CORONARY HEART DISEASE AND CARDIAC ARREST SURVIVAL:
SENSE OF COHERENCE AS A
PREDICTOR OF QUALITY OF LIFE

by

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ABSTRACT

TITLE: **Coronary Heart Disease and Cardiac Arrest Survival: Sense of Coherence as a Predictor of Quality of Life**

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This nonexperimental, correlational study assessed the influence of the sense of coherence, a variable that previously has not been studied in relationship to chronic illness, in exploring quality of life in persons with coronary heart disease who survived a cardiac arrest. The primary hypothesis to be tested was: After controlling for social status variables related to poor health vulnerability (age, gender, race, socioeconomic status, marital status), perceived social support, self esteem, chronic illness trajectory shape variables (coronary heart disease symptoms prior to first cardiac arrest; number of cardiac arrests; time since last cardiac arrest), and chronic illness trajectory work variables (reported other medical problems; reported medical treatment; physical and emotional comfort; functional capacity), the addition of sense of coherence will significantly improve estimation of quality of life.

The entire population of survivors of cardiac arrest from two medical facilities was given the opportunity to participate. Of 162 persons who responded to the mailed survey, 149 met analysis requirements. The sample was largely male (73%) and predominantly Caucasian (95%). Ages ranged from 30 to 85 years ($M = 63$, $SD = 11.1$). Most were married or living with significant others (82%) and had greater than a high school education (55%).

The dependent variable was measured using the Modified Flanagan Quality of Life Scale. Stepwise, hierarchical multiple regression was used to test the primary hypothesis. Variables were entered in the following steps: 1. Social status variables—R^2 change =.05 (p =.53); 2. Perceived social support (Modified Burckhardt Perceived Support Score)—R^2 change =.05 (p =.01); 3. Self esteem (Duke Health Profile [DHP] Self Esteem)—R^2 change =.23; (p <.01) 4. Chronic illness trajectory shape—R^2 change =.02 (p =.36); 5. Trajectory work (Modified DHP Physical and Mental), functional capacity (reported NYHA Functional Class; Modified DHP Social)—R^2 change =.17 (p <.01); 6. Sense of coherence (Sense of Coherence Questionnaire, Short Form)—R^2 change =.14 (p <.01). Total explained quality of life variance was 67% (adjusted R^2 =.59), compared to only 46% with similar quality of life models without sense of coherence. Thus, the primary hypothesis was supported.

These new findings suggest a strong sense of coherence may empower cardiac arrest survivors to have high life quality. It may be that specific nursing strategies could be developed to enhance one or more sense of coherence components, thus improving patients' quality of life.

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CHAPTER 1

Introduction

This study focused on understanding the quality of life in persons who have had a cardiac arrest, a manifestation of chronic coronary heart disease. Specifically, it assessed the influence of the sense of coherence, a variable that previously has not been studied in relationship to heart disease, in exploring quality of life.

Corbin and Strauss (1988) posited that the work of managing a chronic illness is accomplished primarily by the ill person and his or her spouse or family within the home. They believed that there are extensive human costs involved in continuously accommodating to the demands of the illness and its management. They viewed *accommodation* as "the day-to-day struggle...to keep some sense of balance and give meaning to their respective lives" (p. 6). Juggling time, space, energy, money, jobs, activities, and identities constituted what they considered the day-to-day struggle.

These areas of life involved in chronic illness accommodation are congruent with the quality of life domains identified by Flanagan (1982) and modified by Burckhardt and her colleagues (Burckhardt, Woods, Schultz, & Ziebarth, 1989): physical and material well-being; relations with other people; social, community, and civic activities; personal development and fulfillment; recreation; and independence. Therefore, it seems apparent that accommodation to the demands of chronic illness would affect one's quality of life. Yet, based on this investigator's clinical experience, it is evident that some persons with coronary heart disease who have survived cardiac arrest continue to have exceptional life quality in spite of the required accommodation to their chronic illness and its acute phases.

Antonovsky (1987) proposed the salutogenic theory to explain why persons during times of extremely stressful conditions remain healthy. The key construct within his theory is the sense of coherence, comprised of comprehensibility, manageability, and meaningfulness. Could a strong sense of coherence be a personality orientation that empowers cardiac arrest survivors to have the strength and endurance to maintain or attain a high quality of life?

Statement of the Problem and Significance to Nursing

Coronary heart disease, a type of chronic cardiovascular disease, currently affects over 5 million Americans (American Heart Association, 1989). It is characterized by episodes of acute exacerbation, such as acute myocardial infarction, heart failure, and cardiac arrest or sudden cardiac death. The terms *cardiac arrest* and *sudden cardiac death* are synonymous; they are defined as any death occurring within 1 hour of symptom onset and, as suggested by the medical history, without any other probable cause of death (Cupples, Gagnon, & Kannel, 1992). Annually, between 300,000 and 400,000 Americans have an episode of cardiac arrest related to underlying coronary heart disease (Cupples et al., 1992; Hurwitz & Josephson, 1992; Myerberg, Kessler, & Castellanos, 1992). Cardiac arrest accounts for 50% of all cardiovascular deaths (Myerberg et al., 1992). For 13% to 20% of these persons, the cardiac arrest is the first manifestation of the coronary heart disease process (Hurwitz & Josephson, 1992). Resuscitation rates are variable, determined in part by the quality of community emergency medical services. The most optimistic survival rates for out-of-hospital cardiac arrest are 25-30% (Myerberg et al., 1992). The recurrence rate of cardiac arrest within the first 2 years is approximately 40% (Hurwitz & Josephson, 1992).

Cardiac arrest survivor's are likely to be affected by the underlying chronicity of the coronary heart disease process and its ramifications, by the acute event itself, and by the uncertainty of cardiac arrest recurrence—that is, by the stability of the chronic illness trajectory and by the work involved in shaping the trajectory. However, the dimensions of quality of life experienced by persons with coronary heart disease who have survived a cardiac arrest are not yet described in the literature.

Antonovsky (1987) posited that the salutogenic theory may explain in part how some people manage to stay well in spite of seemingly insurmountable odds. As his focus has been primarily on physical health, Sagy and colleagues (Sagy, Antonovsky, & Adler, 1990) contended Antonovsky downplays the relationship between sense of coherence and life satisfaction. However, the results of their own path analysis indicated that sense of coherence contributes directly to life satisfaction in older persons ($\beta = .49$, $p < .001$).

If the sense of coherence provided additional information about quality of life in persons with a chronic illness, then nursing strategies could be designed specifically to enhance comprehensibility, manageability, and/or meaningfulness, thereby resulting in improved life quality. For example, the cardiac arrest survivor with a strong sense of coherence might more successfully (a) understand the unpredictability of chronic coronary heart disease; (b) accomplish trajectory-shaping work; and (c) minimize the impact of coronary heart disease on his or her family. Further investigation of quality of life incorporating sense of coherence into the statistical model seems warranted. Thus, the purpose of this study was to evaluate the contribution of the sense of coherence to explained variance in quality of life in persons with chronic heart disease who have survived a cardiac arrest.

CHAPTER 2

Theoretical Framework

A chronic illness theory (Corbin & Strauss, 1988; Strauss, Corbin, Fagerhaugh, Glaser, Maines, Suczek, et al., 1984), a theory of quality of life (Burckhardt et al., 1989; Flanagan, 1982), and the salutogenic theory (Antonovsky, 1979, 1987) comprise the framework for this proposal. An explanation of their interrelationships, the theoretical model used in this study, and a comparison to Burckhardt's theoretical framework follow.

Chronic Illness

The physical and emotional consequences of chronic illness in general, and of coronary heart disease and cardiac arrest survival in particular, may influence quality of life. Strauss and his colleagues (1984) conceptualized any chronic illness as potentially causing multiple problems of daily living for the person with the disease. They suggested that chronic illness is characterized by the following problems in daily life:

1. The prevention of *medical crises* and their management once they occur
2. The control of *symptoms*
3. The carrying out of prescribed *regimens* and the management of problems attendant on carrying out the regimens
4. The prevention of, or living with, *social isolation* caused by lessened contact with others
5. The adjustment to changes in the *course of the disease*, whether it moves downward or has remissions
6. The attempts at *normalizing* both interaction with others and style of

life

7. *Funding*—finding the necessary money—to pay for treatments and to survive despite partial or complete loss of employment
8. Confronting attendant *psychological*, *marital*, and *familial* problems. (p. 16)

They posited that in order to handle these key problems, basic coping strategies, considered as work, must be developed by the patient and his or her support system.

Within this chronic illness framework, Strauss and his colleagues (1984) coined the term *illness trajectory* "that refers not only to the physiological unfolding of a sick person's disease but also to the *total organization* of work done over that course, plus the impact on those involved with that work and its organization" (p. 64). They posited that the term *management*, so often used within the hospital setting, does not capture the work's full complexity, its medical outcomes, or its consequences for all those involved. Rather, they proposed *shaping* as a term useful for describing handling of problematic trajectories since full control of all phases of the trajectory is not possible.

Corbin and Strauss (1988) viewed illness trajectory as the key concept within their theory of chronic illness. They considered *variability* and *phase* as the two components of a trajectory's shape. Therefore, trajectories can be acute, stable, unstable, or deteriorating (progressive disablement or death). Additionally, periods of physical and emotional recovery, called *comeback phases*, might be involved. Figure 2-1 illustrates the conceptualization by Corbin and Strauss of four illness trajectories. The X-axis was time, but the

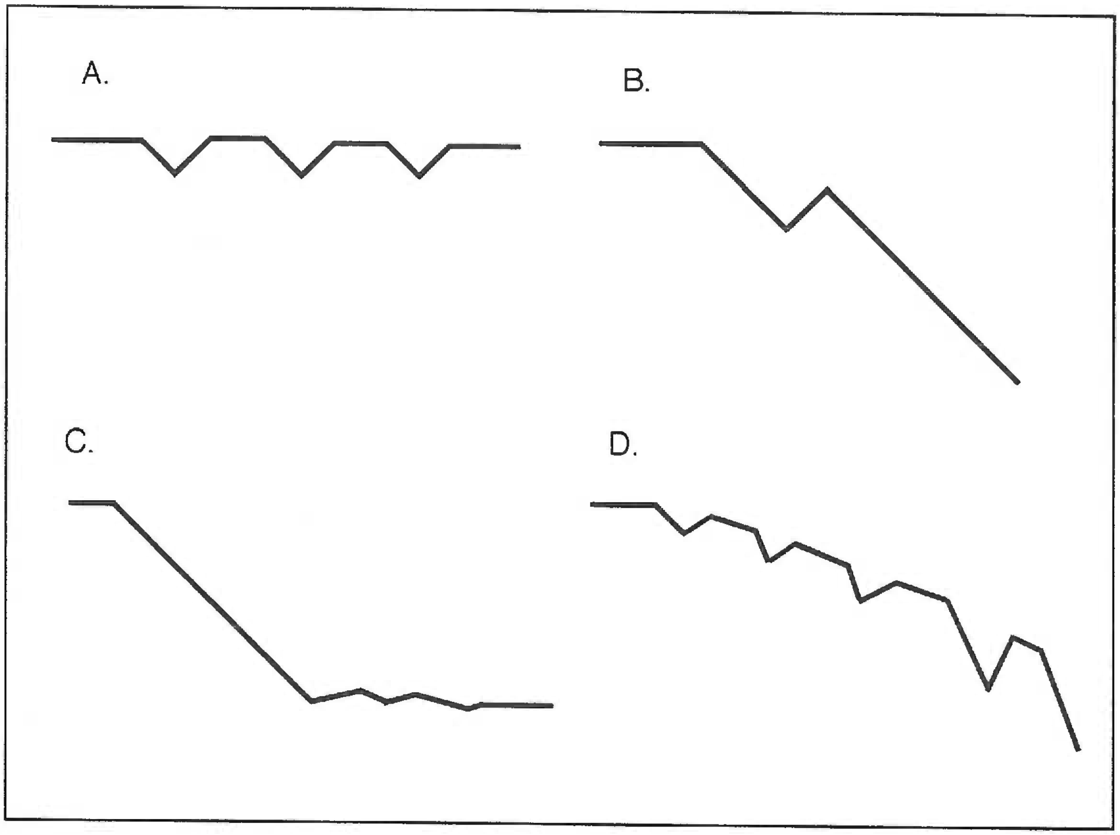

Figure 2-1. **Examples of Chronic Illness Trajectories. A.** Sinusitis; **B.** Cardiac Disease; **C.** Stroke; and **D.** Cancer.

Note. From *Unending Work and Care* (pp. 43-44) by J. M. Corbin and A. Strauss, 1988, San Francisco: Jossey-Bass.

units were not specified. The Y-axis was not labeled.

Corbin and Strauss (1988) posited that people with severe, chronic illness cannot be regarded simply as in need of medical care. That is, they believed that at some phase during the illness trajectory, persons with chronic illness and their spouses are likely to need counsel on deeply personal matters. Thus, it seems that well-timed and appropriate interventions might assist the chronically ill in shaping their illness trajectory in a more efficient and positive way, thereby improving life quality.

Quality of Life

Quality of life is becoming increasingly important as an outcome measure in health care research. According to the Agency for Health Care Policy and Research (1990), quality of life through the eyes of the client rather than the provider is the important issue. For the person with acute illness, improved quality of life often means having immediate symptomatic relief followed by being cured. For the person with chronic illness, interventions need to be directed toward the entire illness trajectory. Often these caring interventions are used in an attempt to improve or maintain life quality. However, the scientific base for quality of life interventions is limited, as only within the past 7 years has consideration of quality of life as a measured variable in health care research been emphasized (Fletcher, Hunt, & Bulpitt, 1987; Greer, 1987; Levine, 1987; Miettinen, 1987; O'Young & McPeek, 1987; Spitzer, 1987; Troidl, Kusche, Vestweber, Eypasch, Koeppen, & Bouillon, 1987; Wenger, Mattson, Furberg, & Elinson, 1984a, 1984b; Wiklund, Lindvall, & Swedberg, 1986).

All health care interventions are being scrutinized in terms of their cost-benefit ratio. From a medical economics perspective, this scrutiny is particularly important when interventions involve high technology, and therefore, high costs. Continuing to channel scarce financial resources into development of high technology treatments that may or may not improve quality of life, while rationing health care to the disadvantaged, goes against the ethical principle of utilitarianism—providing the greatest good for the greatest number of people (Munson, 1988). Thus, interventions are being sought that are comparably less expensive but still are efficacious in maintaining or improving quality of life.

Nurses are in a unique position to assess and counsel persons with chronic illnesses and their families about strategies that might enhance life quality. These strategies could be used in conjunction with other interventions to enhance life satisfaction. However, many conceptual and measurement issues about quality of life as an outcome variable remain unresolved (Stewart, 1992). They are summarized below.

Defining Quality of Life

There is little consensus about the definition of quality of life and thus, the indicators with which to measure it. Wenger and her colleagues (1984a) included three domains within their quality of life framework: functional capacity (daily routine, social, intellectual, emotional, economic), perceptions (health status, well being), and symptoms (disease under study, other illnesses). Wenger (1986) defined quality of life as: "...a wide range of capabilities, limitations, symptoms, and psychosocial characteristics that describe a person's ability to perform a variety of roles and to derive satisfaction or enjoyment from these roles" (p. 122). Wiklund and colleagues

(1986) also incorporated other dimensions within their quality of life definition: "the individual's capacity to function within the context of work, social role, and family; his physical, emotional, mental, and intellectual capacity; his perception of and satisfaction with the way in which he functions" (p. 1).

Flanagan's (1982) approach to defining quality of life also was holistic. He developed the Quality of Life Scale domains inductively by asking two critical-incident questions of 3000 subjects (500 men and 500 women in each of three age groups: 30, 50, and 70 years old). Small groups of individuals representing a wide range of socioeconomic levels were asked such questions as the following:

> 1. Think of the last time you did something very important to you or had an experience that was especially satisfying to you. What did you do or what happened that was so satisfying to you?
> 2. Think of a recent time that you could not do something you very much wanted to do or could not have something you very much wanted to have. What did you want to do or have that you could not do or have? (p. 57)

About 6500 critical incidents were collected. These incidents were clustered according to similarities, and their classification was evaluated by several independent judges. Fifteen categories of critical incidents emerged and could be placed within five domains:

1. Physical and material well-being
    - A. Material comforts—desirable home, food, conveniences, security
    - B. Health and personal safety
2. Relations with other people

   A. Relationships with relatives
   B. Having and rearing children
   C. Close relationship with spouse or member of opposite sex
   D. Close friends—sharing views, interests, activities
3. Social, community, and civic activities
   A. Helping and encouraging others
   B. Participating in governmental and local affairs
4. Personal development and fulfillment
   A. Learning, attending school, improving understanding
   B. Understanding yourself and knowing your assets and limitations
   C. Work that is interesting, rewarding, worthwhile
   D. Expressing yourself in a creative manner
5. Recreation
   A. Socializing with others
   B. Reading, listening to music, or watching sports, other entertainment
   C. Participation in active recreation. (Flanagan, 1982, p. 57)

Although health status of the participants was not specified, Flanagan considered the Quality of Life Scale valid for people in general. He recommended studying quality of life in the disabled by focusing on problems specifically created by their disabilities.

Few researchers have assessed quality of life domains specifically in persons who are disabled or chronically ill. Bostick (1977) and Crewe (1980) found no evidence that persons disabled from spinal cord injury identified different quality of life domains from non disabled persons. Friedman and co-investigators (1985) proposed a two-domain, quality of life taxonomy consisting of functions (social, physical, emotional, and intellectual) and perceptions (life satisfaction and health status). Pearlman and Uhlmann (1988) studied the chronically ill elderly using the taxonomy of Friedman and his colleagues, and found that these two quality of life dimensions (functions and perceptions) are similar across elderly persons with arthritis, coronary heart disease, pulmonary disease, diabetes, and cancer.

Burckhardt and her colleagues (1989) assessed life quality of persons with one of four chronic illnesses or conditions: diabetes mellitus; ostomy secondary to colon cancer or colitis; osteoarthritis; and rheumatoid arthritis. The purposes of their study were: (a) to identify what terms were used by the study participants to describe their quality of life; (b) to compare these terms with the domains identified by Flanagan (1982); and (c) to evaluate the internal consistency reliability, temporal stability, and construct validity of the Quality of Life Scale.

Overall, the participants in all four groups used similar terms to describe quality of life. All but one of the specific items generated could be placed within the existing Flanagan Quality of Life Scale domains. The theme that could not be placed was *independence*, or being able to do for oneself. Thus, Burckhardt and her colleagues (1989) recommended adding an independence-related item to increase the content validity of the Quality of Life Scale for use in chronic illness groups.

Satisfaction with life quality was assessed using the 7-point Delighted-Terrible Scale developed by Andrews and Crandall (1976). Burckhardt and her co-investigators (1989) thought that this rating method would be more sensitive and less negatively skewed than the 5-point satisfaction scale, possibly because of a wider range of affective responses. Using this 7-point scale, Cronbach's alphas for the Flanagan Quality of Life Scale ranged from .82 to .92, and test-retest reliabilities ranged from .76 for a 6-week interval to .78 and .84 for two 3-week intervals. Thus, adequate internal consistency reliability and temporal stability were demonstrated.

To evaluate construct validity, Burckhardt and her group tested three hypotheses:

1. Because the ostomy group has a stable condition, they will have a significantly higher mean score on the Quality of Life Scale than the diabetic group, who have an unstable condition (known groups technique).
2. Because the Life Satisfaction Index and the Quality of Life Scale are conceptually related, they will be highly positively correlated (convergent validity).
3. Because the Duke-UNC Health Profile, Arthritis Impact Measurement Scale, and the Ostomy Adjustment Scale all measure health status, a concept distinct from quality of life, they will have low-to-moderate significant correlations with the Quality of Life Scale (discriminant validity). (pp. 350-351)

Hypothesis 1 was supported: Quality of Life Scale scores were higher in the ostomy group compared to the diabetic group (82.3 vs. 74.1; neither *t* nor *p* values reported). The correlations between the Quality of Life Scale and the Life Satisfaction Index were highest of any correlations (*r* = .67, .75, and .72 over the 3 time periods), supporting Hypothesis 2. Hypothesis 3 also was supported by the low-to-moderately high correlations between the Quality of Life Scale and the other health-related scales (*r* =.25 to .73 over the 3 time periods), with a median absolute-value correlation that was moderate (*r* =.44).

Response dimension. Stewart (1992) asked what about each quality of life domain is of interest, that is, what is the response dimension? For example, is the response dimension *satisfaction* with the domain (e.g., satisfaction with health), *limitations* in the domain (e.g., limitations in the daily routine), or *limitations* from a particular disease condition (e.g., coronary heart disease). Additionally, she noted that, for symptoms, assessment can be made of whether or not they are occurring, their frequency or intensity, or if they are bothersome.

In many medical trials of cardiovascular therapies, *limitations from heart disease* often was the response dimension from which quality of life was derived. That is, the investigators considered the patient's symptoms and objective physiologic indicators of heart disease, such as chest pain, exercise tolerance, or ejection fraction as *the* indicators of life quality (Anturane Reinfarction Trial Research Group, 1978; Beta-Blocker Heart Attack Trial Research Group, 1982; CASS Principal Investigators and their Associates, 1983; Hypertension Detection and Follow-Up Program Cooperative Group, 1979; Lipid Research Clinics Program, 1979; Multiple Risk Factor Intervention Trial Research Group, 1982; Norwegian Multicenter Study Group, 1981). Deriving information about quality of life frequently is done under the beneficence model of health care practice—that of the provider knowing what is in the best interest of the patient (McCullough, 1984). Many clinicians also use the beneficence model in making treatment decisions in the interest of the patient's and family's quality of life. Not only is professional assessment of functional or physiologic indices as the only indication of quality of life paternalistic, it also may not be congruent with patient perceptions of life quality (Mayou & Bryant, 1987; Sugarbaker, Barofsky, Rosenberg, & Gianola, 1982).

Burckhardt and colleagues' (1989) contended that *satisfaction* is the response dimension of interest, and that *perceptions of the individual* should be used in quality of life evaluation. Similarly, direct assessment of quality of life is the approach advocated by many other nurse researchers (Cowan, Graham, & Cochrane, 1992; Ferrans, 1990; Padilla, in press; Penckofer & Holm, 1984). Jalowiec (in press) argued for multidimensional assessment using both subjective and objective measures. She included life satisfaction as only one of six indicators of quality of life, the others being survival, functional status, work ability, compliance, and satisfaction with the medical intervention. From a medical economics perspective, inclusion of the other five indicators might be justifiable, but from a holistic nursing perspective, it seems that the satisfaction of the *person* and his or her family is paramount. Additionally, each of the other five indicators could be reflective of constructs other than life quality, such as investigator bias.

Burckhardt and colleagues' (1989) definition of quality of life as "subjective satisfaction" (p. 348) was congruent with that of Penckofer and Holm (1984) who believed that quality of life consists of "the perceptual component of overall satisfaction with life" (p. 60). In this study, Burckhardt's definition of quality of life as satisfaction with life was used. The domains identified by Flanagan (1982) and modified by Burckhardt (1989) were the areas of life satisfaction evaluated by each respondent.

Variables as Quality of Life Domains versus Quality of Life Predictors

Stewart (1992) argued that a great deal of confusion remains between components and determinants of quality of life. That is, were the components of quality of life identified by Wenger (1984a), Wiklund (1986), Flanagan (1982), and Burckhardt (1989) domains or predictors of life quality? For example, health was identified as a dimension of life quality. However, it seems likely that good health would predict higher life quality, and poor health would predict lower life quality. While this confusion is not apt to be resolved in the near future, the lack of agreement among theorists suggests that the conceptual specification of quality of life and its indices should be examined carefully in relation to associated variables in each data set.

Quality of Life Measurement Issues

Disagreement about how to measure quality of life is apparent. Use of a single, global index might not convey any clues about why functioning may be impaired or may neglect important quality of life dimensions, whereas use of multiple instruments may have serious restrictions in terms of feasibility, design, and costs (Frank-Stromberg, 1988).

A number of researchers (Kaplan & Coons, in press; Schron & Shumaker, in press) advocated for the use of *health-related* quality of life as *the* outcome variable in health care research. According to Schron and Shumaker (in press), the only two health outcomes that are important to the public and to health policy are life expectancy (all-cause mortality) and how people function (life quality). This position implies that persons who have a chronic illness cannot have as high a quality of life as a person without chronic illness. Burckhardt and her colleagues (1989) posited that, if subjective indicators were used, data would not support this position.

Jalowiec (in press) combined health-related quality of life measures with life satisfaction indices for a more holistic approach. Although many measures of health-related quality of life have been developed, some have been designed for use with any acutely ill or chronically ill population (e.g., Duke-UNC Health Profile), and others have been formulated to be disease specific (e.g., Arthritis Impact Measurement Scale). Disease-specific indicators are important for monitoring the course of a disease, but do not allow cross-comparisons of groups with different diseases or chronic illnesses, thus decreasing generalizability and usefulness of the findings. Burckhardt and her colleagues (1989) advocated for an instrument that uses the person's perceptions and that includes all domains of life relevant to persons with chronic illness.

Quality of Life in Persons with Chronic Illness

Cross-comparison of general quality of life measures among different chronic illness populations would be important in clinical trials of nursing therapeutics since nursing strategies often are not disease specific (Burckhardt et al., 1989). In this study, the Flanagan Quality of Life Scale (1982), with the addition of an independence domain as suggested by Burckhardt and her colleagues, provided a general outcome measure of life quality thought to be valid for use in persons with chronic illness.

The importance of quality of life as an outcome measure is well recognized. Its responsiveness to nursing interventions, however, is not known. It may be that its global nature renders it relatively insensitive to change. If predictors of quality of life could be identified that were within the realm of nursing practice, were less global than life quality and, thus, were more sensitive to change as a result of nursing interventions, the beneficial effects of nursing strategies could be documented. Health researchers have identified a number of health-related predictor variables associated with quality of life upon which their practice can have an effect. In addition to variables used to characterize the disease, these health-related predictors have approximated comfort (physical and emotional) and functional capacity. Within the framework of Strauss (Corbin & Strauss, 1988; Strauss et al., 1984), comfort and functional capacity could be considered as chronic illness trajectory work variables. Variables used to characterize the disease could be used to describe the shape of the trajectory. Researchers have used these health-related variables along with self esteem, social support, and certain demographic variables to explain the variance in quality of life. Another construct, the sense of coherence, proposed by Antonovsky (1979, 1987) to be necessary for successful coping with stressors (e.g., the ramifications of chronic heart disease and cardiac arrest survival) may be an important predictor of quality of life. If sense of coherence contributes additionally to explained variance in quality of life, it may prove to be more responsive than quality of life as an outcome measure of the beneficial effects of nursing interventions.

Salutogenic Theory

Antonovsky (1979, 1987), a medical sociologist, initially was intrigued by why some holocaust survivors did well in their everyday lives while others, exposed to the same conditions, did poorly. He proposed the salutogenic theory to explain why persons during times of extremely stressful conditions remain healthy. The salutogenic theory is in contrast to, but complementary with, the pathogenic theory, which traditionally is used within the medical model and focuses on why persons get sick. The salutogenic theory asks why people stay healthy, rather than why they become ill—the question asked within the orientation of the traditional medical model.

