequences of uncertainty in order to test the mediating model of uncertainty.
- 3) Conduct longitudinal studies exploring the level of uncertainty at each stage of illness, assessing over time relationships among uncertainty, symptom severity, appraisal, and anxiety, and testing the uncertainty in illness model.

References

- Bailey, J. M., & Nielsen, B. I. (1993). Uncertainty and appraisal of uncertainty in women with rheumatoid arthritis. *Orthoped Nurs*, 12(2), 63-67.
- Braden, C. J. (1990a). Learned self-help response to chronic illness experience: A test of three alternative learning theories. *Scholarly Inquiry for Nurs Pract*, 4, 23-41.
- Braden, C. J. (1990b). A test of the self-help model: Learned response to chronic illness experience. *Nurs Res*, 39, 42-47.
- Bubien, R. S., Kay, G. N., & Jenkins, L. S. (1993). *Test specifications for Symptom Checklist: Frequency and severity*. Milwaukee: University of Wisconsin-Milwaukee.
- Budner, S. (1962). Intolerance of ambiguity as a personality variable. *J Personal*, 30, 29-50.
- Christman, N. J. (1990). Uncertainty and adjustment during radiotherapy. *Nurs Res*, 39(1), 17-20.
- Christman, N. J., McConnell, E. A., Pfeiffer, C., Webster, K. K.,

- Schmitt, M., & Ries, J. (1988). Uncertainty, coping, and distress following myocardial infarction: transition from hospital to home. *Res Nurs Health*, 11(2), 71-82.
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Hillsdale: Lawrence Erlbaum Associates, Publishers.
- Folkman, S. (1982). An approach to the measurement of coping. *J Occupat Behav*, 3, 56-107.
- Hommel, K., Chaney, J., Wagner, J., White, M., Hoff, A., & Mullins, L. (2003). Anxiety and depression in older adolescents with long-standing asthma: the role of illness uncertainty. *Children's Health Care*, 32(1), 51-63.
- Jenkins, L. S. (1993). *The manual for the Symptom Checklists - Frequency and Severity*. Maryland: University of Maryland.
- Jessup, D. J., & Stein, R. E. K. (1985). Uncertainty and its relation to the psychological and social correlates of chronic illness in children. *Soc Sci Med*, 20(10), 993-999.
- Kang, Y. (2002). Uncertainty in Patients Newly Diagnosed with Atrial Fibrillation. *J Korean Acad Nurs*, 32(7), 960-966.
- Kang, Y. (2003). A Critical Review of Literature: Mid-Range Nursing Theory of Uncertainty in Illness. *J Korean Acad Adult Nurs*, 15(1), 146-153.
- Mishel, M. H. (1981). The measurement of uncertainty in illness. *Nurs Res*, 30(5), 258-263.
- Mishel, M. H. (1984). Perceived uncertainty and stress in illness. *Res Nur Health*, 7, 163-171.
- Mishel, M. H. (1988). Uncertainty in illness. *Image: J Nurs Scholarsh*, 20(4), 225-232.
- Mishel, M. H. (1990). Reconceptualization of the uncertainty in illness theory. *Image: J Nurs Scholarsh*, 22(4), 256-262.
- Mishel, M. H. (1997). *Uncertainty in illness scales manual*. Chapel Hill: The University of North Carolina.
- Mishel, M. H., & Sorenson, D. S. (1991). Uncertainty in gynecological cancer: A test of the mediating functions of mastery and coping. *Nurs Res*, 40(3), 167-171.
- Mishel, M. H., Hostetter, T., King, B., & Graham, V. (1984). Predictors of psychosocial adjustment in patients newly diagnosed with gynecological cancer. *Cancer Nurs*, 7(4), 291-299.
- Mishel, M. H., Padilla, G., Grant, M., & Sorenson, D. S. (1991). Uncertainty in illness theory: a replication of the mediating effects of mastery and coping. *Nurs Res*, 40(4), 236-240.
- Pedhazur, E. J. (1982). *Multiple regression in behavioral research* (2nd Ed.). New York: Holt, Rinehart, and Winston.
- Santacroce, S. (2002). Uncertainty, anxiety, and symptoms of post-traumatic stress in parents of children recently diagnosed with cancer. *J Pediatr Oncol Nurs*, 19(3), 104-111.
- Specht, D. A. (1975). On the evaluation of causal models. *Soc Sci Res*, 4, 113-133.
- Spielberger, C., Gorsuch, F., & Lushene, R. (1971). *STAI manual for the S-T-A-I ("self-evaluation Questionnaire")*. Palo Alto: Consulting Psychologist Press.
- Webster, K. K., & Christman, N. J. (1988). Perceived uncertainty and coping post myocardial infarction. *Western J Nurs Res*, 10(4), 384-400.
- Weintraub, F., & Hagopian, G. (1990). The effect of nursing consultation on anxiety, side effects and self-care of patients receiving radiation therapy. *Oncol Nurs Forum*, 17 (Suppl. 3), 31-38.
- Wong, C., & Bramwell, L. (1992). Uncertainty and anxiety after mastectomy for breast cancer. *Cancer Nur*, 15(5), 363-371.