Antonovsky (1979) contended that this pathogenic paradigm has at its core a dichotomous classification of patients as *healthy* or *diseased*. He believed that focusing on a specific disease narrows one's search to specific, disease-relevant factors. In contrast, Antonovsky viewed health on a continuum, with the poles labeled as *ease* and *dis-ease*. This conceptualization facilitates inquiry about generalized factors relevant to many diseases.

Ease / Dis-ease Continuum

The ease / dis-ease continuum was defined using 4 facets: pain, functional limitation, prognostic implication, and action implication (Antonovsky, 1979). However, persons with coronary heart disease surviving a cardiac arrest experience symptoms other than pain, such as shortness of breath, fatigue, palpitations, or electrical shocks from the implantable cardioverter-defibrillator. Thus, if *pain* were changed to *discomfort*, then other symptoms that may be equally distressing could be considered.

Antonovsky (1979) used the technique of sentence mapping to obtain an individual's ease / dis-ease profile. Table 2-1 illustrates the sequence for

Table 2-1

Mapping-Sentence Definition of the Health Ease / Dis-ease Continuum

	A. Discomfort	
Breakdown is any state or condition of the human organism that is felt by the individual to be	1. not at all 2. mildly 3. moderately 4. severely	uncomfortable;
	B. Functional Limitation	
that is felt by him/her to be	1. not at all 2. mildly 3. moderately 4. severely	limiting for the performance of life activities self-defined as appropriate;
	C. Prognostic Implication	
that would be defined by the health professional authorities as a	1. not acute or chronic 2. mild, acute, and self-limiting 3. mild, chronic, and stable 4. serious, chronic, and stable 5. serious, chronic, and degenerative 6. serious, acute, and life threatening	condition;
	D. Action Implication	
and that would be seen by such authorities as requiring	1. no particular health-related action 2. efforts at reduction of known risk factors 3. observation, supervision, or investigation by the health care system 4. active therapeutic intervention	.

For example, breakdown is any state or condition of the human organism that is felt by the individual to be *moderately* uncomfortable; that is felt by him/her to be *moderately* limiting for the performance of life activities self-defined as appropriate; that would be defined by the health authorities as a *serious, chronic, degenerative* condition; and that would be seen by such authorities as requiring *active, therapeutic intervention.*

Note. Modified from *Health, Stress, and Coping* (p. 65) by A. Antonovsky, 1979, San Francisco: Jossey-Bass Publishers.

sentence-mapping of the ease / dis-ease profile using the revised facet of physical discomfort. For example, a profile of 1-1-1-1 would represent the highest point on the *ease* end of the continuum, whereas a profile of 4-4-6-4 would represent the lowest point at the *dis / ease* pole. For the cardiac arrest survivor, the initial profile would be variable for comfort and functional limitation, but fixed for prognostic implication and action indication (_-_-6-4). For the survivor receiving an implantable cardioverter-defibrillator, prognostic implication and action potential probably could be upgraded to 4-5 and 3, respectively. Antonovsky did not address exactly how one would map the profile of an individual with multiple chronic illnesses. Thus, the ease / dis-ease profile seems to have theoretical usefulness but practical limitations.

Sense of Coherence

Antonovsky (1987) defined the sense of coherence, the key construct of the salutogenic model, as

> a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (1) the stimuli deriving from one's internal and external environments in the course of living are structured, predictable, and explicable; (2) the resources are available to one to meet the demands posed by these stimuli; and (3) these demands are challenges, worthy of investment and engagement. (p. 19)

Antonovsky believed that there are three domains within the sense of coherence construct: comprehensibility, manageability, and meaningfulness. *Comprehensibility* was defined as "the extent to which one perceives the stimuli ... as making cognitive sense..., ordered, consistent, structured, and clear, rather than as noise—chaotic, disordered, random, accidental, inexplicable" (Antonovsky, 1987, pp. 16-17). A person with high comprehensibility would expect stimuli to be predictable, or at least orderable and explicable. Regardless of the nature of the stimuli, sense could be made of them.

Manageability was defined as "the extent to which one perceives that resources are at one's disposal which are adequate to meet the demands posed by the stimuli that bombarded one" (Antonovsky, 1987, p. 17). These resources might be under one's own control or under the control of legitimate others. A person with a high sense of manageability would not feel victimized or treated unfairly, and thus would be able to cope and not grieve endlessly.

Meaningfulness was thought to represent a motivational element, and was defined as "the extent to which one feels that life makes sense emotionally, that at least some of the problems and demands ... are worthy of commitment and engagement,...are challenges" (Antonovsky, 1987, p. 18). A person with high meaningfulness willingly would take the challenge, determined to seek meaning in it, and would do the best to overcome it with dignity.

Generalized resistance resources. Antonovsky posited that "a strong sense of coherence is crucial to successful coping with ubiquitous stressors of living and hence to health maintenance" (1987, p. 165). He identified 10 major psychological generalized resistance resources that result in life experiences of *consistency*, *participation in shaping outcome*, and *underload-overload balance*, which Antonovsky hypothesized strengthens the sense of coherence. These generalized resistance resources are: material;

knowledge/intelligence; ego identity; coping strategy: rational, flexible, farsighted; social supports, ties; commitment: continuance, cohesion, control; cultural stability; magic; religion, philosophy, art: a stable set of answers; and preventive health orientation. Additionally, Antonovsky believed that "good health status facilitates the acquisition of other generalized resistance resources" (1979, p. 185).

Operationalization. Antonovsky (1987) operationalized the sense of coherence by conducting a pilot study using qualitative interviews of persons known to have undergone severe trauma with inescapable severe life consequences but thought to be doing well. The sample consisted of 51 persons and, except for four teenagers, ranged in age from 21 to 91. There were 30 men and 21 women. All interviews were conducted in Israel in the homes of the respondents. All were Jewish, but the sample was very heterogeneous on marital/family status and occupation. Interviews, lasting from one to three and one-half hours, revolved around the question "Would you please tell me about your life?" The transcribed interviews were read by three colleagues, who independently classified each respondent as having a strong, moderate, or weak sense of coherence. Moderate agreement about classification was obtained, supporting some degree of consensual validity. Then the interviews of the 16 persons who were classified as having a strong sense of coherence were reviewed for commonalities.

Based on data obtained from these interviews, a 29-item Sense of Coherence Questionnaire was developed. Content validity was assessed by a four-member panel consensus on appropriateness and categorization of each item. Further evidence of validity was established by the differences in mean scores among samples that were expected to differ. The Sense of Coherence Questionnaire has been used in a number of studies, both in Hebrew and in English. Scores ranged from 62 to 189 (*SD* 26.45) in New York State production workers, from 101 to 192 (*SD* 17.15) in Edmonton health workers, and from 109 to 203 (*SD* 17.19) in Israeli officer trainees. Thus, the distribution of responses seemed to indicate that the Sense of Coherence Questionnaire makes considerable distinction among members of different populations. Heterogeneity of responses was apparent for the three samples cited above (coefficient of variation = .149, .108, and .115, respectively). High Cronbach's alphas (.84 to .93) demonstrated good internal consistency reliability.

Principal components factor analysis did not support the development of subscales for the Sense of Coherence Questionnaire. Thus, although theoretically separate, the three domains of comprehensibility, manageability, and meaningfulness are evaluated by a total score. Based on his psychometric study, Antonovsky (1987) chose 13 of the original 29 items as a short-form version of the Sense of Coherence Questionnaire.

Changing the sense of coherence. Antonovsky (1987) believed that the sense of coherence is crystallized around the age of 30 years. He thought that persons with a strong sense of coherence can remain more or less at that level since he or she can "suck orderliness from the environment which counterbalances the pressure toward disorder" (1987, p. 121).

Antonovsky (1987) proposed that there can be both temporary and permanent changes in the sense of coherence. Temporary changes involve fluctuations about the individual's mean sense of coherence. For example, the person with a strong sense of coherence who sustained and survived a cardiac arrest would be knocked off balance. Likewise, a person with a weak sense of coherence who battled his or her insurance company to cover costs of electrophysiologic studies and cardioverter-defibrillator implantation and won might suddenly see the world differently. Even though the changes were temporary and these persons soon would return to their mean, the importance of the changes should not be diminished. Unfortunately, Antonovsky did not define what he means by *temporary*.

Antonovsky (1987) posited that the sense of coherence can increase permanently if the person sought out sense of coherence-enhancing experiences. For example, assertiveness training might begin to reestablish control and manageability in one's daily life. Antonovsky viewed permanent change in the sense of coherence as the most important. He did not address the relative importance that individual sense of coherence components might have in initiating a change. However, one might postulate that if meaningfulness was the component that was enhanced, a more permanent strengthening of the sense of coherence might result. He suggested that, for persons with a moderate or weak sense of coherence, permanent decreases might occur if sense of coherence-diminishing experiences were encountered repeatedly. For example, following a cardiac arrest, if the person's child died, if the person's spouse decided to divorce, or if the person lost his or her job, these cumulative and major losses might diminish the sense of coherence more than temporarily.

Comparison to quality of life. The sense of coherence and quality of life are thought to be distinct constructs, yet with some degree of overlap.

Sense of coherence is a personality orientation of confidence in one's ability to make order of one's world, to manage or to delegate management of the problems in one's world, and to view life as meaningful, thus having the motivational drive to confront one's problems. Selection of appropriate coping strategies that maintains or enhances one's sense of comprehensibility, manageability, and meaningfulness provides the feedback to maintain or strengthen one's confidence. Quality of life is defined as the subjective satisfaction with physical and material well being; relations with other people; social community, and civic activities; personal development and fulfillment; recreation; and independence. Each of these areas has the potential to be viewed as chaotic and unpredictable, to result in multiple problems requiring management, and to provide meaningfulness from which motivational drive can be derived. Thus, the theoretical distinction between the constructs is seen in their definitions: personality orientation versus satisfaction. Evidence for the distinction also is apparent from their indicators, the Sense of Coherence Questionnaire (Short Form) and the Modified Flanagan Quality of Life Scale. (See Appendix A for all measures used in this study.) Quality of life is assessed by *satisfaction* with life domains (e.g., being delighted with material comforts, helping and encouraging others, or independence), whereas sense of coherence is evaluated by one's *affective pattern of responses* to life situations (e.g., very often feeling that one is in an unfamiliar situation without knowing what to do; never or seldom feeling that one is being treated unfairly; and very often not caring about what is going on in one's own world).

Some degree of overlap of the constructs exists at both the theoretical and measurement levels. Theoretical similarities occur as life situations take place within the *context* of life domains. There is overlap at the measurement level within the context of relationships and when evaluating meaningfulness. “Being surprised at the behavior of people whom you thought you knew well” (Appendix A, item C2) and “being disappointed by people who you counted on” (item C3) takes place within the context of relationships with other people—spouse (item Q5), children (item Q4), relatives (item Q3), and close friends (item Q6). Likewise, with measurement of meaningfulness, 4 items on the sense of coherence scale (C1, C4, C7, and C12) overlap with a quality of life item (satisfaction with “understanding yourself: knowing what life is about;” item Q10). Measurement of meaningfulness seems to have the greatest degree of overlap on the two scales. However, of the 16 quality of life items, only 1 seems directly reflective of satisfaction with meaning.

Persons with a strong sense of coherence would be expected to select optimal personal experiences for his or her life situation in order to enhance quality of life. That is, when confronting a stressor situation, they would have the ability “to choose what seems to be the most appropriate strategy from among the variety of potential resources available” (Antonovsky, 1987, p. 140). Thus, a relationship between the constructs would exist since quality of life is the satisfaction with the end result of the success or failure of one’s coping strategies on life domains. The findings of Sagy, Antonovsky, and Adler (1990) confirmed that these two constructs are strongly and positively related ($r = .54$, $p < .001$). Measurement overlap also existed in their study between 5 items of life satisfaction (family life, personal relations with other people, standard of living, spiritual or nonmaterial life, and life as a whole, rated on a 9-point scale of *the worst possible situation...the best possible situation*) and the 29-item version of the Sense of Coherence Questionnaire. The contribution of measurement overlap to the relationship between sense of coherence and quality of life in the study of Sagy and colleagues (1990) or to the findings of this study remains unclear.

Comparison to other constructs. The enduring quality of the sense of coherence is in contrast to the conceptualization of discrete life stressors (e.g., death of a spouse, divorce) by Holmes and Rahe (1967). Thus, the sense of coherence is considered to be more of a trait characteristic than a state characteristic. Antonovsky (1987) posited that responses to these stressor life events is determined by the strength of the sense of coherence. Lazarus and Folkman (1984) believed that "psychological stress is a relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (p. 21). Like Holmes and Rahe, at times Lazarus and Folkman also focused on proximal and discrete events, while at other times they included chronic environmental conditions, ongoing worries or concerns, and distressed emotional reactions within their conceptual framework. Antonovsky believed Lazarus (1984) came closest to his own position when he hypothesized that what may be most important are "the powerful hassles that have major significance for a person's long-range values and goals that create a pattern of vulnerability" (Antonovsky, 1987, p. 376).

Antonovsky (1987) compared the sense of coherence to Kobasa's (1979, 1982) hardiness concept, in which she conceptualized three components: commitment (self-involvement, low alienation); challenge (change is normative); and control (internal locus of control, low powerlessness). He believed her concepts of *commitment* and *control* were parallel to his concepts of *meaningfulness* and *manageability*. From Kobasa's (1979) early work, *perception of personal stress* also emerged as a significant factor in differentiating between high stress/low illness executives and high stress/high illness executives ($p < .01$). Although she has not continued her examination of this variable, it seems that it might be congruent with Antonovsky's comprehensibility component. Antonovsky's concept of manageability is similar to Archbold and Stewart's (Archbold, Stewart, Greenlick, & Harvath, 1990) concept of *preparedness* that has evolved from their research on caregiver role strain. The sense of permanence (Boyce, Shaefer, & Uitti, 1985) had as its major theme the central valued elements of life experience, which was congruent with Antonovsky's *meaningfulness*.

Lewis (1989, 1991) used concepts of control, meaningfulness, and coherence in her work with persons with cancer and their families. Within the framework of attribution theory, she viewed *cognitive control* in persons with advanced cancer as a way of reducing anxiety and protecting self concept. That is, by relinquishing control of health status to external forces, externally attributed control would mediate the deleterious effects of the disease process and allow a shift in emphasis to areas in which control can be maintained (e.g., one's attitude or daily activities). Her unpublished Coherence Scale (comprised of four subscales: certainty, cognitive control, trust, and personal effectiveness) served as an indicator of cognitive control (1991). Unlike Antonovsky (1987) who envisioned control (i.e., manageability) and meaningfulness as separate domains of coherence, Lewis conceptualized that deriving meaning from the cancer experience was one form cognitive control.

Wagnild and Young (1990) studied resilience among older women. They noted that the term *resilience* connotes emotional stamina and describes persons displaying courage and adaptability in the wake of hardship. Their purposive sample was composed of women who were thought to have adjusted successfully to a major loss. Thus, both Antonovsky (1987) and Wagnild and Young used a salutogenic approach to compose their purposive samples. Five themes emerged from Wagnild and Young's qualitative analysis: equanimity, or "having a balanced perspective of one's life and experiences"; perseverance, or "persistence despite adversity or discouragement"; self reliance, or "a belief in oneself and capabilities"; meaningfulness, or "the realization that life has a purpose and the valuation of one's contributions"; and existential aloneness, or "the realization that each person's life path is unique...some experiences are shared...others...must be faced alone" (pp. 253-254). Wagnild and Young believed that these themes were suggestive of mechanisms of flexibility and the ability to restore balance following a difficult experience. They felt that resilience allowed the participants "to integrate the event into the backdrop of their total life experience" (p. 255). The constructs *resilience* and *sense of coherence* seem to have a number of commonalities. First, the resilience theme of equanimity was similar to underload-overload balance, a life experience identified by Antonovsky as strengthening the sense of coherence. Second, meaningfulness was identified both as a theme of resilience and as a domain of sense of coherence. Lastly, having flexibility in choosing a strategy to cope with a stressor is a hallmark of the sense of coherence (Sagy et al., 1990).

It is not known to what extent the sense of coherence overlaps with self esteem. Antonovsky (1987) believed repeated life experiences, beginning in childhood through early adulthood, structure the sense of coherence. Thus, a strong, moderate, or weak sense of coherence develops over time and is thought to be rather stable. However, Antonovsky posited that sense of coherence is not rigidly fixed. Dimond and Jones (1983) contended that development of self esteem occurs throughout the life span, in large part from social interactional experiences. They believed that the growth of self esteem is uneven, depending upon feelings of security and comfort with self-acknowledged limitations and capabilities. They described self esteem as being "rarely static" (p. 68). Thus, it seems that their development is concurrent. Cooley (1902) described the *self* as having three components: one's imaging of how one appears to another person, one's imaging of another's judgment of that appearance, and self feeling. Antonovsky (1987) identified *ego identity* as only 1 of 10 generalized resistance resources that shaped the sense of coherence. He considered the central concepts of ego identity to be: "a sense of the inner person, integrated and stable, yet dynamic and flexible; related to social and cultural reality, yet with independence, so that neither narcissism nor being a template of external reality is needed" (p. 109). Antonovsky viewed the difference between ego identity and sense of coherence as *a picture of oneself* versus a *picture of one's world*. Sagy, Antonovsky and Adler (1990) contended that persons having a strong sense of coherence choose life experiences that offer the greatest amount of ego involvement and that are most consistent with their self concept. Thus, the relationship between sense of coherence and self esteem would appear to be based on: (a) their concurrent development; (b) the picture one has of oneself in one's world; and (c) the positive reinforcement of both ego identity and sense of coherence by successful life experience as a result of appropriately chosen coping strategies.

At least two other groups of investigators used salutogenic approaches. Moos (1984) was concerned with how "people shape acceptable resolutions to difficult circumstances while some not only manage to survive but also to mature in the face of overwhelming hardships" (pp. 6-7). Werner and Smith (1982,) studied stress-resilient children on Kauai. Although exposed to poverty, biological risks, and family instability, they noted that "some children remained invincible and developed into competent and autonomous young adults" (p. 3). Their concepts of *structure and rules* and *internal locus of control* may be congruent with Antonovsky's *comprehensibility* and *manageability*.

Relevance to Nursing Theory, Practice, and Research

Theory. Use of the salutogenic theory by nurses might help in identifying specific coping strategies used by persons who are able to remain well (or satisfied with their life quality) in spite of experiences or situations that would suggest the opposite. This approach is congruent with the focus of nursing practice and research—promotion of wellness and the facilitation of coping strategies for the patient and his or her family to use in shaping the illness trajectory. Sullivan (1989) believed that nurse theorists should remain open to health-oriented conceptual models that have relevance to nursing even if developed in other disciplines. Based on the analytic strategy devised by Fawcett (1984), Sullivan's evaluation found Antonovsky's salutogenic theory to be explicit, comprehensive, logically congruent, and to have social significance, congruence, and utility. Thus, if sense of coherence contributes to quality of life in persons with chronic illness, and if coping strategies of chronically ill persons with high life quality could be identified, then specific interventions could be developed and tested to strengthen coping abilities of chronically ill persons with lower quality of life.

Practice. Antonovsky (1987) posited that having consistency, participating in shaping of an outcome, and having underload-overload balance strengthen the sense of coherence. He saw three ways in which professionals willing to assume some responsibility for the relationship between psychosocial factors and health could influence the sense of coherence. The first two ways involved temporary changes and were based upon the ethical principles of beneficence and nonmaleficence. To provide a temporary strengthening of the sense of coherence, he suggested that health professionals structure their patient interactions in such a way as to raise the sense of coherence above its mean level (or at least not to lower it). He believed the question to be asked of each patient/clinician encounter involves whether or not the patient sees the encounter as consistent, balanced, and meaningful, or the contrary. Although he recognized that both the patient and the professional may have been socialized into their respective traditional roles, he believed that there are still "degrees of freedom" (Antonovsky, 1987, p. 125) within the social structure of the encounter. Further, he felt that the professional has autonomy and discretion, and that social structures have room for change.

Antonovsky (1987) believed that the third way a health care professional might influence an individual's sense of coherence would be to empower that person to improve permanently his or her sense of coherence. However, this method seems much more difficult and may require an extensive commitment. For an example of this type of change, Antonovsky cited Coser's (1963) experience of redefining a ward for the terminally ill as a *rehabilitation unit*. Persons with coronary heart disease surviving a cardiac arrest have long-term relationships with their health care professionals and, therefore, might be able to be empowered by them. Frequently, persons with heart disease participate over many years in cardiac rehabilitation programs for risk factor modification. Either an electrophysiology or arrhythmia management clinic, or a cardiac rehabilitation program could provide a long-term, structured situation to enhance comprehensibility (e.g., via education), manageability (e.g., via risk factor modification or delegation of certain responsibilities to legitimate others), and meaningfulness (e.g., via a support group discussing how similar challenges were met). In the face of events threatening to lower the sense of coherence, it seems likely that one-to-one counseling and a support group might at least maintain the baseline sense of coherence level.

Research. Questions have arisen from clinical practice that are not explained by the pathogenic paradigm. Specifically, all other health-related variables apparently being equal, why do some persons with chronic heart disease who have survived a cardiac arrest seem to have a high quality of life while others have a lower quality of life? Much of the research base, knowledge, and practice of nursing is grounded on the traditional medical paradigm that focuses on curing patients. However, persons with chronic illness cannot be cured. Chronic illness is the most prevalent type of illness in America today. Thus, in the long term, chronically ill persons seem a better "fit" with a caring role that involves maintenance or restoration of wellness, as well as facilitation of coping strategies useful for reducing and making more efficient the work involved in shaping the trajectory. The salutogenic theory may provide a perspective congruent with nursing's caring role that would be useful in addressing unanswered practice questions.

Relationships between the Theories

A Chronic Illness Theory and the Salutogenic Theory

The Y-axis of the four examples of illness trajectories that were illustrated in Figure 2-1 was not made explicit (Corbin & Strauss, 1988; Strauss et al., 1984). Figure 2-2 illustrates three possible illness trajectories, with the ease / dis-ease continuum (Antonovsky, 1979) as the vertical axis. Thus, the salutogenic theory would ask why persons with anticipated problematic chronic illness trajectories are able to shape their trajectory in such a way as to maintain stability or initiate successful comeback phases. The fit between the three sense of coherence domains and trajectory work is displayed in Table 2-2.

Salutogenic Theory and Quality of Life.

As presented in Table 2-3, nine of the generalized resistance resources identified by Antonovsky (1979) as resulting from having consistency, participating in shaping an outcome, and having underload-overload balance can be obtained within the context of the quality of life domains identified by Flanagan (1982) and Burckhardt (1989).

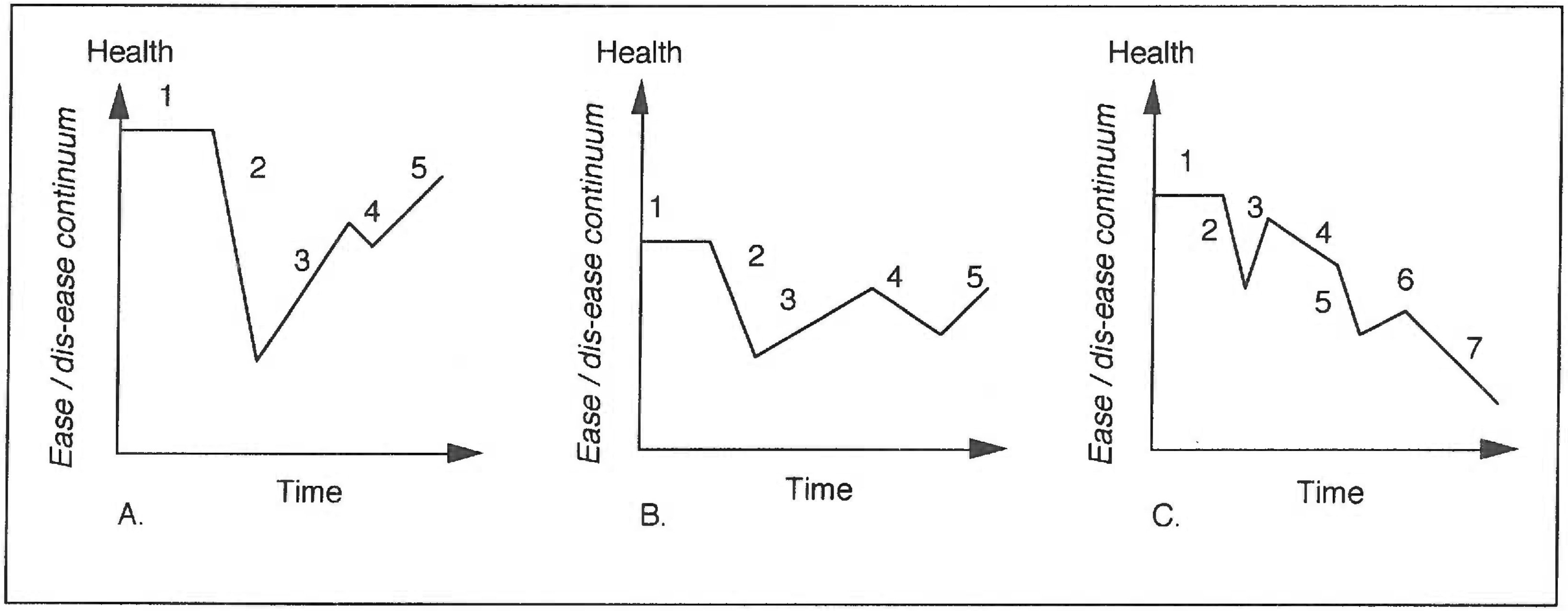

Figure 2-2. **Three Possible Cardiac Arrest Illness Trajectories. A**. (1) Apparent excellent health, (2) followed by cardiac arrest as the first coronary heart disease symptom, resuscitation and treatment, (3) a comeback phase, (4) a minor arrhythmic episode, and (5) another comeback phase. **B**. Unstable trajectory: (1) Moderate health characterized by a 1-year history of angina, (2) followed by cardiac arrest, resuscitation and treatment, (3 and 5) comeback phases, and (4) an acute myocardial infarction. **C**. Deteriorating trajectory: (1) Good health followed by (2) cardiac arrest, resuscitation and treatment, (3 and 6) comeback phases, and acute (4) arrhythmic, (5) anginal, and (7) failure episodes.

Note. The idea for the ease / dis-ease continuum is from *Health, Stress and Coping* by A. Antonovsky, 1979, San Francisco: Jossey-Bass. The idea for illness trajectories is from *Unending Work and Care* by J. M. Corbin and A. Strauss, 1988, San Francisco: Jossey-Bass.

Table 2-2

The Fit between the Three Sense of Coherence Domains and Chronic Illness Trajectory Work

Sense of Coherence [a]	Trajectory Work [b]
Comprehensibility	To make order of the chaos of variability associated with acute and unstable phases
Manageability	To accomplish the trajectory shaping work
Meaningfulness	To have the motivation necessary to initiate a comeback phase, accommodate either to an unstable or a stable but diminished trajectory, and/or minimize the impact of coronary heart disease upon the family; to find meaning in the chronic heart disease and cardiac arrest

Note. [a] The data in column 1 were from *Unraveling the Mystery of Health* by A. Antonovsky, 1987, San Francisco: Jossey-Bass Publishers. [b] The data in column 2 were derived from *Unending Work and Care* by J. M. Corbin and A. Strauss, 1988, San Francisco: Jossey-Bass Publishers.

Table 2-3

Generalized Resistance Resources are Acquired within the Context of Quality of Life Domains

Generalized Resistance Resources[a]	***Quality of Life Domains***
Material	Material well-being[b]
Knowledge/intelligence	Personal development/fulfillment[b]
Ego identity	Personal development/fulfillment[b]
Coping strategy: rational, flexible, farsighted	Material well-being[b]; relationships with other people[b]; independence[c]
Social supports, ties	Relationships with other people[b]; social, community, civic activities[b]; recreation; independence[c]
Commitment	Relationships with other people[b]; social, community, civic activities[b]; personal development/fulfillment[b]
Cultural stability	Relationships with other people[b]; social, community, civic activities[b]
Religion, philosophy, art	Personal development/fulfillment[b]
Preventive health orientation	Independence[c]

Note. [a]The data in column 1 are from *Health, Stress, and Coping* by A. Antonovsky, 1979, San Francisco: Jossey-Bass Publishers. [b]These domains are from "Measurement of Quality of Life. Current State of the Art" by J. C. Flanagan, 1982, *Archives of Physical Medicine and Rehabilitation, 63.* [c]This domain is from "Quality of Life in Adults with Chronic Illness: A Psychometric Study" by C. S. Burckhardt, S. L. Woods, A. A. Schultz, and D. M. Ziebarth, 1989, *Research in Nursing and Health, 12.*

Chronic Illness Theory and Quality of Life

The shape of the chronic illness trajectory, the work involved in shaping the trajectory, and the impact of the disease on the patient and family (also influencing their ability to shape the trajectory) constitute an all-encompassing experience of accommodation to the illness. It seems apparent that this accommodation would affect each quality of life domain.

Theoretical Model Used in this Study

The proposed theoretical model of quality of life used in this study is presented in Figure 2-3. A number of hypotheses were made:

1. Sense of coherence will be strongly and positively related to quality of life.
2. The shape of the chronic illness trajectory, that is, its variability and phase, will be related to both sense of coherence and quality of life. If the shape of the trajectory is stable with only one or two episodes of cardiac arrest, then the relationships with both sense of coherence and quality of life will be positive.
3. Chronic illness trajectory work will be related to both sense of coherence and quality of life. If the trajectory necessitates greater work, then relationships with both sense of coherence and quality of life will be negative.
4. The shape of the chronic illness trajectory will be related to the trajectory work. If the trajectory is stable (as described in hypothesis 2), then this relationship will be negative.
5. Self esteem will be strongly and positively related to sense of coherence.

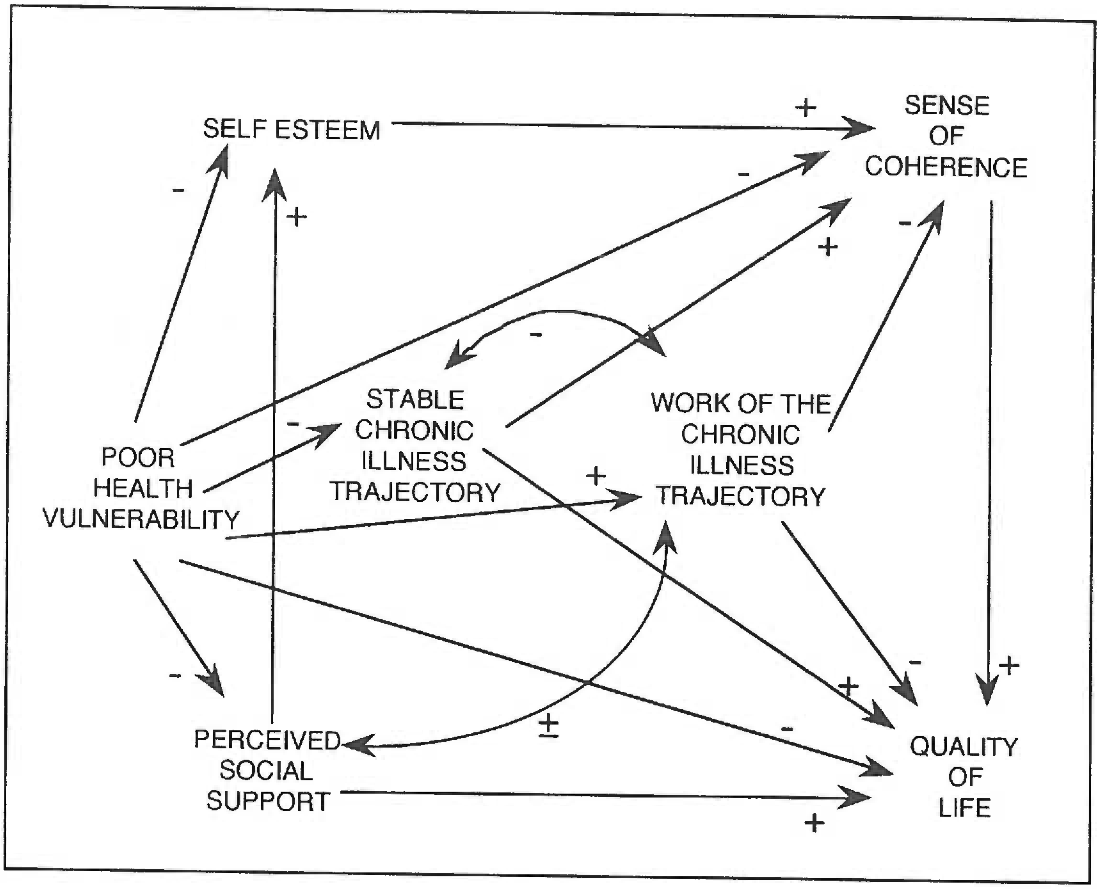

Figure 2-3. **Proposed Theoretical Model of Quality of Life in Persons with Coronary Heart Disease who have Survived a Cardiac Arrest.** The sense of coherence construct was hypothesized to be the predictor variable contributing the greatest amount to explained variance of quality of life.

6. Perceived social support will be positively related to both self esteem and quality of life.
7. There will be a bi-directional relationship between perceived social support and chronic illness trajectory work. The directionality of this relationship is unclear. That is, the more the trajectory work the greater perceived support; or the greater the perceived support the less the trajectory work.
8. There will be negative relationships between the social status variables representing vulnerability to poor health and all other variables except trajectory work. The relationship with trajectory work will be positive.

Theoretical Framework Comparison

Burckhardt has used the Flanagan quality of life paradigm as the basis for her own conceptual development of quality of life. The initial ideas about quality of life in this study drew heavily on hers. Although Burckhardt's original interest in quality of life concerned persons suffering from arthritis (1982, 1985), her recent work, as evidenced by her psychometric study (1989), has included other chronically ill populations. However, she has not made her chronic illness theory explicit. The chronic illness theory proposed by Strauss and his colleagues (1984) and expanded by Corbin and Strauss (1988) provides a theoretical foundation for the generalization of this work across chronic illness populations.

The process of stressor appraisal was a major difference between the stress and coping frameworks proposed in this study and used in Burckhardt's studies. Here, a salutogenic approach (Antonovsky, 1979, 1987) was taken in which successful coping results in a strengthened sense of coherence. In the Lazarus and Folkman (1984) paradigm used by Burckhardt, stressors were always appraised in terms of their potential threat to the individual—a pathogenic orientation. The salutogenic theory and its key construct, the sense of coherence, have not been used before in an attempt to explain the variance in quality of life in persons with chronic illness.

Review of the Literature

The literature review was organized around the proposed theoretical model as presented in Figure 2-3. It includes five main sections: social status variables related to poor health vulnerability, chronic illness trajectory shape variables, chronic illness trajectory work variables, self esteem, and social support.

Demographic variables were reconceptualized as social status variables related to poor health vulnerability and were reviewed from that perspective. The review of health-related predictor variables was organized to be congruent with the framework of the chronic illness theory as proposed by Strauss and his colleagues (1984) and expanded by Corbin and Strauss (1988). Two categorizations of traditional health-related variables were made: chronic illness trajectory shape variables and chronic illness trajectory work variables. Variables indicative of illness trajectory stability or instability and phase were classified as trajectory *shape* variables. *Work* variables were those indicative of the efforts required in shaping the trajectory. Additionally, the literature pertaining to self-esteem and social support is critiqued. Following is a critique of studies estimating explained variance of quality of life. Concluding this section is a brief summary of the literature relevant to introducing sense of coherence into the theoretical model of quality of life in persons with chronic illness.

Social Status Variables Related to Poor Health Vulnerability

Age, gender, race, marital status, and socioeconomic status were considered the social status variables related to poor health vulnerability. Vulnerability to poor health was thought to be primarily a result of older age and low socioeconomic status, and may be especially true for older women who live alone. Persons from minority groups are thought to have greater vulnerability to poor health than are persons from non-minority groups.

Socioeconomic status also was thought to influence quality of life; potentially, each of the six domains identified by Flanagan (1982) and modified by Burckhardt and her colleagues (1989) could be affected. Educational level was used often as an indicator of socioeconomic status (C. S. Burckhardt, personal communication, April, 1990). Education would seem to reflect not only the ability to be employed, but also the income derived from employment.

Thoits (1984) posited that disadvantaged persons are more vulnerable to undesirable life events, and thus reduced life satisfaction. She included women, the aged, the unmarried, and the poor in her classification of the disadvantaged. Thoits (1987) found that women in general have significantly higher anxiety and depression scores than men (p <.001), and that married persons have significantly lower anxiety and depression, regardless of gender (p <.05).

Wood, Rhodes, and Whelan (1989) reviewed published studies of gender differences in positive well-being. They concluded that women were found to report greater happiness and life satisfaction than men, and that this difference seemed to be explained by the difference in their social roles. That is, the "female role" specified a greater emotional responsiveness, and women's past role-related experiences provided them with appropriate skills and attitudes. However, women's greater well-being held only for married women. For all subjects, those who were married had a more favorable well-being. This more favorable outcome was stronger for women than men. Thus, Wood and her colleagues disagreed with Thoits (1984) about how gender influences life satisfaction. Haug and Folmar (1986) found that after controlling for self-rated health, income adequacy, and living alone, neither age nor gender contributed significantly ($R^2 = .007$) to the estimation of psychological distress. In this study, social status variables related to poor health vulnerability were considered as predictors of life quality.

Chronic Illness Trajectory Shape Variables

Optimum shape for a chronic illness trajectory would be stable at a high level of health. If there were acute manifestations of the disease process, the comeback phase ideally would be of short duration and would attain or exceed the previous baseline level of health. Thus, the shape of the chronic illness trajectory is determined by variables affecting both variability and phase (Corbin & Strauss, 1988). In persons with coronary heart disease who survived a cardiac arrest, these variables include having coronary heart disease symptoms prior to first cardiac arrest, the number of previous cardiac arrests, and the time since last cardiac arrest. In this study, they were considered to be quality of life predictors.

Symptoms of coronary heart disease prior to first cardiac arrest.

For up to 20% of persons who experience a cardiac arrest, the cardiac arrest itself was the first manifestation of the coronary heart disease process (Hurwitz & Josephson, 1992). It seemed likely that quality of life might be different depending on whether one had coronary heart disease symptoms prior to cardiac arrest or not. That is, for the majority of persons, if one had a reasonably good level of health prior to the arrest, the cardiac arrest probably would lower quality of life. However, if one had long-standing coronary heart disease with an unstable or deteriorating illness trajectory due to numerous episodes of angina pectoris or acute myocardial infarction, a cardiac arrest with a prolonged comeback phase might not appreciably alter the trajectory or quality of life.

Number of cardiac arrests and time since last cardiac arrest.

The number of cardiac arrests would alter the stability of the illness trajectory and perhaps, subsequently, lower quality of life. In addition to the trajectory work involved, this instability would be characterized by uncertainty of subsequent events, as well as implications for premature death. Likewise, time since last cardiac arrest would be indicative of illness trajectory stability.

Chronic Illness Trajectory Work Variables

Strauss and his colleagues (1984) identified eight problems common to anyone with a chronic illness: prevention of medical crises and their management; control of symptoms; carrying out prescribed medical regimens and management of their inherent problems; prevention of, or living with, social isolation; adjustment to changes in the course of the disease; attempts at normalizing interactions with others and life style; funding of treatments and other expenses in spite of partial or total loss of employment; and confronting attendant psychological, marital, and familial problems. Corbin and Strauss (1988) expanded this conceptualization of having problems as requiring work. *Work* connotes an active role in participation of shaping the trajectory. Participation in shaping of outcomes is one life experience Antonovsky viewed as strengthening the sense of coherence (1987). Chronic illness trajectory work variables were considered to be comfort, functional capacity, other medical problems, and medical treatment. Studies relevant to a sample of persons with coronary heart disease who have survived a cardiac arrest are reviewed.

Comfort

Comfort can be physical or emotional in nature. Corbin and Strauss (1988) considered *comfort work* to be a major component of shaping the illness trajectory. Comfort work can be accomplished by the chronically ill person, his or her family, or the health care professional.

Traditionally, symptoms (i.e., discomfort) of coronary heart disease have been used as indicators of quality of life (e.g., new-onset or worsened chest pain, shortness of breath, fatigue, or weakness). These symptoms also could be manifestations of emotional distress. Discomfort resulting from the cardiac arrest itself also alters quality of life. Medical diagnostics (such as electrophysiologic testing or surgery for epicardial mapping) and therapeutics (such as pharmacological treatment or and aneurysmectomy), although perhaps efficacious in reducing mortality and discomfort, often are physically invasive, are associated with a certain degree of risk, have unpleasant side effects, or are a psychological burden to the patient and family who are concerned about sudden failure of the prescribed treatment (such as with an implantable cardioverter-defibrillator). Sleep disturbances could result. The implantable cardioverter-defibrillator itself may cause discomfort, either from the unit's bulk, surgical placement (in the abdomen), location (near waist level), or resultant electrical shocks. A combination of vague discomfort might cause the individual just not to feel well. Thus, it seems that coronary heart disease, the arrest, or the diagnostics and therapeutics used in shaping the illness trajectory might alter physical and emotional comfort, thereby influencing quality of life.

Physical comfort. Strauss and his colleagues (1984) considered control of symptoms a daily problem experienced by most chronically ill persons. No studies assessing physical discomfort specific to survivors of cardiac arrest could be found. In studies of therapies designed to reduce myocardial ischemia (e.g., coronary artery bypass surgery), presence or absence of continuing angina pectoris was used as an indicator of treatment efficacy and, presumably, enhanced quality of life. However, in at least one study, relief of angina was not reflected in improved quality of life in 40% ($n = 32$) of the sample (Mayou & Bryant, 1987). In their study of heart transplantation patients, Lough and her colleagues (1987) reported that symptom frequency accounted for only 2% of statistical variance of quality of life. Thus, the extensive use in the literature of physical symptoms as a major *indicator* of quality of life may not be justified.

In Burckhardt's (1985) path analysis of the impact of arthritis on quality of life, severity of pain neither directly nor indirectly affected quality of life. However, its negative correlation with quality of life was significant ($r = -.22$,

$p < .05$). In a later study, Burckhardt and her co-investigators (1989) evaluated the construct validity of the Flanagan Quality of Life Scale in their study of persons with four different chronic illnesses. They concluded that physical and emotional comfort appear to be related to but not the same as quality of life. Thus, in this study, physical comfort was considered to be a predictor of quality of life. It was defined as the absence of discomfort from physical symptoms (or their manifestations) that are commonly associated with chronic illness in general, and coronary heart disease and cardiac arrest survival in particular.

Emotional comfort. Dealing on a daily basis with one or more of the problems associated with chronic illness (Strauss et al., 1984) could cause emotional discomfort in the ill person or in his or her family. For example, being vigilant to potential recurrence of arrhythmias, living with social isolation, attempting to normalize life style, assuring adequate funding of continued treatment, and confronting attendant marital and family problems have the potential to cause anxiety and depression. In fact, Jenkins (Jenkins, Stanton, Savageau, Denlinger, & Klein, 1983a) contended that emotions may contribute more to the general sense of well-being than the presence of physical symptoms. This hypothesis was supported in Burckhardt's (1985) path analysis of the impact of arthritis on quality of life. In that study, negative feelings toward one's illness accounted for 15% of the 46% of explained variance in quality of life versus a nonsignificant contribution from severity of pain.

Dobson, Tatterfield, Adler, and McNichol (1971) studied attitudes and long-term adjustment of 20 survivors of cardiac arrest. Through unstructured interviews, they found that the predominant emotions of the survivors were disbelief, insecurity, bewilderment, and closeness to death. Finkelmeier, Kenwood, and Summers (1984) studied psychological feelings of survivors of cardiac arrest (*N* = 60) using the Symptom Distress Checklist, a multidimensional self-report symptom inventory. The predominant psychological feelings in this group of survivors were identified as anxiety (43%), difficulty sleeping (40%), restlessness (38%), dependency (33%), fear of recurrent heart rhythm disturbance (33%), depression (31%), despondency (31%), irritability (21%), tenseness (21%), and violent dreams (14%). Based on their own cardiology practice experience, Vlay and Fricchione (1985) believed that anxiety is related to future uncertainty and loss of control, and that it often is accompanied by a sympathetic nervous system surge, predisposing the patient to a recurrent cardiac arrest.

It seems likely that emotional comfort would account for a significant amount of explained variance in quality of life of persons with coronary heart disease surviving a cardiac arrest. In this study emotional comfort was considered to be the absence of psychological distress (or one of the manifestations of that distress) that is often associated with chronic illness in general, and coronary heart disease and cardiac arrest survival in particular.

Functional Capacity

In nearly all studies of persons with cardiovascular disease, the New York Heart Association (NYHA) Functional Classification (1964) was used as a succinct descriptor of the sample. The NYHA Functional Classification is a standard measure of the severity of underlying coronary heart disease and its impact on functional capacity. There are four functional classification categories: Class I (with coronary heart disease but without resulting limitations in activity), Class II (slight limitation in physical activity), Class III (marked limitation in physical activity), or Class IV (inability to carry on any physical activity).

Within the traditional medical paradigm, functional capacity of the person with coronary heart disease often was used as an indicator of quality of life. Its evaluation frequently was based on the results of an exercise tolerance test or on the cardiac ejection fraction. These methods represented a very narrow view of functioning. Utilizing a more holistic approach, Antonovsky (1979) incorporated role theory into a definition of functional capacity. Role enactment, one component of role theory, involved the number of roles, the degree of effort involved, and the amount of time available (Sarbin & Allen, 1968). Wenger (1986) also incorporated this holistic view, but, as evidenced by her definition of quality of life, still considered functional capacity to be an indicator rather than predictor: "...a person's ability to perform in a variety of roles..." (p. 122).

In order to examine health status of cardiac arrest survivors, Bergner and his colleagues (Bergner, Bergner, Hallstrom, Eisenberg, & Cobb, 1984) administered the Sickness Impact Profile to survivors of cardiac arrest ($n = 424$) 6 months after the event and to a comparison group of patients ($n = 114$) enrolled in a health maintenance organization. They found only about a 10% impairment for mean total, psychosocial, and physical dimension scores for cardiac arrest survivors. This impairment was greater than that of the control patients (not stated). Without knowing the degree of impairment in the general population, it is difficult to interpret the meaning of a 10%

impairment, which seems relatively small. One would suspect that patients who survived a cardiac arrest would demonstrate greater health impairment than described. Again, there may be inadequate sensitivity to health impairment in persons with cardiovascular disease.

Inherently, functioning is dependent upon intellectual function. Brain damage is one of the most serious consequences of cardiac arrest. At the onset of cardiac arrest, consciousness is lost within 15 seconds because of the lack of cerebral blood flow. Therapy that consistently reversed the effects of normothermic cardiac arrest of more than 5 minutes duration has not been identified (Safar, 1986). Thus, the most crucial factors in survival and complete recovery would be the quality of life-support training and time from cardiac arrest to resuscitation attempt. Both Tuggle (1981) and Nielsen and his colleagues (Nielsen, Gram, Rasmussen, Damsgaard, Dalsgaard, Richardt, et al., 1983) found degrees of intellectual impairment in cardiac arrest survivors, ranging from 15% to 54%, respectively.

Strauss and his colleagues (1984) identified the prevention of, or living with, social isolation as one of the inherent problems of living with chronic illness. Tuggle (1981) found that the cardiac arrest survivors had social interaction and communication impairments of only 11% and 7%. This impairment seems so low as to be practically unimportant. However, these clinically small differences might have been the result of the relative lack of sensitivity of the Sickness Impact Profile in her sample.

Employment status often was used as an indicator of functional capacity. Kalbfleisch and her colleagues (1989) evaluated 101 patients with implantable cardioverter-defibrillators to determine re-employment rate and factors associated with return to work. Of the 47 patients employed prior to cardioverter-defibrillator implantation, 62% returned to work. Those who returned to work were better educated (15 vs. 11 years, $p < .001$) and less likely to have had a history of prior myocardial infarction ($p < .05$). There were no significant differences between those that did and did not return to work in terms of age, gender, race, NYHA Functional Class, ejection fraction, extent of coronary heart disease, reason for cardioverter-defibrillator implantation (cardiac arrest vs. sustained ventricular tachycardia), or concomitant coronary artery bypass graft surgery. Thus, employment status seems to reflect constructs other than functional capacity, for example, desirability or necessity of working, thereby not being a valid indicator of functional capacity.

Additionally, employment, as a reflection of activity tolerance, frequently was used as an indicator of improved quality of life (Bergner et al., 1984; CASS Principal Investigators and their Associates, 1983; Jenkins et al., 1983a; Jenkins, Stanton, Savageau, Ockene, Denlinger, & Klein, 1983b; Mayou & Bryant, 1987; Ott, Sivarajan, Newton, Almes, Bruce, Bergner, et al., 1983; Peduzzi, Hultgren, Thomsen, & Detre, 1987) because it is "an objective, behavioral measure of an age-appropriate social role" (Kalbfleisch et al., 1989, p. 199). Retirement, viewed as being the opposite of working, often was used as a negative indicator of quality of life. However, employment status was not always congruent with the individual's perceptions about quality of life. As reported by Mayou and Bryant (1987), for many post-coronary artery bypass graft patients, returning to work was not an unqualified success: 20% ($n = 8$) were very dissatisfied, primarily because they had been switched to less interesting, often less well paying jobs, with loss of promotion chances and lower pensions; a further 13% ($n = 5$) felt anxious and insecure about their jobs. Satisfaction with retirement as an outcome of surgery was split. Of 15 newly retired patients, 7 were enjoying retirement or at least reasonably resigned to its necessity, and 8 were disappointed and bitter. Only one-third of the patients were more pleased with work postoperatively than preoperatively. Thus, employment status does not seem valid as an indicator of quality of life.

In summary, functional capacity has been assessed in a variety of ways. In this study, functional capacity was defined as consisting of the ability, energy and time to perform activities of everyday life within the home, work, and social settings. Although functional capacity seems to play a role in quality of life of chronically ill patients, its contribution to the explained variance of quality of life in survivors of cardiac arrest has not been demonstrated in the literature.

Other Medical Problems

Within the framework of Strauss and his colleagues (1984), having multiple health problems would add to trajectory shaping work. No studies could be found documenting the cumulative effects of multiple medical problems on quality of life in survivors of cardiac arrest.

Medical Treatment

Often, medical regimes are complex. For example, medications might be required "around the clock," life-time habits that pose cardiovascular risk must be changed, follow-up visits to a variety of specialists—cardiologist, electrophysiologist, cardiovascular surgeon—are required. The accommodation of one's life to this therapeutic plan is viewed as work (Corbin

& Strauss, 1988). Additionally, medical prognosis is dependent on the arrhythmic etiology and the success of the treatment in arrhythmic suppression. For a given individual, the best method of arrhythmia management (antiarrhythmic medications, implantable cardioverter-defibrillator, or surgery) is determined by the response of his or her arrhythmia during electrophysiologic testing. Persons who do not have inducible, uniform ventricular tachycardia tend to have a worse prognosis. About 15% to 25% of persons with coronary heart disease who have survived a cardiac arrest fall into this category (Hurwitz & Josephson, 1992). Annual recurrence rates of treated patients range from 2% to 40% depending on the arrhythmic etiology and the intervention used (Vlay & Fricchione, 1985). Thus, the therapeutic regime might affect quality of life based on the amount of work involved in adhering to it, and the differential effects on mortality and morbidity (both perceived by the physician and/or the patient, and documented in the literature).

Self Esteem

Parkerson (1981) defined self esteem as "a liking and respect for oneself and the belief in one's ability to get along with other people (p. 809)." Self esteem accounted for 25% of the 46% of explained variance in quality of life in Burckhardt's (1985) path analysis of the impact of arthritis. She measured self esteem using a 6-item self-concept scale developed by Longino, McClelland, and Peterson (1980). Self esteem had a direct effect on quality of life ($r = .31$, $p < .001$); another variable, severity of impairment, had a direct effect on self esteem ($r = -.26$, $p < .05$). Thus, Burckhardt concluded that in persons with arthritis, maintaining a sense of dignity and self worth while coping with a body that is no longer healthy, strong, and compliant is difficult. Clearly, persons with arthritis had more visibly apparent disability than most persons with other chronic illnesses. It may be that more visible impairments alter self esteem to a greater degree than those disabilities apparent only to the affected person and his or her family members. Additionally, whether the self esteem problems were long standing and unrelated to the arthritis process were not addressed.

In their psychometric study of quality of life in chronically ill adults ($N = 227$), Burckhardt and her co-investigators (1989) used the Duke-UNC Health Profile emotional function subscale (a reflection of self esteem) to obtain evidence of divergent validity for the Flanagan Quality of Life Scale. They concluded that self esteem is related to but different from quality of life. In this study, self esteem was defined using Parkerson's (1981) definition.

Social Support

Dimond and Jones (1983) contended that social support is difficult to define because it is not a single concept but a set of concepts. Cobb (1976) defined social support as "information leading the subject to believe that she/he is cared for and loved, esteemed and a member of a network of mutual obligations" (p. 300). Cobb's inclusion of mutual obligations is congruent with Tilden, Nelson, and May's (1990) conceptualization of interpersonal relationships within social networks as involving reciprocity of both emotional and tangible supplies. Burckhardt (1982) defined social network configuration as "the social bonds formed between the subject and his/her associates" (p. 34).

In her study of the effects of lack of social support, Thoits (1984) examined 1,106 individuals and found a significant negative main effect (p <.01) of social support on psychological distress, which she suggested counterbalances rather than buffers the impact of life stress. Subsequently, she has reconceptualized social support as coping assistance (Thoits, 1986). Her reconceptualization is consistent with Burckhardt's (1985) operationalization of social support as the Perceived Support Score. For the Perceived Support Score, respondents were asked to think of six people they were closest to, and then asked to rate (on a 4-point response scale) how much physical help, social time, and advice or problem-solving help they could expect to receive from each person if they needed or wanted the support. Her operationalization was the result of literature review and clinical experience. She reported a reliability omega estimate of .92 for the instrument.

In Burckhardt's (1985) path analysis of the impact of arthritis on quality of life (N = 94), perceived social support accounted for 10% of the 46% of explained variance in quality of life. Perceived support was accounted for partially by the size and density of the social network. These findings supported her original hypotheses, lending support for this instrument's construct validity.

Given the multiple problems experienced by all persons with chronic illness (Strauss et al., 1984), and the work involved in shaping the chronic illness trajectory (Corbin & Strauss, 1988), the importance of social support in maintaining or enhancing life quality seems crucial. Thus, it seems that social support would be directly related to quality of life. Based on Cobb's (1976) conceptualization, it seems likely that there is a direct relationship between social support and self esteem. The relationship between social support and sense of coherence is thought to be indirect, through its effect on the generalized resistance resource *ego identity*.

Explained Variance in Quality of Life

Older Persons in "Relatively Good Health"

Sagy, Antonovsky, and Adler (1990) studied 805 on-time Israeli retirees (ages 60 and 65 for women and men, respectively). The purpose of the study was to examine the relationship between the sense of coherence, the activity-disengagement continuum, and life satisfaction. This path analysis was the only study found using sense of coherence as a predictor of life satisfaction. The sample was not recruited from health care sites but rather from three major pension funds. Thus, they were felt to be in "relatively good health" (p. 19). Each was interviewed 1 to 2 months before retirement. Four hypotheses were made:

1. According to activity theory, the level of involvement in "instrumental" activities and social interaction activities will be directly and positively related to life satisfaction.
2. Subjective health status will be directly and positively related to life satisfaction.
3. The sense of coherence will be positively related to "instrumental" and social interaction activities and subjective health status.
4. The sense of coherence will be positively related to life satisfaction both directly and through its relationship to "instrumental" and social interaction activities, and to subjective health status. (p. 16)

The hypotheses were tested controlling for age and gender. Life satisfaction was measured by a 5-item scale of 9-point ladder items, anchored by *the worst possible situation...the best possible situation*. The five areas addressed were family life, personal relations with other people, standard of living, spiritual (nonmaterial) life, and thinking of your life as a whole (p. 16). Cronbach's alpha for this life satisfaction scale was .77. Sense of coherence was measured using the 29-item Sense of Coherence Questionnaire. Instrumental activities were defined as the number of hours spent on each of the following activities in the past week—work in and around the house, hobbies, exercise, cultural, voluntary or learning activities, and travel. Social interaction activities were defined as the number of hours spent on the same instrumental activities with family, and with relatives, friends, or neighbors. Health was measured using the Multidimensional Health Scale (Cronbach's alpha =.81). It consisted of 5 multiple-choice items relating to pain, functional limitation, seriousness of existing medical conditions, need for therapeutic intervention, and distance from a perfect state of health.

They (Sagy et al., 1990) found that sense of coherence was strongly correlated with life satisfaction ($r = .54$, $p < .001$). Total explained variance in the path model was 31% ($p < .001$), with sense of coherence having direct effects on life satisfaction ($\beta = .49$, $p < .001$), and indirect effects on instrumental activities ($\beta = .26$, $p < .001$), social interaction ($\beta = .22$, $p < .001$), and health ($\beta = .35$, $p < .001$). The only hypothesized relationships to life satisfaction that reached statistical significance were those with the exogenous variable sense of coherence and the intervening variable of social interaction ($\beta = .12$).

Neither instrumental activities nor health were significantly related to life satisfaction. That health did not contribute significantly to life satisfaction was surprising since health was thought to be the major determinant of life satisfaction among older persons. The zero-order correlation of health with life satisfaction was .22 ($p < .001$), which was thought to be congruent with other published studies. The lack of health's contribution to explained variance may have resulted from the choice of the life satisfaction instrument. Only five areas were evaluated in terms of life satisfaction: family life, personal relations with other people, standard of living, spiritual life, and thinking of your life as a whole. It may be that if more dimensions had been assessed, the contribution of both health and instrumental activities may have been more apparent. Details about the scale's content validity and prior evidence of construct validity were not provided. Thus, the construct validity of their outcome measure may not have been adequate.

Chronically Ill Persons

A number of researchers have investigated the explained variance in quality of life in persons with chronic illness (Burckhardt, 1985; Lehman, 1983; Lough, 1985; Lough et al., 1987; Magni, Unger, Valfrè, Polesel, Cesari, Rizzardo, et al., 1987) using a variety of different instruments as the indicator of the outcome variable. Unfortunately, there is a large degree of variability in the conceptual clarity and methodological rigor of these studies.

The only study of explained variance in quality of life that did not have major conceptual or methodological weaknesses was Burckhardt's (1985) path analysis of the impact of arthritis on quality of life ($N = 94$). The Flanagan Quality of Life Scale served as her outcome variable. She utilized the stress and coping paradigm of Lazarus and Folkman (1984) as the theoretical basis of the study. Path coefficients were derived using stepwise multiple regression analysis. Four mediating variables were identified as having direct effects on quality of life ($p < .05$): perceived support, negative attitude toward the illness, self-esteem, and internal control over health. A fifth variable, severity of impairment, was identified as having an indirect effect ($p < .05$) on self esteem and internal control over health. Within the Lazarus and Folkman paradigm, *severity of impairment* was considered as an input variable. These five variables accounted for the majority of 46% of the statistical variance in quality of life ($F = 7.14$, $p < .001$). Other variables used in her model included age, gender, severity of pain, social network configuration, and socioeconomic status. This study was theoretically based, conceptually clear, and methodologically sound. Her conceptualization and study of quality of life in persons with arthritis was most closely allied with the investigator's own interests. Thus, Burckhardt has included variables very similar to those of interest to this investigator within her framework.

Summary

Bostick (1977) and Crewe (1980), found no evidence that disabled persons identified different quality of life domains than non disabled persons. Burckhardt and her colleagues(1989) found that, with the exception of the independence domain, chronically ill persons identified the same quality of life domains as apparently healthy persons (Flanagan, 1982). Sagy and co-investigators (1990) demonstrated a direct effect of sense of coherence on life satisfaction in older persons. Although not yet documented in the research literature, it seems that sense of coherence also would contribute to quality of life of persons with chronic heart disease who have survived a cardiac arrest.

Purpose, Aims, and Major Hypotheses

The overall purpose of this study was to explain the variance in quality of life in persons who have survived a cardiac arrest. The specific aim of this study was to test whether the addition of Antonovsky's (1979, 1987) sense of coherence construct to the model improved explained variance in quality of life. A secondary aim was to understand more about the construct of sense of coherence in persons with chronic illness in general and with cardiac arrest survivors who have coronary heart disease in particular.

Thus, the primary hypothesis to be tested was: After controlling for social status variables related to poor health vulnerability, perceived support, self esteem, and the chronic illness trajectory shape and work variables, the addition of sense of coherence will significantly improve estimation of quality of life. A second hypothesis to be tested was: After controlling for social status variables related to poor health vulnerability, perceived support, and the chronic illness trajectory shape and work variables, self esteem will contribute significantly to sense of coherence.

CHAPTER 3

Methods

Design

A nonexperimental, correlational design was used to test the study hypotheses. This design was selected because (a) the variables under study were conceptually mature, and (b) the investigator did not have direct control of the independent variables. In a correlational design, inferences about relationships between variables are made from concomitant variation of the independent and dependent variables (Kerlinger, 1986).

Protection of Human Subjects

Approval for this study was obtained from the Human Subjects Review Committees of the Oregon Health Sciences University, Portland, and the University of Washington, Seattle, and the Institutional Review Board of the Virginia Mason Medical Center, Seattle, Washington. The study was considered exempt (category 2) by the Department of Health and Human Services regulations on human subjects. A cover letter conforming to informed consent requirements was sent to all potential study participants (Appendix C). Informed consent was inferred from return of the completed questionnaire.

Sample

The entire population of survivors of cardiac arrest of two medical facilities was given the opportunity to participate in the study: the Oregon Health Sciences University and the Virginia Mason Medical Center. (See Figure 3-1.) In order to test the questionnaire, eight cardiac arrest survivors from the Oregon Health Sciences University Arrhythmia Clinic served as the

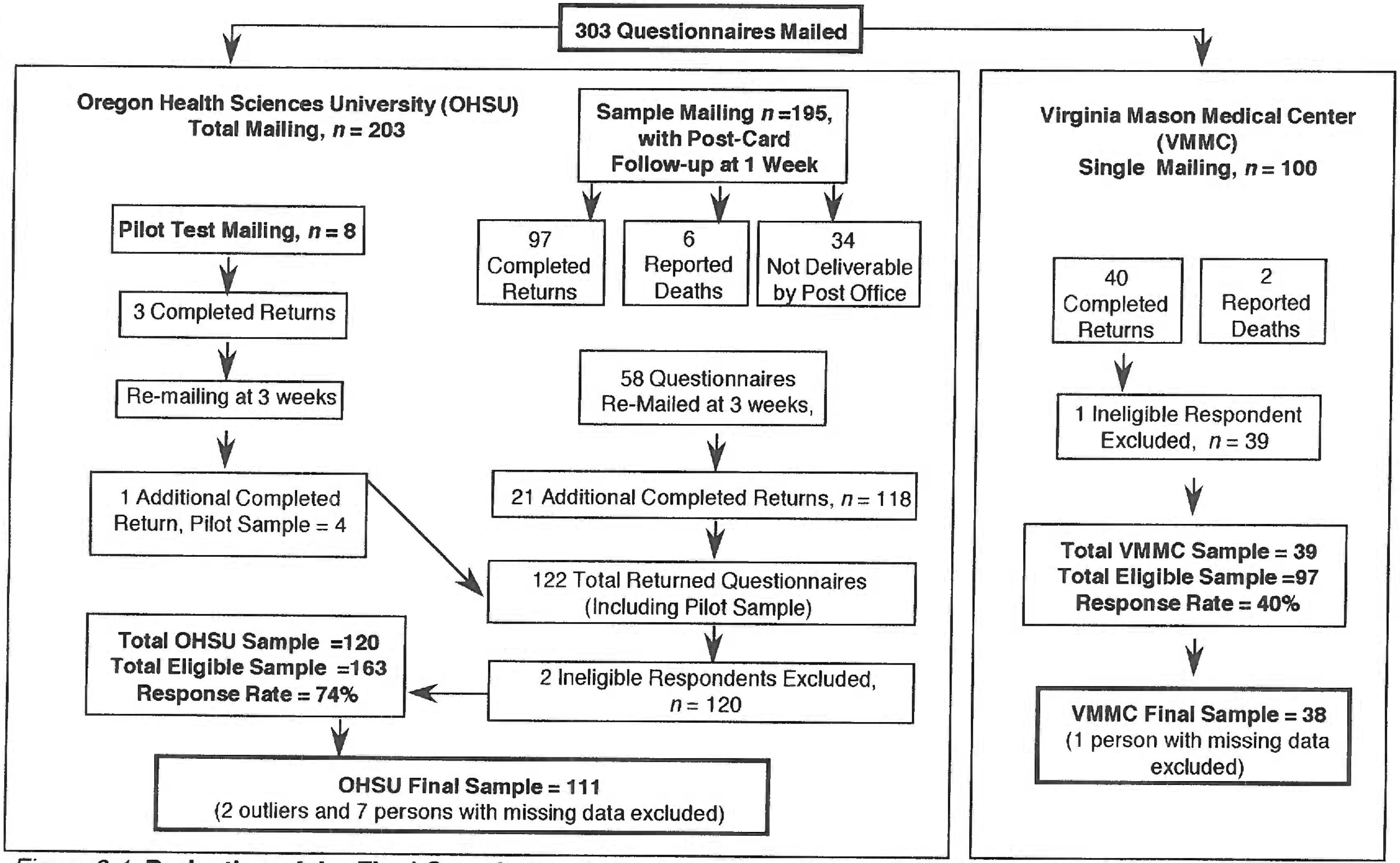

Figure 3-1. **Derivation of the Final Sample** ($N = 149$): 111 respondents from OHSU, and 38 respondents from VMMC. Total response rate was 57%. OHSU sample mailing was based on the Total Design Method (Dillman, 1978).

pilot sample. A random numbers table (Kerlinger, 1986, p. 640) was used to select this sample from a list of 203 cardiac arrest survivors. Three subjects returned completed pilot questionnaires. A follow-up letter was sent to the nonrespondents after 3 weeks, resulting in one more returned questionnaire, for a total pilot sample of four. Pilot data were evaluated and some refinements were made in the questionnaire. (These changes are discussed in the Instruments section.) Revised questionnaires were mailed to the other 195 potential subjects from the Oregon Health Sciences University, and to 100 potential subjects from the Virginia Mason Medical Center Arrhythmia Clinic.

The nature of the changes in the questionnaire allowed the pilot data to be included in the data obtained from the overall sample. Thus, of a total of 303 questionnaires mailed, 162 persons responded. Of these 162 respondents, 3 were considered ineligible (a 17 year-old male, a woman who answered for her husband, and a male who was unsure if he had experienced a cardiac arrest), 2 were extreme outliers for age (males aged 23 and 24 years), 5 had a missing quality of life (QOL) score, and 3 more were missing more than 20% of the predictor variables. (The decision to eliminate subjects missing more than 20% of predictor variables is described in the Instruments section.) Therefore, the final sample size was 149. Based on an a priori power analysis (Cohen, 1988), this sample size was thought to be adequate. For the power analysis, it was hypothesized that explained variance of quality of life using all variables except sense of coherence would be 40%, and that the addition of the sense of coherence to the model would explain an additional 10% of the variance. Desirable power was .90 to .95. Therefore, assuming a moderate effect size and 130 respondents, the power of the statistical test was approximately .93 and .98 for the .01 and .05 significance levels, respectively. (See Appendix D for a detailed description of the power analysis.)

Sample Recruitment

The questionnaire packet consisting of a cover letter, questionnaire (Appendix A), and return envelope was designed and implemented based on the Total Design Method, developed by Dillman (1978) to increase mail survey response rates. This method consists of two parts: (a) identification of each part of the survey that potentially could affect the quality or quantity of the response, and (b) organization of the survey efforts.

The Total Design Method, based on social exchange theory (Blau, 1964; Homans, 1961; Thibaut & Kelley, 1959), advocates rewarding the respondent, reducing costs to the respondent, and establishing trust. Rewarding the respondent was accomplished in the cover letter and the questionnaire by showing positive regard, giving verbal appreciation, using a consulting approach, and making the questionnaire interesting. Each cover letter was dated and, for the Oregon Health Sciences University sample, each letter was addressed individually to the potential respondent. Including a self-addressed, stamped return envelope and offering to accept collect telephone calls if questions about the study arose was an effort to reduce respondent costs. Establishing trust was attempted in several ways. The letterhead stationery used for the cover letter was designed to reflect the investigator's National Center for Nursing Research predoctoral fellowship. In the cover letter, references were made about the investigator's extensive work as a nurse in caring for persons surviving a cardiac arrest and in educating health care professionals about cardiac arrest. Additionally, identification with both the Oregon Health Sciences University School of Nursing and the University of Washington School of Nursing was thought to lend credibility. The name of the physician who had provided the study referral also was used. For the Virginia Mason Medical Center sample, a letter signed by the clinic director supporting the study was enclosed (Appendix E).

Organization of the survey efforts focused on Dillman's follow-up procedures (1978). A list of names and addresses of potential subjects was obtained from the Oregon Health Sciences University Arrhythmia Clinic. However, the Virginia Mason Medical Center Institutional Review Board stipulated that names and addresses of the potential participants not be made available to the investigator. Thus, as names and addresses of potential respondents were available only for the Oregon Health Sciences University sample, Dillman's recommendations for follow-up were restricted to those subjects. A modification of the Total Design Method procedure was used. It consisted of using two out of three recommended follow-up procedures: (a) sending a postcard to all potential subjects 1 week after the questionnaire as both a thank you and friendly reminder (Appendix F), and (b) sending a second letter and replacement questionnaire to all nonrespondents 3 weeks after mailing the first questionnaire. Dillman's third follow-up procedure was not used as it was thought to be too coercive: 7 weeks after the initial mailing, sending by certified mail a third letter and replacement questionnaire.

The total response rate was 57%. As illustrated in Figure 3-1, the response rate of the Oregon Health Sciences University sample (74%) was much greater than the response rate of the Virginia Mason Medical Center sample (40%). This difference may have been related to the use of the modified Total Design Method follow-up procedures. Additionally, because the investigator's return address was used on the mailing envelopes to the Oregon Health Sciences University sample, any non-deliverable envelopes were returned to the investigator by the post office. These potential subjects were not considered part of the eligible sample when calculations of response rates were made. The return address used on the mailing envelopes for the Virginia Mason Medical Center sample was the Arrhythmia Clinic address. Other than the two deaths reported to the investigator by spouses, no other information about nonrespondents was known. Thus, for that sample, the eligible sample size may have been overestimated, resulting in a lower response rate.

Sample Characteristics

The sample of 149 persons was largely male (73%) and predominantly Caucasian (95%). Ages ranged from 30 to 85 years, with a mean of 63 years (*SD* = 11.1). Most respondents were married or living with significant others (82%) and had greater than a high school education (55%). Nearly 36% were still working. Of those who were no longer working (*n* = 96), the majority retired for reasons other than health (58%). Table 3-1 summarizes the social status characteristics and the work status of the sample.

For 40% of the respondents, the cardiac arrest was their first manifestation of coronary heart disease. Most of the sample (64%) had experienced a single cardiac arrest. For the majority of respondents, the last cardiac arrest occurred between 6 months and 3 years prior to this study

Table 3-1

Social Status Characteristics and Work Status (*N* =149)

Variable	**Frequency (%)**	**Variable**	**Frequency (%)**
Gender		**Work Status**	
Male	109 (73)		
Female	40 (27)	*Outside Home*	*135 (91)*
		Working (full time)	25 (17)
Race		Working (part time)	17 (11)
Caucasian	142 (95)	Retired (heart disease)	32 (22)
Black	1 (.7)	Retired (other medical)	6 (4)
Native American	1 (.7)	Retired (other reasons)	55 (37)
Oriental	1 (.7)		
[*Missing data*]	[4 (2.7)]	*Inside Home*	*14 (9)*
		Able to do homemaking	11 (7.4)
Marital Status		Unable (heart disease)	1 (.7)
Married/ Significant Other	122 (82)	Unable (other medical)	1 (.7)
		Unable (other reasons)	1 (.7)
Separated/Divorced	10 (7)		
Single	5 (4)		
Widowed	12 (8)		
Education (Years)			
<12	24 (16)		
12	43 (29)		
13 through 14	46 (31)		
15 through 16	22 (15)		
≥17	14 (9)		

Age (Years): Missing data = 1 *M* = 63.15 *SD* = 11.07 Range = 30 to 85
Skewness = -0.04 (*SE* = 0.20) Kurtosis = 0.91 (*SE* = 0.40)

(55%), although for 19%, more than 5 years had elapsed. Slightly more than half had no other medical problems. Treatment to prevent another cardiac arrest was variable. About three-fourths considered themselves as NYHA Functional Class I or II. These chronic illness trajectory shape and work variables are summarized in Tables 3-2 and 3-3.

Instruments

Four standardized instruments were combined into a single questionnaire, along with social status variables related to poor health vulnerability, an item about work status, and several open-ended questions. For the pilot test, the standard instruments included the Modified Flanagan Quality of Life Scale, the Sense of Coherence Questionnaire, the Duke-UNC Health Profile, and the Modified Burckhardt Perceived Support Score. Parkerson and his colleagues (Parkerson, Broadhead, & Tse, 1990) identified a number of conceptual problems with the Duke-UNC Health Profile: (a) categorization of *symptoms* did not follow the World Health Organization dimensions of physical, mental, and social health; (b) self-esteem was the sole indicator of emotional health; and (c) social function was restricted to role performance.

In response to these conceptual problems and the length of the Duke-UNC Health Profile (63 items), Parkerson and his colleagues (1990) developed a new 17-item Duke Health Profile from the items on the original Duke-UNC Health Profile (Parkerson et al., 1981). Item selection was based on a combination of face validity and psychometric testing. The original Emotional Function subscale reflected only self esteem. Five items from that scale as well as the Social Function scale were selected as a new Self

Table 3-2

Variables Related to the Shape of the Chronic Illness Trajectory

(*N* =149)

Variable	**Frequency (%)**
Coronary Heart Disease SYMPTOMS before first cardiac arrest	
Yes	90 (60.4)
No	59 (39.6)
NUMBER of cardiac arrests	
1	95 (63.8)
2	29 (19.5)
≥3	17 (11.4)
[*Don't know*]	[*1* *(.7)*]
[*Missing data*]	[*7* *(4.7)*]
TIME since last cardiac arrest	
<3 months	5 (3.4)
3-6 months	10 (6.7)
6-12 months	25 (16.8)
1-2 years	28 (18.8)
2-3 years	29 (19.5)
3-4 years	17 (11.4)
4-5 years	7 (4.7)
>5 years	28 (18.8)

Table 3-3

Variables Related to the Work of the Chronic Illness Trajectory

(*N* = 149)

Variable	**Frequency (%)**
Reported other medical problems	
Yes	77 (51.7)
No	68 (45.6)
[*Missing data*]	[*4* *(2.7)*]
Reported Treatment (RX) to prevent recurrent cardiac arrest	
Medication	46 (30.9)
Surgery	16 (10.7)
Implantable cardioverter defibrillator (ICD)	14 (9.4)
Medication & surgery	28 (18.8)
Medication & ICD	18 (12.1)
Surgery & ICD	6 (4.0)
Medication, surgery, & ICD	12 (8.1)
No treatment	8 (5.4)
[*Missing data*]	[*1* *(.7)*]
Reported NYHA Functional Class	
I	61 (40.9)
II	49 (32.9)
III	30 (20.1)
IV	6 (4.0)
[*Missing data*]	[*3* *(2.0)*]

Esteem scale. From the original Symptom subscale (in which physical and emotional symptoms were combined), items were selected as indicators of either physical or mental health, forming two new scales: Physical Health and Mental Health (5 items each). Two of the self esteem items were included in the Mental Health scale. Two of the original Social Function subscale items were retained for the new Social Health scale, which also included three self concept items from the Self Esteem scale. Rationale for the redundancy of self esteem items between three scales is not explicit. Additionally, there was one item of perceived health, and one disability item. Evidence of content and construct validity, and internal and test-retest reliability of the Duke Health Profile is presented in Appendix B.

After the pilot test, it became apparent that the length of the questionnaire might have affected response rate. Because of potential consequent respondent burden, and because items from the Duke Health Profile seemed more congruent with the conceptualization of comfort than did the Duke-UNC Health Profile, some changes were made in the questionnaire. Shorter versions of two scales were used: the 25-item Duke Health Profile was substituted for the 63-item Duke-UNC Health Profile, and the 13-item version of the Sense of Coherence Questionnaire was used instead of the 29-item version. As a result, there were 54 fewer items on the questionnaire. Ordering of items also was changed to make the questionnaire more interesting: the dependent variable, quality of life, and the independent variable of interest, sense of coherence, were assessed first, and the social status variables related to poor health vulnerability were assessed last. An item assessing race was added. Additionally, in an attempt to make the questionnaire look more appealing, the cover was printed on light blue paper.

The measurement model used in this study is illustrated in Figure 3-2. The study questionnaire can be found in Appendix A. The evidence of reliability and validity accrued in other studies for all instruments used in both the pilot study and the larger study is presented in Appendix B. Before each scale is presented, an explanation of the management of missing data is provided. This explanation is necessary for understanding scaling procedures for each instrument.

Missing Data

Cohen and Cohen (1983) advocated using *all* information available. By so doing, they posited that: (a) risk of nonrepresentiveness in dropping subjects if data are missing nonrandomly is avoided; (b) loss of statistical power due to reduced sample size even if data are missing randomly is avoided; (c) information inherent in the absence-presence of values on the variables in question can be utilized; and (d) information present on other variables although missing for some subjects on the variable in question can be utilized. They have identified three alternatives for handling missing data problems: dropping variables, dropping subjects (i.e., listwise deletion), or pairwise deletion. However, dropping theoretically based variables from analysis is unsatisfactory because of the importance of the lost information. Dropping subjects if the proportion of missing data is large and the sample size not comfortably large reduces statistical power and, perhaps more importantly, allows the non-randomness of the missing data to go undetected. Thus, results would not be representative of the population sampled. The pairwise deletion procedure—computing a correlation matrix for each pair of

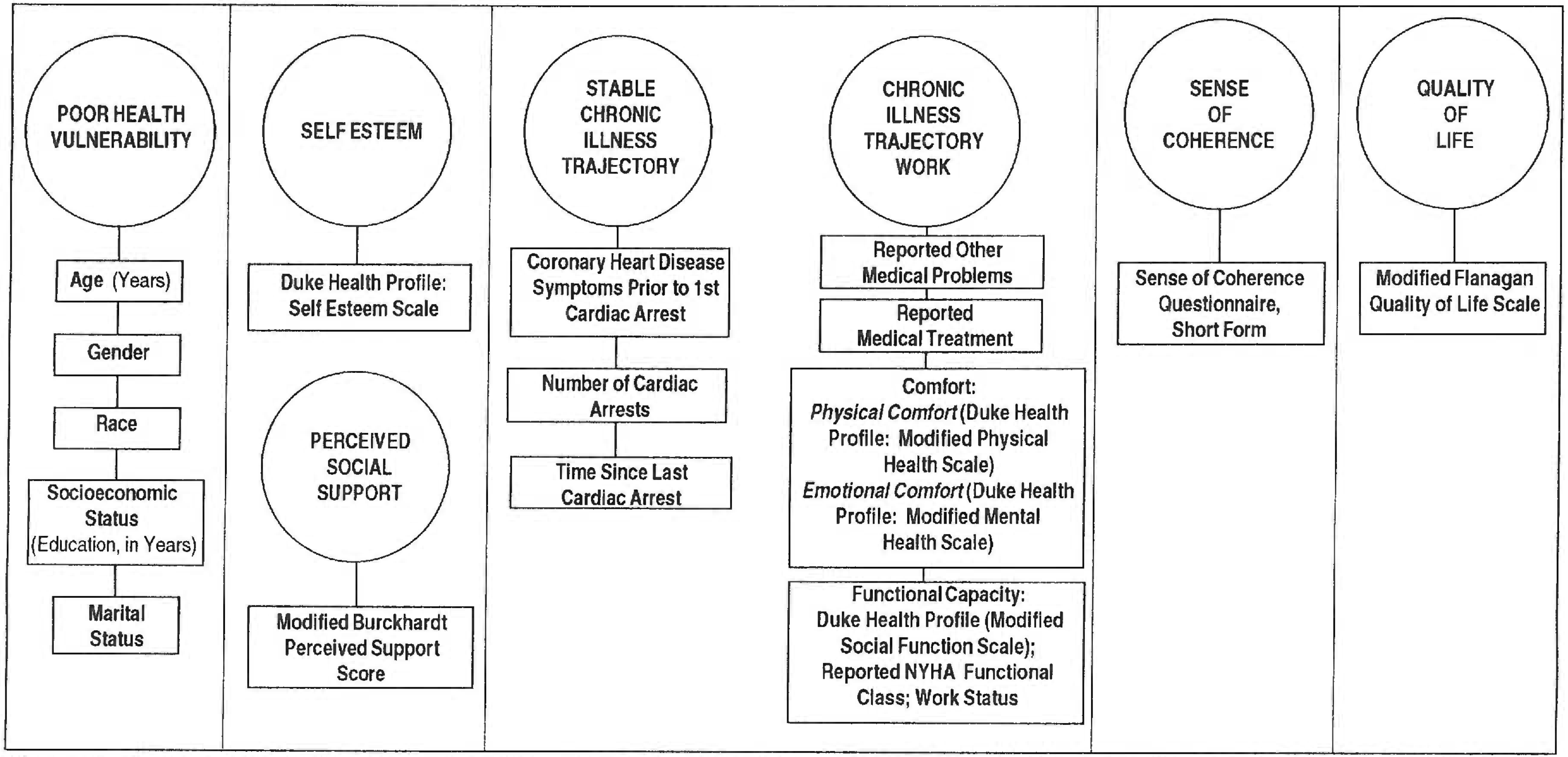

Figure 3-2. **Measurement Model used to Explain the Variance in Quality of Life for Persons with Coronary Heart Disease who Survived a Cardiac Arrest.**

variables for as many cases as have values for both variables—is acceptable only if the data are randomly missing. Otherwise, the estimate of the population parameter is biased.

In this study, subjects were dropped if they had a missing score for the dependent variable ($n = 5$), or if they were missing more than 20% of the predictor variables ($n = 5$). Two of these subjects were missing both the dependent variable and 20% of the predictor variables. Thus, a total of eight subjects (out of 157, or 5%) were dropped from the analysis because of missing scores. Cohen and Cohen (1983) believe that no serious objection can be raised for dropping approximately 5% of subjects with missing data.

No clear guidelines exist for the proportion of missing data that are practically important either per independent variable or for all independent variables. Cohen and Cohen (1983) suggested that the magnitude of the problem of missing data is different if 1% versus 40% of the data are missing. Based on experience and on Cohen and Cohen's recommendations of keeping as many subjects as possible, an arbitrary cutoff of 20% of missing predictor variables was established. This value was chosen because it seemed a legitimate yet conservative way either to derive a score or predict the dependent variable. Cohen and Cohen recommended plugging missing values with the mean, combined with a separate predictor variable reflecting the presence or absence of missing data. Thus, except for the variable perceived support (see below), for persons missing less than 20% of items per predictor variable score or missing less than 20% of the predictor variables, the item mean value or the score mean value was substituted. However, mean substitution for randomly missing values weakens statistical stability and power of multiple correlation-regression analyses. The randomness versus selectiveness of missing data was evaluated statistically. These procedures are described in detail in the Data Analysis section. If missing values totaled more than 20%, the subject was dropped from analysis.

For the dependent variable, measured by the Modified Flanagan Quality of Life Scale, respondents were given the option of writing *not applicable* next to any item. *Not applicable* was added after expert review of the questionnaire and may have contributed to ambiguous directions. Because respondents had been offered that option, if they marked *not applicable* next to any QOL item, that response was considered as legitimately missing. This approach is supported by Cohen and Cohen (1983) who argue that variables containing such conditional missing data should not be dropped, nor should the respondents providing the data. If *not applicable* was the response option chosen for an item, the mean value for all completed items was obtained, and that average was multiplied by the total number of scale items (i.e., by 16) to obtain an overall QOL score.

Some persons left blank some of the quality of life scale items. Stewart (1992) believed that one advantage of using multi-item quality of life scales is the ability of the investigator to minimize the problem of missing data. Thus, the criterion of 20% of missing item values used for the predictor variables also was applied to the dependent variable scale. If more than 20% of the applicable items were missing (i.e., 3 or more items left blank), a QOL score was not calculated. If 80% or more applicable items were complete, the item mean was substituted.

Dependent Variable

For the purposes of this study, the dependent variable, quality of life, was defined as subjective satisfaction with life. A modified version of the Flanagan Quality of Life Scale (Appendix A, questionnaire items Q1 to Q16) served as its indicator. The five domains recommended by Flanagan (1982) (physical and material well-being; relations with other people; social, community, and civic activities; personal development and fulfillment; and recreation) were combined with the domain of independence suggested by Burckhardt and her co-investigators (1989). The 7-point Delighted-Terrible Scale (Andrews & Crandall, 1976) was used. Burckhardt thought that this rating method would be more sensitive and less negatively skewed than the 5-point satisfaction scale, possibly because of a wider range of affective responses. In Burckhardt and colleagues' study (1989), Cronbach's alphas ranged from .82 to .92, and test-retest reliabilities ranged from .76 for a 6-week interval to .78 and .84 for two 3-week intervals. (Psychometric statistics for all scales used in this study are presented later in this chapter; see Table 3-4.) The Modified Flanagan Quality of Life Scale is a summated rating scale of 16 items. The potential range for this scale was 16 to 112, with a higher score indicating a higher quality of life.

Independent Variables

Data from 17 independent variables were gathered to be used in predicting the variance in quality of life. Data from one additional independent variable, work status (Appendix A, item P6), was used for descriptive purposes only because of the lack of validity of employment status in reflecting functional capacity (Mayou & Bryant, 1987). Each of these independent variables was based on the conceptual model presented in Figure 2-3.

Social status variables related to poor health vulnerability. Stated age (Appendix A, item P1) , gender (item P2), race (item P5), marital status (item P3), and years of education (item P4) served as the social status variables. Years of education was thought to be a valid and reliable indicator of socioeconomic status (C. S. Burckhardt, personal communication, April, 1990).

Social support. Social support was considered to be physical help, financial help, advice or problem-solving help, and social time obtained from one's social network. A modified version of the Burckhardt Perceived Support Score (Burckhardt, 1985) was used as its indicator (Appendix A, items S1 to S6). The original score consisted of three items: perceived physical help, advice, and social time. Based on the literature review and discussion with experts, it was modified to include a fourth item, perceived financial help. Respondents were asked to think of six individuals, and to rate each of those individuals on the four items using a 4-point scale: 0 equaled *none*, 1 equaled *a little*, 2 equaled *some*, and 3 equaled *a lot*. Thus, the original version contained 18 items and the modified version had 24 items. Burckhardt reported a reliability omega estimate of .92 for her original instrument.

To receive a valid score on the perceived support scale, a respondent had to have provided, on the average, at least one of the possible four ratings for each network person listed. To accommodate the extent of missing data (21 to 39 missing responses per item) but retain the intent of the support score, the social support score was averaged regardless of social network size. For example, if the respondent listed six supporters who provided support in all four categories, the summed score was divided by 24. If only one supporter was listed, and only one category of support was perceived, that score was considered the average support score. If the respondent left all Perceived Support items blank, the score was given a missing value. The potential range of the Modified Burckhardt Perceived Support Score was 0.00 to 3.00, with higher scores reflecting higher levels of social support.

Self esteem. Self esteem was defined as "a liking and respect for one's self, and the belief in one's ability to get along with other people" (Parkerson et al., 1981). In this study, the Duke Health Profile Self Esteem Scale (Parkerson et al., 1990) served as the indicator for self-esteem (Appendix A, items H1, H2, H4, H6, and H7).

A 3-point scale was used to rate self esteem: 0 equaled *yes, describes me exactly*, 1 equaled *somewhat describes me*, and 2 equaled *no, doesn't describe me at all*. For this 5-item scale, Cronbach's alpha and test-retest reliability of .64 and .78, respectively, were reported by Parkerson. The Duke Self Esteem Scale also was calculated by summing the items, dividing that sum by twice the number of items, and multiplying the final sum by 100. Its potential range was 0 to 100, with higher scores reflecting higher levels of self esteem.

Chronic illness trajectory shape variables. Having symptoms of coronary heart disease prior to first cardiac arrest (Appendix A, item D5), the number of previous cardiac arrests (item D2), and time since last cardiac arrest (item D3) constituted the chronic illness trajectory shape variables to be used in the regression equation. These data were obtained by self report.

Chronic illness trajectory work variables. Presence of other medical problems, method of arrhythmia management, physical and emotional comfort, and functional capacity were considered the illness trajectory work categories. Presence of other medical problems (Appendix A, item D6) and method of arrhythmia management (item D4) were obtained by self report.

Physical comfort was defined as the absence of discomfort from physical symptoms (or their manifestations) that are commonly associated with chronic illness in general, and coronary heart disease and cardiac arrest survival in particular. The Modified Duke Physical Health Scale (Parkerson et al., 1990) was used to reflect physical comfort (Appendix A, items H8 to H14). Based on the investigator's clinical experience, two physical symptoms applicable to cardiac arrest survivors were added to modify the original scale: "heart palpitations" and "losing consciousness."

Items were rated on a 3-point scale of how much trouble or difficulty the respondent had with each physical symptom, where 0 equaled *a lot*, 1 equaled *some*, and 2 equaled *none*. Parkerson reported Cronbach's alpha of .67 and test-retest reliability of .75 for the original, 5-item scale. Based on Parkerson's directions, the scale was calculated by summing the items, dividing that sum by twice the number of items, and multiplying the final sum by 100. The potential range for the 7-item Modified Duke Health Profile Physical Health Scale was 0 to 100, with higher scores reflecting more physical comfort.

Emotional comfort was defined as the absence of psychological distress (or one of the manifestations of that distress) that is often associated with chronic illness in general, and coronary heart disease and cardiac arrest survival in particular. The Modified Duke Health Profile Mental Health Scale (Parkerson et al., 1990) was used as an indicator of emotional comfort (Appendix A, items H5, and H15 to H22). Based on the study of Finkelmeier and her colleagues (1984), six emotional symptoms applicable to this population were added: "anxiety," "restlessness," "fear of recurrent heart rhythm disturbance," "discouragement," "irritability or tenseness," and "having bad dreams."

The original mental health scale consisted of two additional items: "I like who I am" (Appendix A, item H1) and "I give up too easily" (item H4). These items were eliminated from the modified version of the mental health scale because they also were used as items on the Duke Health Profile Self Esteem Scale. Parkerson and his colleagues (1990) selected items for the Duke Health Profile based on

> "face validity in terms of the investigators' experience in research, health promotion, and patient care, and by certain psychometric properties....comparable item score variances, strong correlations of item scores with the mean score of the other items in their respective dimension (item-convergent validity), and the ability of these correlations to discriminate each item's dimension from other dimensions (item discriminant validity)." (p. 1058)

Regardless of their expertise or method of construct validity, this overlap seemed to represent inadequate content as well as inadequate construct validity of the Mental Health scale. Item overlap would tend to increase the correlation between the Mental Health and Self Esteem scales. The decision to drop the two items from the Mental Health scale was made because the items seemed more reflective of self esteem than emotional comfort.

A 3-point scale was used to measure the emotional distress or manifestations of distress. For the mental health item "I have difficulty concentrating," 0 equaled *yes, describes me exactly*, 1 equaled *somewhat describes me*, and 2 equaled *no, doesn't describe me at all*. All other items were rated according to the amount of trouble experienced in the previous week, where 0 equaled *a lot*, 1 equaled *some*, and 2 equaled *none*. For the original 5-item scale, Cronbach's alpha and test-retest reliability of .68 and .70, respectively, were reported by Parkerson and his colleagues (1990). Per Parkerson's instructions, the scale was calculated by summing the items, dividing that sum by twice the number of items, and multiplying the final sum by 100. The potential range for the 9-item Modified Duke Health Profile Mental Health Scale was 0 to 100, with higher scores reflecting greater emotional comfort.

Functional capacity was defined as consisting of the ability, energy and time to perform activities of everyday life within the home, work, and social settings. Social function was considered to be one component of functional capacity. The Modified Duke Health Profile Social Scale (Parkerson et al., 1990) was used to reflect social function (Appendix A, items H23 and H24). Using the same reasoning as with the Duke Health Profile Mental Health scale, three of the original Duke Health Profile Social Scale items were dropped from the modified version because they also had been included by Parkerson and his colleagues (1990) in the Duke Self Esteem Scale: "I am not an easy person to get along with," "I am happy with my family relationships," and "I am comfortable being around people." These items seemed to reflect self esteem to a greater extent than social function.

A 3-point scale was used to rate how often in the previous week the respondent engaged in social activities: 0 equaled *none*, 1 equaled *some*, and 2 equaled *a lot*. Parkerson (1990) reported Cronbach's alpha of .55 and test-retest reliability of .57 for the original, 5-item scale. As with the other Duke Health Profile scales, the social function scale was calculated by summing the items, dividing that sum by twice the number of items, and multiplying the final sum by 100. The potential range for the 2-item Modified Duke Social Health Scale was 0 to 100, with higher scores reflecting more social function.

The NYHA Functional Class (1964) often has been used as a succinct descriptor of functional capacity of persons with cardiovascular disease both in clinical practice and research. In this study it was conceptualized as a component of functional capacity indicative of chronic illness trajectory work. Traditionally, the classification is made by the health practitioner (usually a physician) based on *his or her perceptions* of the effect of heart disease on physical activity. For this study, the NYHA Functional Classification was modified to be a closed-ended question completed by self report (Appendix A, item D1). Using the same four standard categories, respondents were asked to classify themselves based on their own perceptions of activity limitations from heart disease.

Sense of coherence. Sense of coherence was defined using Antonovsky's (1987) definition:

> a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (1) the stimuli deriving from one's internal and external environments in the

> course of living are structured, predictable, and explicable; (2) the resources are available to one to meet the demands posed by these stimuli; and (3) these demands are challenges, worthy of investment and engagement. (p. 19)

Antonovsky's (1987) Sense of Coherence Questionnaire, Short Form (Appendix A, items C1 to C13), was used as the indicator of the independent variable of interest. Each of 13 items was rated on a 7-point scale, where 1 reflected a weak sense of coherence and 7 reflected a strong sense of coherence. For the 29-item version, Antonovsky (1987) reported Cronbach's alphas ranging from .84 to .93. Using the formula $r_{kk} = (kr_{11}) / [1+(k - 1)r_{11}]$, where k equals the number of items on the shorter test divided by the number of items on the longer test and r_{11} equals the Cronbach's alpha on the longer test (Nunnally, 1978, p. 243), Cronbach's alphas for the short version were estimated to be .70 to.86.

The Sense of Coherence Questionnaire is a summated rating scale. Based on factor analyses of multiple samples, Antonovsky (1987) concluded that, although theoretically distinguishable, the sense of coherence components of comprehensibility, manageability, and meaningfulness were not empirically separate. Therefore, only a total score was calculated. The potential range for the short form version was 13 to 91, with higher scores reflecting a stronger sense of coherence.

Qualitative, Open-Ended Questions

An open-ended question, "Please describe how your life and your view of life has changed as a result of your cardiac arrest," was added to enrich and clarify the quantitative results. This question was used when describing representative cases. A second open-ended question was added to gain insight on *near-death* experiences: "Do you have any memories of the cardiac arrest event? Please describe." Questions also were included that asked if the respondent would be willing to participate in a second study or to be interviewed by the investigator. These subjects could be part of a longitudinal study or could comprise a purposive sample for a qualitative study.

Psychometric Statistics

Internal consistency reliabilities were obtained for all scales used in this study, and are displayed in Table 3-4. Cronbach's alpha for the Modified Flanagan Quality of Life Scale, Sense of Coherence Questionnaire (Short Form), Modified Duke Health Profile Mental Scale, and the Modified Burckhardt Perceived Support Scale met Nunnally's (1978) criterion of .80 or higher for mature scales. His criterion of .70 for new scales was met by the Modified Duke Health Profile Physical Scale (Cronbach's alpha =.74). The Cronbach's alpha for the Modified Duke Health Profile Social Scale was .65. The Duke Health Profile Self Esteem Scale had the lowest Cronbach's alpha (.50). Cronbach's alpha values reported in Table 3-3 were computed using a listwise deletion approach. All but two of the Cronbach's alpha values were based on at least 146 cases.

Because of the extent of missing data for the 16-item Modified Flanagan Quality of Life Scale (0 to 11 missing responses per item, for a total of 41 missing values) and the 24-item Modified Burckhardt Perceived Support Score (21 to 39 missing responses per item, totaling 674 missing responses), internal consistency reliability also was estimated for these two scales using

Table 3-4

Internal Consistency Reliabilities for Scale Variables

Scale	**Number of Items**	**Number of Response Options**	**Cronbach's Alpha (*n*)**
Modified Flanagan Quality of Life (QOL)	16	7	.91 (69)[a]
Sense of Coherence Questionnaire, Short Version (SOC)	13	7	.87 (147)
Modified DUKE Physical Scale (PHYSICAL)	7	3	.74 (149)
Modified DUKE Mental Scale (EMOTIONAL)	9	3	.85 (146)
Modified DUKE Social Scale (SOCIAL)	2	3	.65 (149)
DUKE Self Esteem Scale (SELF ESTEEM)	5	3	.50 (149)
Modified Burckhardt Perceived Support Score (SUPPORT)	24	4	.90 (104)[a]

[a] Cronbach's alpha was computed only for those cases having valid (i.e., nonmissing) responses to all items on the scale. For the QOL scale, many subjects had legitimate missing data on an item if it was marked *not applicable.* For the SUPPORT scale, subjects sometimes left an item blank. In order to estimate Cronbach's alpha using the maximum number of cases, for each of these two scales, a pairwise deletion correlation matrix among the scale items was obtained. For each matrix, $\bar{r}$ (the average r among all pairs of items) was computed and standardized alpha was estimated using the formula: alpha = $[k\bar{r}] / [1 + (k-1)\bar{r}]$. The estimated standardized alpha values based on the pairwise correlation matrix were .92 for QOL and .90 for SUPPORT.

an alternative approach. For the Modified Flanagan Quality of Life Scale, respondents were given the option of writing *not applicable* next to any item. For the Modified Burckhardt Perceived Support Scale, a number of respondents left the questions blank. These missing values may reflect difficulty in answering the scale rather than not having a social support network. Therefore, such missing values were considered legitimate. In order to use the maximum number of cases in the computation, the standardized alpha coefficient was estimated based on correlation matrices obtained from pairwise rather than listwise deletion. Standardized alphas for both the Modified Flanagan Quality of Life Scale and the Modified Burckhardt Perceived Support Score met Nunnally's (1978) criterion for mature scales (.92 and .90, respectively). These standardized alphas were comparable to the Cronbach's alphas obtained using the listwise deletion approach.

Data Analysis

Stepwise, hierarchical multiple regression was used to test the primary hypothesis: After controlling for social status variables related to poor health vulnerability, perceived support, self esteem, and the chronic illness trajectory shape and work variables, the addition of sense of coherence will significantly improve estimation of quality of life. Partial F tests were obtained after each stepwise addition. The a priori level of significance was $p < .05$. Variables were entered in the following steps: (a) social status variables related to poor health vulnerability—age, gender, race, educational level, marital status; (b) perceived social support (SUPPORT); (c) self esteem (SELF ESTEEM); (d) chronic illness trajectory shape variables—coronary heart disease symptoms (SYMPTOMS) prior to first cardiac arrest, number (NUMBER) of cardiac arrests, time (TIME) since last cardiac arrest; (e) chronic illness trajectory work variables—other medical problems (PROBLEMS), medical treatment (TREATMENT), physical comfort (PHYSICAL), emotional comfort (EMOTIONAL) social function (SOCIAL), and NYHA Functional Class; and (f) sense of coherence (SOC). Subjects were omitted from the analysis if a QOL score could not be calculated as a result of the extent of missing data or if they had more than 20% missing data for the predictor variable scales or scores.

As advocated by Cohen and Cohen (1983), dummy coding was used to assess randomness versus selectiveness of missing data. Missing predictor variables were counted and categorized as either 0, 1, 2, or 3 variables missing. Since the support score had the largest number of missing responses (see Chapter 4), a dichotomous variable indicating a missing or non-missing value for perceived support was created. Dummy coding also was used to create another variable indicating the number of missing predictor variables other than perceived support. Each of these variables were used in the regression analyses to estimate their respective contributions to explained variance in quality of life or sense of coherence. Additionally, cases were dichotomized into three groupings of missing or not missing (a) any of the predictor variables, (b) only perceived support, and (c) any of the predictor variables other than perceived support. *T*-tests were used to determine if there were differences by group membership on the dependent variable and all independent variables. A conservative alpha level of $\leq .10$ was chosen in an attempt to identify an differences.

For persons with 20% or fewer missing predictor variables, mean substitution was used in the regression analyses. Cohen and Cohen (1983) advocated for mean substitution because it runs no risk of a mistaken randomness assumption, nor of producing an inconsistent correlation matrix. Additionally, mean substitution uses all of the independent variables and the entire sample. Thus, they posited that it adheres realistically to the population actually sampled, missing data and all.

Based on the recommendations of Kleinbaum and his associates (Kleinbaum, Kupper, & Muller, 1988), descriptive statistics, scatter diagrams, histograms, and regression diagnostics were used to check the assumptions underlying the data and to assess the accuracy of the computations. The assumptions underlying the model were linearity, homoscedasticity, and normal distribution. Descriptive statistics (mean, standard deviation, median, minimum and maximum scores, skewness, standard error of skewness, kurtosis, and standard error of kurtosis) and histograms were used to evaluate data plausibility and normal distribution. Outliers were assessed using scatter diagrams of all independent variables with quality of life and with sense of coherence. Regression diagnostics included residual analyses, casewise analysis, and partial plots. Residual analyses (standardized residuals plotted against standardized predicted values) were used to detect systematic trends indicative of nonlinear relationships or heteroscedasticity. Normal probability plots were used to detect deviations from normality. Casewise analysis was used to identify outliers. Standardized partial plots of each independent variable with the dependent variable, holding all other variables constant, were used to visualize the independent contribution of each predictor variable at the last step of the regression. The standardized partial plot between quality of life and sense of coherence, holding all other independent variables constant, was used to assess the appropriateness of the regression model in this sample, and to select cases representative of fitting the model well, having higher quality of life than predicted from sense of coherence, and having lower quality of life than predicted from sense of coherence.

Qualitative data from 22 representative cases were used to describe the sample and to enrich the quantitative findings. For the representative cases, words, phrases, descriptors and terms central to quality of life and sense of coherence were identified. A comparison was then made between the qualitative descriptors and the quality of life, sense of coherence and other predictor variables.

CHAPTER 4

Results

Dependent Variable

The dependent variable, quality of life, as measured by the Modified Flanagan Quality of Life Scale, had a scale score that ranged from 36 to 112 (possible range is 16 to 112), and an average score of 84.8 (*SD* = 14.0) in this sample. Stated differently, the mean QOL score of each of the 16 items was 5.3 (on the 7-point delighted-terrible scale, where 7 = delighted and 1 = terrible). Satisfaction was highest for “close relations with spouse or significant other” (*M* = 6.1) and “having and rearing children” (*M* = 6.0), and lowest for “participating in organizations and public affairs” (*M* = 4.3) and “participating in active recreation (*M* = 4.5). Satisfaction with health ranked 13th out of 16, with a mean value of 4.7. Three items in particular were considered by many respondents to have no applicability to their lives: “having and rearing children” (43%), “learning” (25%), and “participating in organizations and public affairs” (26%). Only one item, “independence, being able to do things for yourself,” was answered by all respondents. Table 4-1 presents all QOL scale items in order of respondent satisfaction, along with their mean scores and standard deviations.

Independent Variables

The primary independent variable of interest, sense of coherence, as measured by the Sense of Coherence Questionnaire (Short Form), had a scale score that ranged from 31 to 91 (possible range is 13 to 91), and averaged 69.2 (*SD*=13.0). Stated in another way, the average of each of the 13 items was 5.3 (on a 7-point scale, with 7 representing the strongest SOC

Table 4-1

Descriptive Statistics for Modified Flanagan Quality of Life Scale

Scale (*N* =149) *M* = 84.79 *SD* =14.04 Item average = 5.30 Minimum = 36 (possible low =16) Maximum = 112 (possible high = 112) Skewness = -0.56 (*SE* = 0.20) Kurtosis = 0.41 (*SE* = 0.40) **Items** (7-point scale, 7 = *delighted*, 1 = *terrible*)	**Mean (*SD*)**	***n***	**Missing**	**Not applicable**
Q 5. Close relations with spouse or significant other	6.09 (1.12)	134	3	12
Q 4. Having and rearing children	6.03 (1.10)	74	11	64
Q 6. Close friends	5.79 (1.02)	147	1	1
Q 1. Material comforts: home, food, financial security	5.78 (1.01)	148	1	0
Q14. Reading, music, watching entertainment	5.76 (1.03)	148	0	1
Q16. Independence, being able to do things for yourself	5.72 (1.22)	149	0	0
Q 3. Relationships with parents, siblings, & other relatives: communicating, visiting, helping	5.69 (1.22)	146	1	2
Q10. Understanding yourself: knowing what life is about	5.57 (1.27)	147	1	1
Q13. Socializing: meeting other people, doing things	5.25 (1.36)	146	2	1
Q11. Work: job or home	5.07 (1.45)	135	6	8
Q 7. Helping and encouraging others, volunteering	5.02 (1.41)	133	4	12
Q12. Expressing yourself creatively	4.96 (1.38)	139	6	4
Q 2. Health: being physically fit and vigorous	4.73 (1.48)	148	1	0
Q 9. Learning: attending school, improving knowledge	4.60 (1.57)	106	6	37
Q15. Participating in active recreation	4.48 (1.78)	138	2	9
Q 8. Participating in organizations and public affairs	4.28 (1.68)	121	2	26

Note. From "Measurement of Quality of Life: Current State of the Art" by J.C. Flanagan, 1982, *Archives of Physical Medicine and Rehabilitation*, *63*, 57; "Quality of Life in Adults with Chronic Illness: A Psychometric Study" by C.S. Burckhardt, S.L. Woods, A.A. Schultz, and D.M. Ziebarth, 1989, *Research in Nursing and Health*, *12*, 351; and *Social indicators of well-being: The development and measurement of perceptual indicators* by R.M. Andrews and R. Crandall, 1976, New York: Plenum Press.

and 1 representing the weakest SOC). Along with the SOC scale and item descriptive statistics, Table 4-2 groups the SOC items under the three domains of comprehensibility, manageability, and meaningfulness. Scores for all other independent-variable scales used in the regression models are summarized in Table 4-3.

Missing Data

The extent of missing data in this sample is apparent from Tables 4-2 and 4-3. Nearly 36% of respondents had one (*n* = 27), two (*n* = 8), or three (*n* =1) missing predictor variables, 21 respondents (14%) had missing data for the perceived support score, and 9% of respondents were missing either one (*n* = 13) or two (*n* = 1) predictor variables other than SUPPORT. As suggested by Cohen and Cohen (1983), independent *t*-tests were used to assess whether persons with complete data differed from each of three groupings of subjects with missing predictor data. These three groupings of respondents were (a) missing one, two or three predictor variables including the perceived support variable versus missing none, (b) missing only the perceived support variable versus not missing the perceived support variable, and (c) missing one, two or three predictor variables other than perceived support versus not missing one, two or three variables other than perceived support. Due to the differences in group size, separate variance estimates were used. In an effort to insure that differences were recognized, a conservative alpha of .10 was chosen.

Based on group membership, differences were seen in four variables: QOL, SOC, SOCIAL, and SYMPTOMS. Group comparisons revealed differences in QOL and SOCIAL scores if one, two or three predictor variables

Table 4-2

Descriptive Statistics for Sense of Coherence Questionnaire *(Short Form)*[a]

Scale (*n*=147) *M* = 69.21 *SD* =12.95 Item average = 5.32 Minimum = 31 (possible low = 13) Maximum = 91 (possible high = 91) Skewness = -0.49 (*SE* = 0.20) Kurtosis = -0.39 (*SE* = 0.20) **Items** (7-point scale, 7 = strongest SOC, 1 = weakest SOC)	**Mean (*SD*)**	***n***	**Missing**	**Not applicable**
COMPREHENSIBILITY				
C 2. Has it happened in the past that you were surprised by the behavior of people whom you thought you knew well? (1 = *always happened*, 7 = *never happened*)	5.04 (1.44)	149	1	0
C 6. Do you have the feeling that you are in an unfamiliar situation and don't know what to do? (1 = *very often*, 7 = *very seldom or never*)	5.64 (1.69)	149	0	0
C 8. Do you have very mixed-up feelings and ideas? (1 = *very often*, 7 = *very seldom or never*)	5.35 (1.61)	145	3	1
C 9. Does it happen that you have feelings inside you would rather not feel? (1 = *very often*, 7 = *very seldom or never*)	5.08 (1.87)	146	3	0
C 11. When something happened, have you generally found that: (1 = *you overestimated or underestimated its importance*, 7 = *you saw things in right proportion*)	4.74 (1.57)	147	2	0
MANAGEABILITY				
C 3. Has it happened that people whom you counted on disappointed you? (1 = *always happened*, 7 = *never happened*)	5.25 (1.47)	149	0	0
C 5. Do you have the feeling that you're being treated unfairly? (1 = *very often*, 7 = *very seldom or never*)	5.91 (1.42)	149	0	0
C 10. Many people—even those with a strong character—sometimes feel like sad sacks *(losers)* in certain situations. How often have you felt this way in the past? (1 = *very often*, 7 = *never*)	4.98 (1.59)	147	2	0
C 13. How often do you have feelings that you're not sure you can keep under control? (1 = *very often*, 7 = *very seldom or never*)	5.66 (1.56)	148	1	0

Table continues...

[a] Based on scale instructions, items C1, C2, C3, C7, and C10 were recoded.

Table 4-2 *(Continued)*

Descriptive Statistics for Sense of Coherence Questionnaire *(Short Form)*[a]

Items (7-point scale, 7 = strongest SOC, 1 = weakest SOC)	**Mean (*SD*)**	***n***	**Missing**	**Not applicable**
MEANINGFULNESS				
C 1. Do you have the feeling that you don't really care about what goes on around you? (1 = *very often*, 7 = *very seldom or never*)	5.61 (1.81)	148	1	0
C 4. Until now your life has had: (1 = *no clear goals or purpose at all*, 7 = *very clear goals and purpose*)	5.45 (1.37)	148	0	1
C 7. Doing the things you do everyday is: (1 = *a source of pain and boredom*, 7 = *a source of deep pleasure and satisfaction*)	5.19 (1.48)	147	2	0
C 12. How often do you have the feeling that there's little meaning in the things you do in your daily life? (1 = *very often*, 7 = *very seldom*)	5.38 (1.71)	147	2	0

[a] Based on scale instructions, items C1, C2, C3, C7, and C10 were recoded.

Note. From *Unraveling the Mystery of Health* (pp. 189-194) by A. Antonovsky, 1987, San Francisco: Jossey-Bass Publishers.

Table 4-3

Descriptive Statistics for Independent Variables other than Sense of Coherence

Variable	*n*	*% Missing*	*M*	*SD*	**Range Potentia l**	**Range Actual**	**Skewness (SE)**	**Kurtosis (SE)**
PHYSICAL	149	0	62.48	19.25	0-100	14.3-100	-0.22 (.20)	-0.48 (.40)
EMOTIONAL	149	0	70.72	21.93	0-100	0-100	-0.61 (.20)	0.10 (.40)
SOCIAL	149	0	60.24	27.42	0-100	0-100	-0.06 (.20)	-1.00 (.40)
SELF ESTEEM	149	0	77.36	17.22	0-100	40-100	-0.35 (.20)	-0.88 (.40)
SUPPORT	128	14	2.04	0.59	0.00-3.00	0.13-3.00	-0.29 (.21)	-0.09 (.43)

KEY: PHYSICAL = Modified Duke Health Profile Physical Scale; EMOTIONAL = Modified Duke Health Profile Mental Scale; SOCIAL = Modifed Duke Health Profile Social Scale; SELF ESTEEM = Duke Health Profile Self Esteem Scale; SUPPORT= Modified Burckhardt Perceived Support Score including SUPPORT or if SUPPORT alone were missing. On the average, there were lower scores on both QOL and SOCIAL if data were missing. The SOC score was different only in the group missing one, two or three predictor variables including the perceived support variable. For this group, on the average, if one, two or three predictor variables were missing, the SOC score was lower. Differences in having coronary heart disease symptoms before first cardiac arrest were seen in respondents grouped according to missing only the average support variable. On the average, those respondents missing the perceived support score were more likely to have experienced other symptoms of coronary heart disease prior to their first cardiac arrest. Membership in the group with one, two or three missing predictor variables other than perceived support resulted in no differences in any study variable. These results, suggestive that the pattern of missing data was non random, are summarized in Table 4-4.

Correlation and Multiple Regression

Zero-Order Correlation Analyses

Quality of life was more highly correlated to the primary independent variable of interest, sense of coherence, than to any other variable studied (r=.73). There were strong correlations between QOL and SELF ESTEEM (r=.50), EMOTIONAL (r=.50), PHYSICAL (r=.40), SOCIAL (r=.40), reported NYHA Classification (r=-.39), and SUPPORT (r=.25). The QOL score was not related to any of the social status or trajectory shape variables, but was inversely associated with the number of missing predictor variables (r= -.17, p=.037).

Sense of coherence also was unrelated to the social status and

Table 4-4

Significantly Different Responses on Four Variables for Respondents Grouped by Number and Type of Missing Predictor Variables

	Missing 1, 2, or 3 Predictor Variables *including* Perceived Support					Missing *only* Perceived Support					Missing 1 or 2 Predictor Variables *other than* Perceived Support				
VARIABLE	No	Yes	t	df	p	No	Yes	t	df	p	No	Yes	t	df	p
Quality of Life	$M = 86.37$ $SD = 12.94$ ($n = 113$)	$M = 79.82$ $SD = 16.24$ ($n = 36$)	2.21	49.97	.032	$M = 85.81$ $SD = 13.21$ ($n = 128$)	$M = 78.58$ $SD = 17.41$ ($n = 21$)	1.82	23.92	.082	$M = 85.09$ $SD = 13.87$ ($n = 135$)	$M = 81.93$ $SD = 15.87$ ($n = 14$)	.72	15.41	.485
Sense of Coherence	$M = 70.29$ $SD = 13.00$ ($n = 113$)	$M = 65.60$ $SD = 12.29$ ($n = 34$)	1.93	57.04	.059	$M = 69.81$ $SD = 12.88$ ($n = 127$)	$M = 65.4$ $SD = 13.09$ ($n = 20$)	1.40	25.14	.173	$M = 69.60$ $SD = 13.04$ ($n = 134$)	$M = 65.20$ $SD = 11.74$ ($n = 13$)	1.28	15.02	.221
Social Function	$M = 62.61$ $SD = 27.57$ ($n = 113$)	$M = 52.78$ $SD = 25.90$ ($n = 36$)	1.95	62.31	.055	$M = 62.70$ $SD = 26.99$ ($n = 128$)	$M = 45.24$ $SD = 25.76$ ($n = 21$)	2.86	27.71	.008	$M = 59.63$ $SD = 27.66$ ($n = 135$)	$M = 66.07$ $SD = 25.21$ ($n = 14$)	-.90	16.42	.380
Heart Disease Symptoms before First Cardiac Arrest	$M = .57$ $SD = .50$ ($n = 113$)	$M = .72$ $SD = .45$ ($n = 36$)	-1.75	63.98	.085	$M = .58$ $SD = .50$ ($n = 128$)	$M = .76$ $SD = .44$ ($n = 21$)	-1.75	29.16	.090	M=.61 SD=.49 (n=135)	M=.57 SD=.51 (n=14)	.25	15.56	.805

Note. Because of unequal group sizes, separate variance estimates were used. A conservative alpha ($p \leq .10$) was chosen to insure that group differences were seen.

trajectory shape variables. The SOC score was strongly and positively associated with EMOTIONAL (r=.68), SELF ESTEEM (r=.50), PHYSICAL (r=.37), SOCIAL (r=.32), and SUPPORT (r=.17). It was inversely correlated with reported NYHA Classification (r=-.29) and the number of missing predictor variables (r= -.16, p=.05). Table 4-5 displays correlation coefficients for QOL and SOC with all independent variables not having dummy coding (i.e., marital status, race, and medical treatment). Appendix G contains the correlation matrix for all variables not having dummy coding. The correlation matrix for marital status and treatment with all variables not having dummy coding is presented in Appendix H. The variable *race* was excluded from Appendix H because of its lack of variability in this sample.

Maximum-Model Multiple Regression

Stepwise hierarchical multiple regression with 17 independent variables was used to test the primary study hypothesis: After controlling for social status variables related to poor health vulnerability, perceived support, self esteem, and the chronic illness trajectory shape and work variables, the addition of sense of coherence will significantly improve estimation of quality of life. Mean substitution (Cohen & Cohen, 1983) was used for cases missing 20% or less of the predictor variables. As proposed in the theoretical model (Figure 2-3), the 17 variables were entered in 6 steps. At the first step, social status variables related to poor health vulnerability did not contribute significantly to explained variance. Thus, the first significant change in the squared multiple correlation coefficient, 5% (p =.008), was attained at Step 2 with the addition of SUPPORT to the model. At the third step, SELF ESTEEM

Table 4-5

Zero-Order Correlation Coefficients for Quality of Life (Modified Flanagan Quality of Life Scale) and Sense of Coherence Questionnaire *(Short Form)* ***with all Independent Variables not Having Dummy Coding***

	r with QOL				r with SOC		
Variable	*r*	*n*	*p*	Variable	*r*	*n*	*p*
AGE	-.001	148	.912	AGE	.067	146	.419
GENDER	.095	149	.250	GENDER	.012	147	.888
EDUCATION	.131	149	.112	EDUCATION	.086	147	.300
SELF ESTEEM	.503	149	.000	SELF ESTEEM	.495	147	.000
SUPPORT	.248	128	.005	SUPPORT	.173	127	.051
SYMPTOMS	-.121	149	.141	SYMPTOMS	.034	147	.684
NUMBER	.086	142	.311	NUMBER	.056	140	.509
TIME	.006	149	.940	TIME	.006	149	.940
PROBLEMS	-.110	145	.186	PROBLEMS	-.023	147	.781
PHYSICAL	.404	149	.000	PHYSICAL	.366	147	.000
EMOTIONAL	.503	146	.000	EMOTIONAL	.681	144	.000
SOCIAL	.403	146	.000	SOCIAL	.315	147	.000
NYHA	-.387	146	.000	NYHA	-.288	144	.000
SOC	.728	147	.000				

KEY: GENDER (1 = female, 0 = male); EDUC = Education (in years); SYMPTOMS = Reported coronary heart disease symptoms before first cardiac arrest (1 = yes, 0 = no); NUMBER = Reported number of cardiac arrests; TIME = Reported time since last cardiac arrest; PROBLEMS = Reported other medical problems (1 = yes, 0 = no); NYHA = Reported NYHA Classification; PHYSICAL = Modified Duke Health Profile Physical Health Scale; EMOTIONAL = Modified Duke Health Profile Mental Health Scale; SOCIAL = Modified Duke Health Profile Social Health Scale; SELF ESTEEM = Duke Health Profile Self Esteem Scale; SUPPORT= Modified Burckhardt Perceived Support Score contributed 23% to explained variance. The chronic illness trajectory shape variables also did not make a significant contribution to explained variance. After all independent variables except SOC had been entered, the percent of explained variance equaled 52% ($p <.001$). At the last step, the entry of SOC contributed an additional 14% to the explained variance ($p <.001$), for a total percent of explained variance in quality of life of 67% (adjusted $R^2 = .59$). The summary table for this regression is presented in Table 4-6.

The variable with the highest beta weight throughout the regression analysis was SOC, starting at Step 1 at .73 and ending at Step 6 at .58 ($p <.001$). Thus, the beta weight for SOC dropped only by .15 after all other variables had been entered. The only other variable with a significant beta weight at the last step was SELF ESTEEM (β weight =.18, $p = .008$).

Residual analysis. Residual analysis revealed eight cases between +2 and +3 or between -2 and -3 standard errors of the estimate, but none at or beyond ±3 standard errors of the estimate. The normal probability plot did not suggest any departures from the normality assumption. On the scatter diagram of standardized residual versus predicted values, a horizontal band without any systematic trends was obtained, suggesting constant error variance and normality. Based on this residual analysis, the tests of significance appear to be valid.

To assess how well cases fit the model when the first 16 predictors had been partialled out, a standardized partial plot was obtained between the standardized residual for QOL (i.e., Z_{QOL}-$Z_{QOL'}$, where $Z_{QOL'}$ is predicted from all predictors in the model except SOC) and the standardized residual for SOC (i.e., Z_{SOC}-$Z_{SOC'}$, where $Z_{SOC'}$ is predicted from all other predictors in

Table 4-6

Maximum-Model, Quality-of-Life*[a] *Multiple Regression Summary (*N* = 149)

Step	Variable	R^2 Change	Sig Change	R^2	Adj R^2	*F* (Eqn)	Sig *F*	β weight at last step [b]
1	AGE	.05	.529	.05	-.01	.89	.529	-.02
	GENDER							.09
	EDUCATION							.02
	MARITAL							
	RACE							
2	SUPPORT	.05	.008	.10	.04	1.58	.118	.05
3	SELF ESTEEM	.23	.000	.33	.28	6.22	.000	.18
4	SYMPTOMS	.02	.358	.35	.28	5.13	.000	-.12
	NUMBER							.08
	TIME							-.01
5	PROBLEMS	.17	.000	.52	.42	5.13	.000	-.01
	TREATMENT							
	PHYSICAL							.08
	EMOTIONAL							-.02
	SOCIAL							.14
	NYHA CLASS							-.09
6	SOC	.14	.000	.67	.59	8.94	.000	.58

KEY: [a] Modified Flanagan Quality of Life Scale; [b] For those variables not having dummy coding

Headings: Sig Change = Significance of change (two-tailed); Adj = Adjusted; Eqn = Equation; Sig *F* = Significance of *F* test

Steps: 1 = Social status variables related to poor health vulnerability; 4 = Chronic illness trajectory shape variables; 5 = Chronic illness trajectory work variables

Variables: AGE (Years); GENDER (1 = female, 0 = male); EDUCATION = Education (Years); MARITAL = Marital Status (Dummy coding); RACE (Dummy coding); SUPPORT = Modified Burckhardt Perceived Support Score; SELF ESTEEM = Duke Self Esteem Scale; SYMPTOMS = Coronary heart disease symptoms before first cardiac arrest (1 = yes, 0 = no); NUMBER = Number of cardiac arrests; TIME = Time since last cardiac arrest; PROBLEMS = Other medical problems (1 = yes, 0 = no); TREATMENT = Medical treatment (Dummy coding); PHYSICAL = Modified Duke Physical Scale; EMOTIONAL = Modified Duke Mental Scale; SOCIAL = Modified Duke Social Scale; NYHA = Reported NYHA Functional Classification; SOC = Sense of Coherence Questionnaire, Short Form the model) ($r^2 = .55$, $p < .001$). This plot, displayed in Figure 4-1, demonstrates how well the majority of cases fit the model. No case fell outside ±3 standard errors of the estimate.

Contribution of missing predictors. To test the contribution of missing predictors in explained variance of quality of life, three additional hierarchical regression analyses using the original 17 independent variables in the same order were performed. On the 7th step of each regression analysis, either the number of missing predictors including perceived support (0, 1, or 2), the number of missing predictor variables other than perceived support (0, 1, 2), or missing only perceived support (0, 1) was added. None of these variables made a significant change in explained variance of quality of life (R^2change $= .001$, $p = .707$; R^2change $= .000$, $p = .844$; and R^2 change $= .003$, $p = .266$, respectively).

Parsimonious-Model Multiple Regression

A simpler model might facilitate use of these findings in clinical practice. Thus, the four constructs that made significant contributions to explained variance of quality of life in the maximum model (perceived support, self esteem, chronic illness trajectory work variables, and sense of coherence) were selected for further analysis. Six variables served as indicators of chronic illness trajectory work. Other medical problems was eliminated as an indicator of that construct because it had a nonsignificant zero-order correlation with quality of life. For the construct *type of arrhythmia treatment*, significance of the overall construct was tested prior to entering the specific treatment categories into the parsimonious model (Polissar & Diehr, 1982). Because the construct was not significant, it was eliminated. Thus, seven

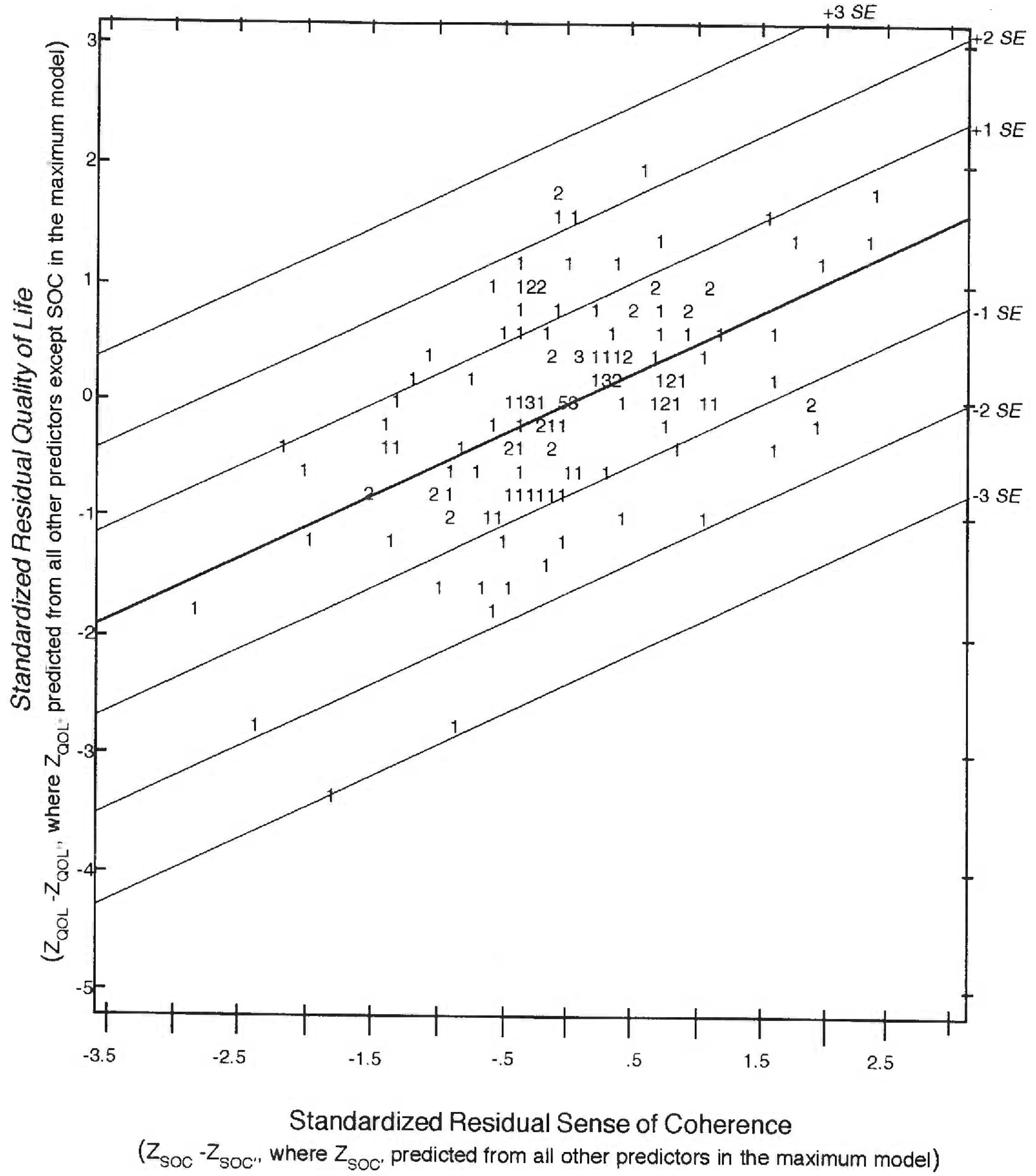

Figure 4-1. **Standardized Partial Plot Regression** (n =147). Partial r^2 =.30, *SE* of the estimate = 0.77, Significance p<.001, Intercept (*SE*) = -0.00 (.06), Slope (*SE*) = 0.55 (0.07). The regression line is darkest, and is bounded by lines representing ±1 to ±3 *SE* of the estimate. Numbers on the plot itself (i.e., 1, 2, 3, 5) represent the number of cases at that point.

independent variables representing the four constructs that made significant contributions to explained variance of quality of life in the maximum model were used to create a parsimonious regression model.

To meet the criterion of having 80% of predictor variables, in this model only one independent variable could be missing. Mean substitution was used for cases missing one predictor variable. Thus, the sample size was reduced to 147 when the parsimonious model was used to test the contribution of the sense of coherence to quality of life. The variables entered on Steps 1 through 3 each made a significant contribution to percent of explained variance: 5% by SUPPORT, 22% by SELF ESTEEM, and 18% by the indicators of chronic illness trajectory work—PHYSICAL, EMOTIONAL, SOCIAL, and NYHA. After Step 3, the percent of explained variance in quality of life totaled 45%. On the last step, SOC contributed an additional 17% ($p < .001$) to the percent of explained variance, for a total percent of explained variance of 62% (adjusted $R^2 = .60$). The summary table for this regression is presented in Table 4-7.

Assessment of shifts in beta weights at each step may clarify the independent contribution of each of the variables. Although there were no clear guidelines, based on experience, an arbitrary cutoff of ≥.10 change in beta weights was chosen to evaluate large shifts. Table 4-8 summarizes beta weights for each variable before and after entry into the parsimonious model. Beta weights from four variables had important changes. At Step 2, with the entry of self esteem, beta weights dropped both for emotional comfort (.48 to .36) and social function (.39 to .28). The beta weight for emotional comfort continued to drop at Step 3 with the addition of chronic illness trajectory work

Table 4-7

Parsimonious-Model, Quality-of-Life* [a] *Multiple Regression Summary
(*N* = 147)

Step	Variable	R^2 Change	Sig Change	R^2	Adj R^2	F (Eqn)	Sig F	β weight at last step
1	SUPPORT	.05	.008	.05	.04	7.29	.008	.07
2	SELF ESTEEM	.22	.000	.27	.26	26.27	.000	.14
3	PHYSICAL EMOTIONAL SOCIAL NYHA CLASS	.18	.000	.45	.43	19.15	.000	.09 -.08 .14 -.12
4	SOC	.17	.000	.62	.60	32.04	.000	.59

KEY: [a] Modified Flanagan Quality of Life Scale

Headings: Sig Change = Significance of change (two-tailed); Adj = Adjusted; Eqn = Equation; Sig *F* = Significance of *F* test

Steps: 3 = Chronic illness trajectory work variables

Variables: SUPPORT = Modified Burckhardt Perceived Support Score; SELF ESTEEM = Duke Self Esteem Scale; SYMPTOMS = Coronary heart disease symptoms before first cardiac arrest (1 = yes, 0 = no); NUMBER = Number of cardiac arrests; TIME = Time since last cardiac arrest; PHYSICAL = Modified Duke Physical Scale; EMOTIONAL = Modified Duke Mental Scale; SOCIAL = Modified Duke Social Scale; NYHA = Reported NYHA Functional Classification; SOC = Sense of Coherence Questionnaire, Short Form

Table 4-8

Beta Weights for Parsimonious-Model, Quality-of-Life [a] ***Multiple Regression*** (*n* = 147)

Variables in Order Entered	Zero-Order r with QOL	Step 1	Step 2	Step 3	Step 4
1 SUPPORT	.25	.22	.16	.11	.07
2 SELF ESTEEM	.50	.47	.47	.29	.14
3 PHYSICAL	.40	.41	.32	.06	.09
EMOTIONAL	.50	.48	.36	.25	-.08
SOCIAL	.40	.39	.28	.19	.14
NYHA CLASS	-.39	-.37	-.30	-.15	-.12
4 SOC	.73	.71	.63	.59	.59

Note: Beta weights below the bold line represent variables not yet in the equation. Circled values represent step changes of ≥.10 in beta weights.

Variables: [a] Modified Flanagan Quality of Life Scale; SUPPORT= Modified Burckhardt Perceived Support Score; SELF ESTEEM = Duke Health Profile Self Esteem Scale; PHYSICAL = Modified Duke Health Profile Physical Scale; EMOTIONAL = Modified Duke Health Profile Mental Scale; SOCIAL = Modified Duke Health Profile Social Scale; NYHA = Reported NYHA Functional Classification; SOC = Sense of Coherence Questionnaire, Short Form variables (.36 to .25) and at Step 4 with the addition of sense of coherence. (.25 to -.08). Other variables that had decreases in beta weights at Step 3 were SELF ESTEEM (.47 to .29), PHYSICAL (.32 to .06), and NYHA (-.30 to -.15). The beta weight for SELF ESTEEM was reduced further (.29 to .14) when SOC was added on the last step. Thus, three variables had statistically significant beta weights after all variables had been entered into the model: SOC (β =.59, p <.001), SOCIAL (β =.14, p =.02), and SELF ESTEEM (β =.14, p =.02). The beta weights for SOC were highest and most consistent of any variable in the model. At Step 1, the beta weight for SOC was .71. During the regression analysis it dropped only by .12, ending at .59. Its largest drop (.71 to .63) occurred at Step 2 with the addition of SELF ESTEEM into the equation.

Residual analysis. Residual analysis of this parsimonious model revealed ten cases between +2 and +3 or between -2 and -3 standard errors of the estimate, but none at or beyond ±3 standard errors of the estimate. As in the maximum model, the normal probability plot did not suggest any departures from the normality assumption. The scatter diagram of standardized residual versus predicted values revealed a horizontal band without any systematic trends, again suggesting constant error variance and normality. Based on this residual analysis, the tests of significance appear to be valid.

Contribution of missing predictors. Three more hierarchical regression analyses were performed to test the contribution of the missing predictors in explained variance of QOL in the parsimonious model. The same seven independent variables were added in the same four steps. As the maximum model, the contributions of one missing predictor including perceived support, missing one predictor other than perceived support, and missing only the perceived support score were assessed. On each of three regressions, one of the new variables was added on the fifth step. Having one missing predictor including perceived support or missing only the perceived support score contributed small but significant amounts to explained variance (R^2change = .01, p =.03, and R^2change = .01, p =.02, respectively). Having a missing predictor other than perceived support was not significant.

Sense of Coherence Multiple Regression

Hierarchical multiple regression was used to test the second hypothesis: After controlling for social status variables related to poor health vulnerability, perceived support, and the chronic illness trajectory shape and work variables, self esteem will contribute significantly to sense of coherence. Mean substitution was used for cases missing 20% or fewer of the predictor variables. Neither social status variables related to poor health, perceived support, nor the chronic illness trajectory shape variables—heart disease symptoms prior to first cardiac arrest, number of cardiac arrests, and time since last cardiac arrest—contributed significantly to explained variance. Thus, after nine variables had been entered in the first three steps, explained variance in sense of coherence totaled only 10%. The addition of the chronic illness trajectory work variables at step 4 contributed 44% to explained variance, for a total explained variance of 54%. At the last step, self esteem contributed an additional 4% (p <.002), for a total explained variance of 57% (adjusted R^2 =.48). The summary table for the SOC regression is presented in Table 4-9.

Table 4-9

Sense of Coherence ^{a} ***Multiple Regression Summary*** (n = 147)

Step	**Variable**	R^2 **Change**	**Sig Change**	R^2	**Adj** R^2	F **(Eqn)**	**Sig** F	**β weight at last step** ^{b}
1	AGE	.06	.510	.06	-.00	.92	.510	.01
	GENDER							.04
	EDUCATION							.01
	MARITAL							
	RACE							
2	SUPPORT	.02	.060	.08	.01	1.20	.294	.10
3	SYMPTOMS	.02	.435	.10	.01	1.14	.335	.09
	NUMBER							.05
	TIME							-.08
4	PROBLEMS	.44	.000	.54	.44	5.62	.000	.00
	TREATMENT							
	PHYSICAL							.01
	EMOTIONAL							.54
	SOCIAL							.04
	NYHA CLASS							-.03
5	SELF ESTEEM	.04	.002	.57	.48	6.24	.000	.23

KEY: [a] Sense of Coherence Questionnaire, Short Form; [b] For those variables not having dummy coding

Headings: Sig Change = Significance of change (two-tailed); Adj = Adjusted; Eqn = Equation; Sig F = Significance of F test

Steps: 1 = Social status variables related to poor health vulnerability; 4 = Chronic illness trajectory shape variables; 5 = Chronic illness trajectory work variables

Variables: AGE (Years); GENDER (1 = female, 0 = male); EDUCATION = Education (Years); MARITAL = Marital Status (Dummy coding); RACE (Dummy coding); SUPPORT = Modified Burckhardt Perceived Support Score; SYMPTOMS = Coronary heart disease symptoms before first cardiac arrest (1 = yes, 0 = no); NUMBER = Number of cardiac arrests; TIME = Time since last cardiac arrest; PROBLEMS = Other medical problems (1 = yes, 0 = no); TREATMENT = Medical treatment (Dummy coding); PHYSICAL = Modified Duke Physical Scale; EMOTIONAL = Modified Duke Mental Scale; SOCIAL = Modified Duke Social Scale; NYHA = Reported NYHA Functional Classification; SELF ESTEEM = Duke Self Esteem Scale

The variable with the highest beta weight throughout the regression analysis was EMOTIONAL, starting at Step 1 at .67 and ending at Step 5 at .54 ($p < .001$). Thus, the beta weight for EMOTIONAL dropped only by .13 after all other variables had been entered. SELF ESTEEM had the second highest beta weight at Step 1 (β weight =.50); it dropped to .23 ($p = .002$) at the last step. These were the only two variables having significant beta weights at Step 5.

Residual analysis. There were 10 cases between +2 and +3 or between -2 and -3 standard errors of the estimate, but none at or beyond ±3 standard errors of the estimate. The normal probability plot did not suggest any departures from the normality assumption. On the scatter diagram of standardized residual versus predicted values, a horizontal band without any systematic trends was obtained, suggesting constant error variance and normality. Based on this residual analysis, the tests of significance appear to be valid.

Contribution of missing predictors. To test the contribution of missing predictors in explained variance of sense of coherence, three additional hierarchical regression analyses using the original 16 independent variables in the same order were performed. On the sixth step of each regression analysis, either the number of missing predictors including perceived support (0, 1, 2, or 3); the number of missing predictor variables other than perceived support (0, 1, 2); or missing only perceived support (0, 1) was added. None of these variables made a significant change in explained variance of SOC (R^2 change =.004, p =.31; R^2 change =.003, p =.40; and R^2 change =.003, p =.35, respectively).

Qualitative Data

In order to present results from the open-ended question "Please describe how your life and your view of life has changed as a result of your cardiac arrest," cases were selected as representative respondents from the 17-variable regression model sample ($N=149$). Using the partial regression plot (see Figure 4-1), 22 representative cases were selected based on how they fit the model (Figure 4-2). The criterion for fitting the model well was falling within ±0.5 standard error of the estimate. Cases were categorized by levels of the standardized residual SOC score (i.e., $Z_{SOC}-Z_{SOC'}$, where $Z_{SOC'}$ is predicted from all other predictors in the model) and levels of the standardized residual quality of life score (i.e., $Z_{QOL}-Z_{QOL'}$, where $Z_{QOL'}$ is predicted from all predictors in the model except SOC). For both QOL and SOC, categorizations were low (< -1 *SD*), moderate (between -1 and +1 *SD*), and high ($> +1$ *SD*). Nine combinations were possible. For the representative cases, Table 4-10 presents this categorization, and the extent to which they fit both the partial regression model (*SE* of the estimate) and the 17-variable model (standardized residual scores). Table 4-11 displays the social status variables associated with poor health vulnerability as well as the work status for each representative case. A slightly higher percentage of women were selected as representative cases than were in the overall sample (32% vs. 27%). Chronic illness trajectory shape and work variables are presented in Table 4-12. Quality of life, sense of coherence, and the remaining two predictor variables, self esteem and perceived support, are presented in Table 4-13. For ease in interpretation, scores for all scales were standardized, and are presented in that manner in both tables and text.

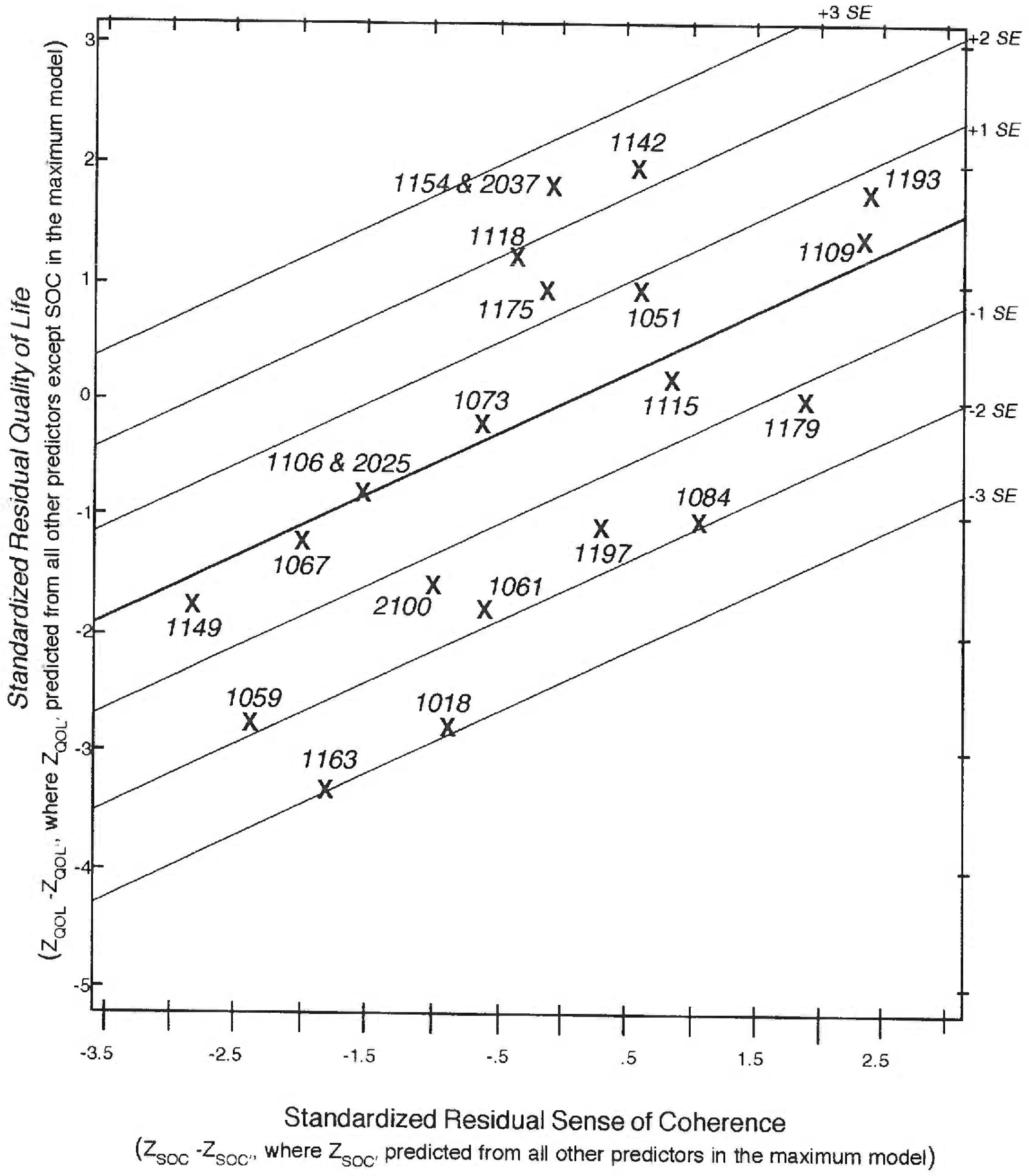

Figure 4-2. **Representative Cases** (*n* = 22) **from Standardized Partial Plot Regression**. Cases were selected that (a) fit the model well (± 0.5 *SE* of estimate); (b) had higher quality of life (QOL) than predicted from sense of coherence (SOC); or (c) had lower QOL than predicted from SOC. Figure 4-1 displays the partial plot for all 147 cases.

Table 4-10

Representative Cases** (n = 22): **Categorization by Levels of Residuals from Partial Plot, Fit to the Partial Plot, and Fit to the Maximum-Model Regression

ID	**Levels of Residual SOC / Residual QOL** Partial $r Z_{QOL}/Z_{SOC\cdot}$All other predictors	**Fit to Partial Plot (*SE* of Est.)**	**Fit to Maximum-Model Regression (Standardized Residual)**
	Cases that Fit the Model Well		
1067	Low SOC / Low QOL	< ±0.5	-0.14
1149	Low SOC / Low QOL	< ±0.5	-0.23
1073	Low SOC / Moderate QOL	< ±0.5	-0.03
1106	Low SOC / Moderate QOL	< ±0.5	-0.04
2025	Low SOC / Moderate QOL	< ±0.5	0.06
1115	Moderate SOC / Moderate QOL	< ±0.5	-0.36
1109	High SOC / High QOL	< ±0.5	0.24
	Cases with Higher QOL than Predicted from SOC		
1118	Low SOC / High QOL	+1 to +2	1.78
2037	Low SOC / High QOL	+2 to +3	2.09
1154	Low SOC / High QOL	+2 to +3	2.11
1051	Moderate SOC / Moderate QOL	+0.5 to +1	0.78
1175	Low SOC / Moderate QOL	+1 to +2	1.26
1142	Moderate SOC / High QOL	+2 to +3	2.04
1193	High SOC / High QOL	+0.5 to +1	0.66

Table Continues

KEY: QOL = Modified Flanagan Quality of Life Scale; SOC = Sense of Coherence Questionnaire, Short Form

Table 4-10 *Continued*

Representative Cases (n = 22): ***Categorization by Levels of Residuals from Partial Plot, Fit to the Partial Plot, and Fit to the Maximum-Model Regression***

ID	**Levels of Residual SOC / Residual QOL** Partial $r Z_{QOL} / Z_{SOC}$. All other predictors	**Fit to Partial Plot (*SE* of Est.)**	**Fit to Maximum-Model Regression (Standardized Residual)**
	Cases with Lower QOL than Predicted from SOC		
2100	Low SOC / Low QOL	-1 to -2	-1.31
1061	Low SOC / Low QOL	-1 to -2	-1.88
1059	Low SOC / Low QOL	-1 to -2	-1.91
1018	Low SOC / Low QOL	-2 to -3	-2.84
1163	Low SOC / Low QOL	-2 to -3	-2.88
1197	Moderate SOC / Low QOL	-1 to -2	-1.55
1084	High SOC / Low QOL	-1 to -2	-1.91
1179	High SOC / Moderate QOL	-1 to -2	-1.16

Table 4-11

Social Status Variables Associated with Poor Health Vulnerability and Work Status of Representative Cases ($n = 22$)

ID	Age (Years)	Gender	Race	Marital Status	Educ. (Years)	Work Status
	Cases that Fit the Model Well					
1067	66	Male	White	Married	12	Retired, other than health
1149	54	Male	White	Married	<12	Retired, other than health
1073	64	Female	White	Married	13-14	Working, full time
1106	68	Male	White	Married	13-14	Retired, heart disease
2025	72	Male	White	Married	13-14	Retired, heart disease
1115	45	Female	White	Married	12	Working, full time
1109	66	Male	White	Married	12	Working, part time
	Cases with Higher QOL than Predicted from SOC					
1118	76	Female	White	Widowed	13-14	Retired, other than health
2037	74	Female	White	Married	13-14	Retired, other than health
1154	59	Male	White	Married	<12	Working, full time
1051	56	Male	White	Married	12	Retired, heart disease
1175	52	Female	White	Married	13-14	Working, full time
1142	70	Male	White	Married	15-16	Retired, heart disease
1193	60	Male	White	Married	≥17	Retired, other than health
	Cases with Lower QOL than Predicted from SOC					
2100	74	Male	White	Married	12	Retired, other than health
1061	51	Female	White	Married	15-16	Working, full time
1059	70	Male	White	Married	<12	Retired, other than health
1018	55	Male	White	Married	13-14	Retired, heart disease

Table continues

Table 4-11 *Continued*

Social Status Variables Associated with Poor Health Vulnerability and Work Status of Representative Cases (*n* = 22)

ID	Age (Years)	Gender	Race	Marital Status	Educ. (Years)	Work Status
	***Cases with Lower QOL than Predicted from SOC**, Continued*					
1163	68	Male	White	Divorced	12	Retired, other than health
1197	70	Male	White	Married	<12	Retired, other than health
1084	67	Male	White	Divorced	12	Retired, other than health
1179	68	Female	White	Married	13-14	Retired, other than health

Table 4-12

Chronic Illness Trajectory Shape and Work Variables for Representative Cases (*n* = 22)

	Shape Variables (All Reported)			Work Variables					
ID	CHD SX before 1st C. Arrest	Number of C. Arrests	Time since last C. Arrest	Reported Other Med. Problems	Reported Medical Treatment	Physical Comfort [a] (Z-score)	Emotional Comfort [b] (Z-score)	Social Function [c] (Z-score)	Reported NYHA Class
	Cases that Fit the Model Well								
1067	No	1	>5 years	No	Medications	0.08	0.44	-0.37	II
1149	Yes	≥3	1-2 years	Yes	ICD	-0.65	0.44	0.54	IV
1073	No	1	>5 years	No	Medications	1.59	1.34	-0.37	I
1106	No	≥3	3-6 months	Yes	Medications & surgery	-1.39	0.32	-1.29	II
2025	Yes	2	1-2 years	Yes	Medications & ICD	0.09	-1.96	-1.29	II
1115	Yes	1	3-6 months	No	ICD	-0.02	0.44	-0.29	III
1109	Yes	≥3	1-2 years	Yes	Medications & ICD	-0.65	-0.17	-1.29	III
	Cases with Higher QOL than Predicted from SOC								
1118	No	1	>5 years	Yes	Medications & surgery	-1.76	0.32	-1.29	III
2037	Yes	≥3	<3 months	*Missing*	ICD	-1.74	-1.72	-0.37	III
1154	Yes	1	>5 years	Yes	Medications & surgery	-1.38	0.33	-1.29	*Missing*
1051	Yes	1	3-6 months	Yes	Medications, surgery, & ICD	-1.02	-0.69	-0.37	III

Table continues

KEY: Duke Health Profile [a] Modified Physical Health Scale, [b] Modified Mental Health Scale, and [c] Modified Social Health Scale; CHD = Coronary heart disease; SX = Symptoms; C. Arrest = Cardiac arrest; Med. = Medical; ICD = Implantable cardioverter-defibrillator; QOL = Modified Flanagan Quality of Life Scale; SOC = Sense of Coherence Questionnaire, Short Form

Table 4-12 *Continued*

Chronic Illness Trajectory Shape and Work Variables for Representative Cases (*n* = 22)

	Shape Variables (All Reported)			Work Variables					
ID	CHD SX before 1st C. Arrest	Number of C. Arrests	Time since last C. Arrest	Reported Other Med. Problems	Reported Medical Treatment	Physical Comfort [a] (Z-score)	Emotional Comfort [b] (Z-score)	Social Function [c] (Z-score)	Reported NYHA Class
	***Cases with Higher QOL than Predicted from SOC**, Continued*								
1175	Yes	1	1-2 years	No	Medications	0.09	1.08	1.45	II
1142	No	1	>5 years	Yes	Medications	1.59	1.34	1.45	I
1193	No	≥3	>5 years	No	None	0.86	-1.72	-1.29	I
1127	Yes	1	6-12 months	Yes	Surgery	-0.28	0.56	-2.20	III
	Cases with Lower QOL than Predicted from SOC								
2100	Yes	2	6-12 months	Yes	Medications & ICD	-0.65	-1.45	-1.29	II
1061	Yes	1	1-2 years	No	Medications	0.86	-0.94	0.54	I
1059	Yes	1	6-12 months	No	Medications	1.22	-0.17	-0.37	II
1018	Yes	2	3-4 years	No	Medications & surgery	-1.74	-0.90	-1.29	III
1163	No	1	>5 years	No	Medications	1.38	0.83	0.54	I
1197	No	*Missing*	1-2 years	Yes	Medications	-1.39	-0.94	-1.29	III
1084	Yes	1	1-2 years	Yes	Medications & surgery	-0.65	0.44	-0.37	II
1179	Yes	1	1-2 years	Yes	Medications	-1.76	-1.96	-0.37	III

Table 4-13

Standardized Scores for Quality of Life[a], Sense of Coherence[b], Self Esteem[c], and Perceived Support[d] for Representative Cases (*n* = 22)

ID	QOL	SOC	Self Esteem	Perceived Support	ID	QOL	SOC	Self Esteem	Perceived Support
	Cases that Fit the Model Well					***Cases with Higher QOL than Predicted from SOC**, Con't*			
1067	-1.62	-2.26	-1.01	0.49	1175	1.24	0.60	-1.01	1.63
1149	-1.20	-2.26	0.73	0.15	1142	1.94	0.76	-1.59	1.63
1073	0.16	0.02	-1.01	0.36	1193	1.44	0.91	-0.43	*Missing*
1106	-0.86	-1.25	-1.01	*Missing*		***Cases with Lower QOL than Predicted from SOC***			
2025	-2.05	-2.95	-2.17	-0.92	2100	-2.24	-1.64	-0.43	*Missing*
1115	0.09	0.29	0.73	-0.36	1061	-1.27	-0.63	0.15	0.29
1109	0.23	1.06	-0.43	-0.69	1059	-2.05	-1.41	1.31	0.00
	Cases with Higher QOL than Predicted from SOC				1018	-3.48	-1.72	-1.59	*Missing*
1118	0.28	-0.63	-1.01	-1.41	1163	-2.48	-1.25	-1.01	0.44
2037	1.23	-0.79	0.15	0.64	1197	-2.54	-1.17	-2.17	-2.05
1154	1.23	0.14	1.31	*Missing*	1084	-0.98	0.76	0.15	1.63
1051	0.72	0.76	0.15	0.36	1179	-1.41	-0.09	-1.59	-0.27

KEY: [a] Modified Quality of Life Scale; [b] Sense of Coherence Questionnaire, Short Form; [c] DUKE Health Profile Self Esteem Scale; [d] Modified Burckhardt Perceived Support Score

Standardized scores falling between ±0.5 were considered as being average.

The other open-end question, "Do you have any memories of the cardiac arrest event?" was included in the questionnaire to obtain information about near-death experiences. However, the respondents who had memories described the moments, hours or days preceding the arrest, or the time immediately after the arrest, rather than near-death experiences. This information was not used.

Representative Cases Fitting the Model Well

Seven cases fit the model well: 1067, 1149, 1073, 1106, 2025, 1115, and 1109. These cases fall in the middle as well as the extreme ends of the regression line.

Case 1067. Case 1067's sense of coherence score predicted his quality of life score very well. That is, his lower than average self esteem score seemed to be balanced by nearly average scores on all other predictor variables. He fit the model well, as his standardized residual maximum-model regression was -0.14 and he fell within -0.5 standard error of the estimate on the partial plot. Thus, as expected from his large standardized residual SOC score (-2.1 *SD*), his moderately large standardized residual QOL score (-1.3 *SD*) was what one would predict. His response to the open-ended question about change in life after cardiac arrest was:

> This is very hard for me to express. The doctor says that I am lucky to be alive. Considering this, I am living each day as it comes, taking time to smell the flowers and enjoy life very much.

Case 1149. Case 1149 had the lowest residual SOC and QOL scores of the cases fitting the model well (-2.8 and -1.7 *SD*, respectively).

Other than his SOC score (-2.26), he had no extreme values on any predictor variables. Physical comfort was slightly below average, and self esteem and social function were slightly above average. He fell within -0.5 standard errors of the estimate on the partial plot. His standardized residual value for the maximum-model regression also was small (-0.23). In response to the question about change in life and view of life after cardiac arrest, he wrote:

> My life has changed physically. I used to do physical things that I enjoyed and I cannot do them now. I'm always in fear of my defibrillator going off and my asthma is worst [sic].

Case 1073. Case 1073's SOC score was closer to the sample mean SOC score than any other respondent (0.02); her QOL score was only slightly higher than the average (0.16). She seemed to have a complement of higher and lower mean values on the other predictors. That is, her self esteem was lower than average, but her physical and emotional scores were higher than average. Her very small standardized residual QOL (- 0.3 *SD*) was what one would predict based on her small standardized residual SOC (-0.5 *SD*). Thus, she fell within +0.5 standard error of the estimate on the partial plot. Her standardized residual value from the maximum-model regression also was extremely small (-0.03). Her response to the same open-ended question regarding change in life and life view after cardiac arrest follows:

> My cardiac arrest occurred at age 52. The following year I curtailed most of my extracurricular activities (which then appeared to be quite excessive), and concentrated on regaining my physical strength. I became much more aware of the importance of my relationship with family and friends, both of which were extremely supportive. In

> summary, I took time to "smell the roses" and prioritize my involvement in relationships and activities. I gradually picked up some of my former activities, being more cautious to "overload." After a brief sick leave, I returned to full time employment outside the home, and have enjoyed a rewarding career in construction accounting. For the first couple of years after cardiac arrest I felt that God must have saved me for some important mission in life, particularly when I knew or would read of some young children dying. To this day I occasionally give this some thought. Our pastor at that time assured me that perhaps my mission was nothing more than continuing to be a wife, mother, grandmother or friend. He removed the guilt trip I had placed on myself. After twelve years I have perhaps lapsed back into sometimes forgetting that the extension of my life past 52 years is a gift not granted to all. I am most thankful for my second chance.

Case 1106. For Case 1106, scores on all predictor variables are low (self esteem, physical comfort, social function) except emotional comfort (which is average) and perceived support (which is missing). It seems his low SOC score (-1.25) is what one would predict from these variables. Likewise, his standardized residual QOL score (-0.84) is what one would predict from his standardized residual SOC score (-1.45). Thus, he fell within +0.25 standard error of the estimate on the partial plot. His standardized residual value from the maximum model also was extremely small (-0.04). His response to the open end question of change in life and view of life was "unable to do things mentally and phyiscal [sic]." He included an additional note:

> I had major surgery on both my legs and my back since the cardiac arrest. My back hurts and my legs and feet are cold all the time.
>
> Dr. says I lost 10% of my memory...I would never go back to your hosp....There is only 1 Dr. and 1 nurse that know anything.

Case 2025. Case 2025 had a very low self esteem score (-2.17) and low scores on perceived support (-0.92), emotional comfort (-1.96), and social function -1.29). Only his physical comfort score was average. Thus, his extremely low SOC score (-2.95), and his very low QOL score (-2.05) were what one would predict. Based on his standardized residual SOC score (-1.48) and his standardized residual QOL score (-0.76), he fell within +0.25 standard error of the estimate on the partial plot. He also fit the maximum model very well, as his standardized residual was only 0.06. Case 2025 left all personal and disease information and the open-ended question on pages 7 and 8 of the questionnaire blank, yet he had diligently answered all other questions. Since it was felt that these questions may have been skipped inadvertently and he had agreed to be contacted, he was telephoned by the investigator. His response to the open-end question about change in life and view of life after cardiac arrest was: "Hasn't changed. It's other problems—would have been better off if I hadn't lived. Bad marriage."

Case 1115. Of all respondents, Case 1115's QOL score was closest to the sample mean (0.09), while her SOC score was slightly higher than the sample mean (0.29). Her values also were average for all other statistically significant independent variables except self esteem (0.73). Her standardized residual value from the maximum-model regression was -0.36. On the partial plot, she fell within -0.5 standard error of the estimate. Thus, her small standardized residual QOL (+0.1 *SD*) was what one would predict based on her small standardized residual SOC (+0.8 *SD*). In response to the open-ended question change in life and view of life after cardiac arrest, she wrote:

> My life hasn't changed too much since my cardiac arrest. I had faith before the attack and it has been strengthened because of the events that happened immediately after the attack. Each thing that happened shouldn't have, and I shouldn't have recovered as fully as I have. To me that's a miracle and I believe my life wasn't meant to end yet. So life is more meaningful and has a stronger purpose. Problems seem less important as I realize my life can end in a second, so I'm trying to enjoy what I have left and impress upon others to care and live to help one another.

Case 1109. Case 1109 had average scores on self esteem and emotional comfort, a somewhat low score on physical comfort, and a low social function score (-1.29). However, his SOC score was high (1.06) and, as he fell within +0.25 standard error of the estimate, predicted his QOL score (0.23) well. His standardized residual from the maximum-model regression also was small (0.24). His response to the open-ended question was:

> Activities have slowed down, and physical activities less.
>
> Values have changed—life is more balanced with what is important. My spiritual life has become more important. I know where I'm going should (or when) I die. Future is not uncertain.

Representative Cases with Higher QOL Scores than Predicted from SOC Scores

Seven representative cases had higher standardized residual QOL scores than expected from their standardized residual SOC scores: 1118, 2037, 1154, 1051, 1175, 1142, and 1193. These cases represent instances where low, moderate, or high sense of coherence predicted either moderate or high quality of life.

Case 1118. Case 1118 had low scores on self esteem (-1.01), perceived support (-1.41), social function (-1.29), and physical comfort (-1.76). Her emotional comfort score was average. Her SOC score was somewhat lower than average (-0.63), while her QOL score was average (0.28). As she fell at nearly +2 standard errors of the estimate on the partial plot, her standardized residual QOL (1.25 *SD*) was much higher than predicted by her standardized residual SOC (-0.23 *SD*). She also was not a good fit to the maximum model (1.26 *SD*). Her response to the open-ended question was: "Had other medical problems. Have been more careful of all I do. Proper rest mainly, in order that I can continue to help others even with my limited ability to move about."

Case 2037. Case 2037 had a high QOL score (1.23) but a lower than average SOC score (-0.79). Her self esteem and social function scores were average, her perceived support score was slightly above average (0.64), and her physical and emotional comfort scores were low (-1.74 and -1.72, respectively). Her standardized residual on the maximum-model regression was +2.09. On the partial plot she fell at about +2.5 standard errors of the estimate. Thus, her large standardized residual QOL (+1.75 *SD*) was higher than expected from her very small standardized residual SOC score (-.001 *SD*). Her response to the change question was: "Limited my physical ability...." In apparent reference to the implantable cardioverter defibrillator, she wrote "... relieved some stress from my spouse; not having him worry that my heart will stop during my sleep."

Case 1154. Case 1154 had a high score on QOL (1.23) and an somewhat less than average score on SOC (-0.79). His self esteem score was high (1.31), and his physical comfort and social function scores were low (-1.38 and -1.29, respectively). He had an average emotional comfort score, and was missing the perceived support score. His standardized residual value on the maximum-model regression was +2.11, and he fell at approximately +2.5 standard errors of estimate on the partial plot. Therefore, his moderately large standardized residual QOL (+1.8 *SD*) was much greater than predicted from his extremely small residual SOC score (-0.02 *SD*). His only response to the open-ended question of change was "slowed down."

Case 1051. Case 1051 had somewhat higher than average scores for both QOL (0.72) and SOC (0.76). His emotional comfort score was low (-1.01) and his physical comfort was somewhat less than average (-0.69). Scores for self esteem, perceived support, and social function were all average. His moderately high standardized SOC residual (0.66 *SD*) did not predict his high standardized QOL residual (+1.03 *SD*); thus, he fell between +0.5 and +1.0 standard error of the estimate on the partial plot. His standardized residual value on the maximum-model regression was 0.78. His response to the open-ended change of life and view of life question was:

> I haven't thought too much about the cardiac arrest itself. I would like to get a clear picture of what actually happened, but it's what happened after, for the next six weeks, that I keep thinking about over and over again each day. I spent six weeks in 3 different hospitals. Bypass

> surgery, then three weeks later a defibrillator implant. A lot of frustration and pain! I was released and went home. Five weeks later I had congestive heart failure and another heart attack. As I said, I would like to understand more about the cardiac arrest, but have been keeping busy groaning over what came after. I think with the quality medical knowledge, the hospitals, doctors, nurses, and God's will, I've still got a few miles left in me. Right now I know a lot of people care about me and if I can hold onto my sense of humor, I really don't have too many problems.

Case 1175. Case 1175 has high scores on perceived support (1.63), emotional comfort (1.08), and social function (1.45). Her physical comfort score was average, and her self esteem score was low (-1.01). Although her moderate SOC score was higher than average (0.60), it didn't predict QOL well. Her small standardized residual SOC (-0.17 *SD*) did not predict her large standardized residual QOL (+1.0 *SD*), and thus she fell beyond +1.0 standard error of the estimate. Her fit to the maximum model regression was (1.26). Her response to the open-ended question about change in life and view of life following cardiac arrest was:

> I am very happy and thankful every morning that I wake up. I can tell that I am not 12 yo again & can not do everything I want to. I had bypass surgery 7 weeks before my CA [cardiac arrest]. High elevations bother me the first 2 hours. Physical activity (hard or long) I have fatigue or if I get less than 9-10 hrs sleep I am very very tired. I am not as active as before in sports & my stamina is short. 88% of the time I feel normal & pain free. I love being here.

Case 1142. Case 1142 had the maximum QOL score (1.94) and a higher than average SOC score (0.76). Except for the low score for self esteem (-1.59), all other scores were very high. He had maximum scores for perceived support, emotional comfort, and social function (1.63, 1.59, and 1.45, respectively), and a very high score on physical comfort (1.59). On the partial plot, he fell at approximately between +2.0 and +2.5 standard errors of the estimate. Based on his small standardized residual SOC score (+0.55 *SD*), his large standardized residual QOL (+2.02 *SD*) was greater than expected. His standardized residual score on the maximum-model regression was +2.04. He provided no response to the question about change in life and view of life after cardiac arrest.

Case 1193. For Case 1193, scores for QOL, SOC, and physical comfort were greater than the sample mean (1.44, 0.91, and 0.86, respectively). His self esteem score was average, and his scores for emotional comfort and social function were low (-1.72 and -1.29, respectively). His score for perceived support was score missing. His standardized residual value on the maximum-model regression was +0.66, and he fell between +0.5 and +1.0 standard error of the estimate on the partial plot. Therefore, his large standardized residual QOL (+1.9 *SD*) was greater than predicted based on his very large standardized residual SOC score (+2.38 *SD*). In response to the open-ended question of change following cardiac arrest, he wrote:

> This is a difficult question. There are no significant changes except diet. My only change in the way I view life is minor...I have no perceptible fear of death. But this might be true of other atheists as well.

Representative Cases with Lower QOL Scores than Predicted from SOC Scores

Eight representative cases had lower standardized residual QOL scores than predicted from their standardized residual SOC scores: 2100, 1061, 1059, 1018, 1163, 1197, 1084, and 1179. These cases represent instances when low, moderate, and high residual SOC predicted low, moderate or high QOL.

Case 2100. Case 2100's score for QOL was very low (-2.24). His scores for emotional comfort and social function were low (-1.45 and -1.29, respectively), and his score for physical comfort was moderately low (-0.65). He had an average score for self esteem, and was missing the perceived support score. His standardized residual on the maximum-model regression was -1.31, and on the partial plot, he fell between -2.0 and -2.5 standard errors of the estimate. Thus, his large standardized residual QOL score (-1.64 *SD*) was lower than one would predict from his moderately large standardized residual SOC score (-0.98 *SD*). His response to the open-ended question about change in life and life view after cardiac arrest was:

> I feel completely useless. It seems to me that everyone including Drs. want to hide something. No one bothered to explain any procedure to me or to show me anything about the operation. In short, while I am glad to be alive, I feel like I was conned into the operation. My Dr. sails through the office with a "you're looking fine." I'd like to feel that I can talk to him.

Case 1061. Case 1061 (a nurse) had a low score on QOL (-1.27) and lower than average SOC (-0.63) and emotional comfort (-0.94) scores.

Scores for physical comfort and social function were higher than average (0.86 and 0.54, respectively); scores for self esteem and perceived support were about average. Standardized residual on the maximum-model regression was -1.88, and she fell between -2.0 and -2.5 standard errors of the estimate on the partial plot. Her large standardized residual QOL score (-1.89 *SD*) was lower than expected based on her small standardized residual SOC score (-0.59 *SD*). Her response to the open-ended question was:

> I was petrified for the first 6 mos after the arrest & felt I had no control over my life—complete powerlessness. I have recently become unhappy with many aspects of my life and am re-evaluating them currently. I am constantly aware that life is too short and too precious to get bogged down in the "bull shit." I will make a career change as soon as possible. My husband and I are in counseling to either improve or dissolve our marriage.

Case 1059. For Case 1059, the score for QOL was very low (-2.05) and the score for SOC was low (-1.41). Scores for self esteem and physical comfort were high (1.31 and 1.22, respectively), with other scores being average. Standardized residual on the maximum-model regression was -1.91. On the partial plot, his extremely large standardized residual QOL (-2.9 *SD*) was lower than predicted by his very large standardized residual SOC score (-2.34 *SD*); he fell between -1.5 and -2.0 standard errors of the estimate. "So far can't drive my car," was his only response to the open-ended question.

Case 1018. Case 1018 had the lowest scores of the 22 representative cases on both the QOL and SOC scales (-3.48 and -1.72, respectively). His scores for self esteem (-1.59), physical comfort (-1.74), and social function (-1.29) were low, while his emotional comfort score also was below average (-0.90). His perceived support score was missing. His standardized residual on the maximum-model regression was -2.84. His very large standardized residual QOL score (-2.88 *SD*) was much lower than predicted (between -2.5 and -3.0 *SE* of the estimate) by his moderately large standardized residual SOC score (-0.88 *SD*). His one-word response to the open-ended question of change was “Lot.”

Case 1163. Case 1163 had a very low QOL score (-2.48) and low scores on both SOC (-1.25) and self esteem (-1.01). His scores for physical and emotional comfort (1.38 and 0.83, respectively), and social function (0.54) were higher than average. His perceived support score was about average. He was the poorest fit to the model, having a standardized residual on the maximum-model regression of -2.88, and falling just inside -3.0 standard errors of the estimate on the partial plot. Thus, his extremely large standardized residual QOL (-3.41 *SD*) was much lower than predicted by his large standardized residual SOC (-1.8 *SD*). In response to the change question he wrote: “In the first year after cardiac arrest I was slightly hesitant to do or follow normal life style—as time has passed I do not let the fact that I had a C.A. [cardiac arrest] bother me.”

Case 1197. All of Case 1197’s scores were low. His QOL score was extremely low (-2.54). He had very low scores for self esteem (-2.17) and perceived support (-2.05). Physical comfort, social function, SOC, and emotional comfort all were low (-1.39, -1.29, -1.17, and -0.94, respectively). He fell at about -1.5 standard errors of the estimate on the partial plot, Thus, his large residual QOL score (-1.08) was lower than expected based on his fairly small and positive residual SOC score (0.41). He also was not a good fit to the maximum model, with a standardized residual of -1.55. He response to the open-ended question was "No change."

Case 1084. Case 1084 had lower than average QOL and physical comfort scores (-0.98 and -0.65, respectively) and a higher than average SOC score (0.76). His perceived support score was the maximum value (1.63). Self esteem, emotional comfort, and social function were about average. His standardized residual value from the maximum-model regression was -1.91. His position on the partial plot was unique: nearly -2.0 standard errors of the estimate, with a much lower residual QOL (-1.05 *SD*) than predicted by his moderately high standardized residual (+0.99 *SD*) SOC score. His open-ended question response was:

> Everyday is wonderful and I like to do as much as I can as long as I can. Rest & then go back till [sic] I'm tired again.
>
> I don't want to say I give up for or on any chore. I know my limitations & face myself at anything I do.
>
> I don't remember a thing or two days before till I woke at in OHS almost 2 months later. Everyone says I acted normal all this time.

Case 1179. All Case 1179's scores were either lower than average or average. Her QOL, self esteem, physical and emotional comfort scores all were low (-1.41, -1.59, -1.76, and -1.96, respectively). She had average scores for SOC, perceived support, and social function. As her large standardized residual SOC score (1.8) did not predict her small QOL residual (0.02), she fell at between -1 and -1.5 standard errors of the estimate on the partial plot. Her response to the open-ended question was: "can't do anything very fast (walk, clean house)...slow getting in an out of car. Feel okay if I sit around doing needlework, reading, doing genealogy [sic] (have some lines back to 1500's)...Can't travel. Just recently drive [sic] 4 blocks to grocery store to purchase 3 or 4 items."

CHAPTER 5

Discussion and Conclusions

A description of the meaning of the study results, including comparisons between findings from this study and other research studies, begins this section. Issues related to validity of the findings, and limitations of the study follow. Implications for theory, practice and research, recommendations, and future directions conclude this section.

Meaning of Results

Sense of Coherence as a Predictor of Quality of Life

The findings support the primary study hypothesis: After controlling for social status variables related to poor health vulnerability, perceived support, self esteem, and the chronic illness trajectory shape and work variables, the addition of sense of coherence will significantly improve estimation of quality of life. The independent contribution of 14% to explained quality of life variance by sense of coherence exceeded the estimate of 10% made when performing the power analysis. Based on the maximum model of 17 independent variables, for the predicted QOL score, holding all other independent variables constant, on the average, for every 1 unit increase in the SOC score, there is a corresponding 0.63 unit increase in the QOL score. In standardized (Z-score) format, for the predicted QOL score, holding all other independent variables constant, on the average, for every one standard deviation increase in the SOC score, there is a corresponding 0.58 standard deviation increase in the QOL score.

In order to generate a parsimonious model that would facilitate clinical use, all nonsignificant variables—social status variables related to poor health vulnerability, chronic illness trajectory shape variables, reported other medical problems, and the construct of reported medical treatment—were eliminated from the model. In the parsimonious model, the independent contribution of SOC was even greater than with the maximum model: 17%. Total explained variance was slightly less with this parsimonious model (62% vs. 67%), but shrinkage of the multiple correlation coefficient also was less (2% vs. 8%). As a result, the adjusted, squared multiple-correlation coefficient was slightly higher for the parsimonious model (.60 vs. .59). With the parsimonious model, for the predicted QOL score, holding all other independent variables constant, on the average, for every 1 unit increase in the SOC score, there is a corresponding 0.64 increase in the QOL score. In standardized (Z-score) format, for the predicted QOL score, holding all other independent variables constant, on the average, for every one standard deviation increase in the SOC score, there is a corresponding 0.59 standard deviation increase in the QOL score.

Burckhardt (1985) explained 46% of the variance in quality of life (Flanagan Quality of Life Scale) in her sample of 94 persons with arthritis. There were both theoretical and methodological similarities between Burckhardt's study and the current study. Five variables explained most of the variance in her study: severity of impairment (Arthritis Impact Measurement Scales), perceived support (Perceived Support Score), negative attitude (Negative Attitude toward the Illness Scale), self esteem (Self-Concept Scale), and internal control over health (Internal Locus of Control Subscale of the Multidimensional Health Locus of Control Scales). Age, gender, and socioeconomic status did not make significant contributions. In this study, severity of impairment was reflected by reported NYHA Functional Classification and by social function, perceived support was reflected by a modification of Burckhardt's Perceived Support Score, attitude was reflected by the Modified Duke Health Profile Mental Health Scale, and self esteem was reflected by the Duke Health Profile Self Esteem Scale. Internal control over health was not measured, although it may have been reflected in part by the sense of coherence score (which includes the concept of manageability). Therefore, the findings of 52% and 45% of explained variance in quality of life in the maximum-model and parsimonious-model regressions, respectively, *prior to the entry of sense of coherence into the model* are congruent with Burckhardt's finding of 46% explained variance. The additional 14% to 17% contribution by sense of coherence provides new information about quality of life in persons with chronic illness. This study also supports the findings of Sagy, Antonovsky, and Adler (1990) who found that sense of coherence contributed significantly to life satisfaction (total $R^2 = .31$, sense of coherence direct $\beta = .48$, $p < .001$).

The representative cases fitting the partial correlation model well were informative. (See Figure 4-2.) That is, for them, holding all other predictor variables constant, sense of coherence was very important in explaining quality of life. For example, for Cases 1067 and 1149, values on other variables of interest were average or only somewhat above or below average. Clearly, these other variables did not predict the low QOL scores (-1.62 and -1.20, respectively). However, the SOC scores for both cases were very low (-2.26) and were very predictive of quality of life. Case 1109 had relatively low scores on other predictor variables but a high score on sense of coherence

(1.06), yet sense of coherence still predicted quality of life well. Cases 1115 and 1109 had average sense of coherence scores that predicted average quality of life scores.

From these representative-case respondents that fit the partial correlation model well, after cardiac arrest, finding new meaning or purpose in life and changing priorities seemed apparent: "...taking time to smell the flowers and enjoy life very much" (Case 1067); "...became much more aware of the importance of my relationship with family and friends....took time to 'smell the roses' and prioritize my involvement in relationships and activities....have enjoyed a rewarding career....perhaps my mission was nothing more than continuing to be a wife, mother, grandmother or friend" (Case 1073); "I had faith before the attack and it has been strengthened because of the events that happened immediately after the attack....I believe my life wasn't meant to end yet. So life is more meaningful and has a stronger purpose" (Case 1115); "Values have changed—life is more balanced with what is important. My spiritual life has become more important" (Case 1109).

Since meaningfulness was such an important aspect of the sense of coherence, might such an acute event like a cardiac arrest amplify the difference in sense of coherence between apparently healthy individuals and cardiac arrest survivors? As assessed by Antonovsky's Sense of Coherence Questionnaire (Short Form), the item mean SOC score obtained in this study suggested a relatively strong sense of coherence (*M* = 5.3 out of a possible item score of 7; see Table 4-4). It was slightly less than the item mean obtained by Antonovsky and his group in a homogeneous sample of Israeli Army groups hypothesized to have a strong sense of coherence (*M* = 5.5), and was slightly greater than the item mean in a sample of homogeneous health care workers hypothesized to have a moderate sense of coherence (*M* = 5.0-5.2) (1987). It also was slightly higher than the item mean of on-time retirees (*M* = 5.1) for whom no hypothesis about strength of sense of coherence was stated (Sagy et al., 1990). The item mean of 5.3 was quite a bit higher than the item mean of diverse populations (i.e., Israeli national sample, New York State production workers, U.S. undergraduates) hypothesized to have a relatively low sense of coherence (*M* = 4.6-4.8) (1987). Thus, by comparison, the SOC score obtained in this study seemed somewhat higher than one might expect. Its strength may have been related to the acute cardiac arrest, chronic heart disease, or both.

Differences in the standard deviations of the SOC score obtained in Antonovsky's studies and in this study also suggested that differences in the sense of coherence between apparently healthy individuals and cardiac arrest survivors may be amplified by the acute event. (The standard deviations cited by Antonovsky obtained using the 29-item Sense of Coherence Scale were recalculated using a linear transformation, with a factor of .45.) The standard deviation of the SOC score obtained in this study (*SD* = 13.0) was much larger than that cited by Antonovsky (1987) for studies of Israeli officer trainees (*SD* = 7.5-7.7), Israeli health workers (*SD* = 7.9), and Edmonton health workers (*SD* = 7.7); larger than that cited for studies of Nordic occupational health workers (*SD* = 9.0), the Israeli national sample (*SD* = 9.0), and U.S. undergraduates (*SD* = 9.0-9.9); and somewhat larger than that cited for the diverse sample of New York State production workers (*SD* = 11.9). Thus, the larger SOC score standard deviation obtained in this study implied a greater variability in sense of coherence, perhaps in response to the cardiac arrest or to the chronic illness.

Of the representative cases fitting the model well, two were females and five were males. Both women wrote of the importance of relationships to their lives. Their comments supported Gilligan's (1982) thesis that women's development is associated with the importance of attachment through relationships. Interestingly, only one of the men (Case 2025) mentioned relationships as being part of a changed view life after cardiac arrest: "...would have been better off if I hadn't lived. Bad marriage." Not unexpectedly, both his QOL and SOC scores were extremely low (-2.05 and -2.95, respectively). However, of all quality of life scale items, satisfaction with relationships had the highest mean values.

Seven respondents had higher quality of life than predicted from sense of coherence. Since sense of coherence wasn't a good predictor of quality of life, what variables were omitted from the model? Case 2037, who had very low physical and emotional comfort scores (-1.74 and -1.72, respectively), may have derived a different form of comfort (than assessed by the Duke Health Profile) from mutuality with her spouse: "...relieved some stress from my spouse." Since accommodation to the chronic illness trajectory involves both the chronically ill person and his or her spouse or partner, not assessing quality of life from a dyadic perspective clearly was a limitation of this study. Case 1051's lowest score was for physical comfort, with other predictors being about average. He seemed to be striving for comprehensibility, though not achieving it: "...would like to get a clear picture of what actually happened....would like to understand more about the cardiac arrest, but have been keeping busy groaning over what came after." That "a lot of people care about me" may have been helpful to him in shaping his illness trajectory. However, his response was not reflected by his perceived support score (0.36). Measurement of social support in this study was identified as a threat to statistical conclusion validity (presented later in the section on validity of findings). Case 1175 expressed "I love being here." A joy for life and a strong desire to live may not have been captured adequately in the instruments chosen for this study.

For some individuals, quality of life was much lower than predicted by sense of coherence. Case 1061 may have been in transition in terms of her personal life and regaining control (i.e., manageability) of it: "I was petrified for the first 6 mos after the arrest & felt I had no control over my life—complete powerlessness. I have recently become unhappy with many aspects of my life and am re-evaluating them currently." Thus, she seemed to have many other problems in her life that were not related to her heart disease and cardiac arrest.

Another possibility for why sense of coherence did not predict quality of life well for these individuals was measurement error. Case 1084 described "Everyday is wonderful and I like to do as much as I can." Yet his quality of life was low (-0.98), and much lower than predicted by his sense of coherence (0.76). Most of his other predictor variable scores seemed congruent with this somewhat higher than average score except for perceived support (he had the maximum possible score). Perhaps either perceived support or some other unmeasured variable was a better predictor of quality of life for him or, perhaps, he answered the quality of life items incorrectly. Case 2100 had a low sense of coherence (-1.64) and a much lower quality of life (-2.24) than predicted with this model: "I feel completely useless...everyone...wants to hide something. No one bothered to explain...." Based on this response, it was surprising that his self esteem, emotional comfort, and social function scores were not lower: -1.45, -0.43, and -1.29, respectively. For this respondent, it seemed that an unmeasured construct contributed to his very low life quality.

Quality of Life

As measured by the Modified Flanagan Quality of Life Scale, quality of life in this sample was high (item average = 5.3 out of a possible item score of 7). This finding was congruent with that of Burckhardt and her colleagues (1989) in their study of persons with one of four chronic conditions: diabetes mellitus, ostomy secondary to colon cancer or colitis, osteoarthritis, or rheumatoid arthritis. Using the original, 15-item Flanagan Quality of Life Scale, Burckhardt obtained an average item score of 5.2.

Health, independence, and material comforts. Clearly, in any chronically ill population, health, independence, and material comforts (i.e., financial security) are major concerns. In this study, satisfaction with health (*M* = 4.7), independence (*M* = 5.7), and material comforts (*M* = 5.8) ranked 13th, 6th, and 4th, respectively (see Table 4-1). Although there was relatively low satisfaction with health, the mean value actually was high (greater than the mid-point of 4 on the scale). Most respondents felt that the Duke Health Profile statement "I am basically a healthy person," described them exactly (42%) or somewhat (43 %). "No, doesn't describe me at all" fit only 15% of the sample. This positive self perception of health might reflect a holistic view in which coronary heart disease and cardiac arrest survival represent only one aspect of their life, or might be an example of expressed self-desirability—"the tendency to say good rather than bad things about oneself" (Nunnally, 1978 p. 661).

The ability to remain independent depends upon intellectual and physical functioning. Those persons with intellectual impairment from the anoxia suffered during the cardiac arrest would have been unable to complete the questionnaire, and therefore would not be part of the sample. The majority of respondents (74%) had either no limitations or only slight limitations of physical activities from heart disease (NYHA Functional Class I or II; see Table 3-3), and thus could be expected to be independent. Satisfaction with material comfort relates to the ability to hold a job or to retire with adequate financial resources, including maintaining health insurance coverage. Although information about health insurance was not obtained, only 28% of the sample were either retired or unable to carry out homemaking activities because of health (see Table 3-1).

Items with the most satisfaction: Relationships. Modified Flanagan Quality of Life Scale items with the greatest satisfaction were found to be relationships with spouse or significant other ($M = 6.1$), children ($M = 6.0$), and close friends ($M = 5.8$). One other item related to relationships: parents, siblings and other relatives: communicating, visiting, helping ($M = 5.7$). This item also had a high absolute value, although it was ranked 7th for overall satisfaction. These items seem reflective of the strength of ties (i.e., duration, emotional intensity, intimacy, and mutuality), one of five characteristics of social networks described by Walker and colleagues (1977). Although Burckhardt (1985) included social network in her regression model of quality of life in persons with arthritis, it did not make a significant contribution to explained variance. Additionally, she demonstrated that, in her sample (*N* = 94), the relationship between social network configuration (size and density) and perceived social support was weak and statistically nonsignificant ($r = .17$, $p > .05$). She concluded that, for some persons, even if the social network was dense, the extent of the available support was not perceived.

Using path analysis, Burckhardt (1985) attributed a direct effect by perceived support (path coefficient =.20, $p < .05$) on quality of life. In this study, perceived amount of social support (*M* = 2.04 out of a possible high score of 3.00) contributed only a small amount to explained variance in quality of life (R^2 change =.05 in both the maximum and parsimonious models; see Tables 4-6 and 4-7, respectively). Perceived social support may not be a strong predictor of quality of life because the QOL scale items related to social support have more extreme means and smaller standard deviations than other items (see Table 4-1). Additionally, there were a number of measurement problems associated with the social support variable. These problems are discussed in detail in the section on statistical conclusion validity.

Items with the least satisfaction: Active recreation and participation in organizations/public affairs. The least satisfaction was found with participation in active recreation (*M* = 4.5) and organizations and public affairs (*M* = 4.3). Low satisfaction with participation in active recreation was not unexpected in this sample of chronically ill persons. Fifty-six percent of respondents reported that they would have *a lot* or *some* difficulty walking up a flight of stairs; 85% reported that they would have *a lot* or *some* difficulty running the length of a football field. Although reported NYHA Functional Classification implied less functional impairment (only 24% reported marked limitation or the inability to carry out any physical activity as a result of heart disease), 52% of the sample reported having other medical problems. (See Table 3-3.) Other medical problems, such as asthma or arthritis, could account for the apparent discrepancy. Additionally, nervousness and anxiety, reported by 50% of respondents, and fear of recurrent arrhythmia, expressed by 45%, would tend to limit participation in active recreation.

The Modified Flanagan Quality of Life Scale item with the lowest level of satisfaction, participation in organizations and public affairs, supports the chronic illness theory of Corbin and Strauss (1988). They posited that shaping the chronic illness trajectory requires unending work and care for both the patient and his or her spouse. Thus, it seems reasonable that little time or energy would be available for participating in organizations. Two items from the Modified Duke Health Profile Physical Scale supported respondents having inadequate energy: "trouble sleeping" and "getting tired easily" were reported by 54% and 81% of the sample, respectively.

Sense of Coherence

The item mean SOC score obtained in this study suggests a relatively strong sense of coherence in this sample. The Sense of Coherence Questionnaire item with the highest mean was related to manageability: "Do you have the feeling that you are being treated unfairly?" ($M = 5.9$). The dimension of manageability implies a sense of control. Internal locus of control was one of the significant paths (path coefficient =.26, $p < .01$) in

Burckhardt's quality of life model for persons with arthritis. In this study, the item with the lowest mean was related to comprehensibility: "When something happened, have you generally found that: you overestimated or underestimated its importance, or you saw things in the right proportion" ($M = 4.7$). In spite of this relatively low item mean, the average response was greater than the mid-point of four.

Distinction between sense of coherence and quality of life. The zero-order correlation coefficient for SOC and QOL was the highest between any two variables in the model (r=.73, p = <.001). The distinction between the two constructs, as well as potential theoretical and measurement overlap, was presented in Chapter 2. Zero-order correlation coefficients were evaluated to assess measurement overlap. First, comparisons of all zero-order correlations of QOL and SOC with all other independent variables were made (see Table 4-5). The relationships of NYHA, PHYSICAL, and SOCIAL to QOL (r =-.39,.40, and .40, respectively), were generally greater than the relationships of NYHA, PHYSICAL, and SOCIAL to SOC (r=-.29, .37, .32, respectively). The correlation between EMOTIONAL and SOC (r=.68, p<.001) was much stronger than the relationship between EMOTIONAL and QOL (r=.50, p<.001). These differences suggest that quality of life is related more to physical and social function and to physical comfort, and that sense of coherence is associated to a greater degree with emotional comfort. The relationship between SELF ESTEEM and QOL (r=.50) was equivalent to that between SELF ESTEEM and SOC (r=.50). Thus, SELF ESTEEM probably contributed a great deal to the strength of the relationship between SOC and QOL (r=.73). However, the Cronbach's alpha (.50) of SELF ESTEEM is of concern. This concern is addressed more fully in the section on statistical conclusion validity.

Second, the relationships between the items on the Sense of Coherence Questionnaire thought to overlap with items on the Modified Flanagan Quality of Life Scale were evaluated. Satisfaction with relationships was assessed by questionnaire items Q3 (parents, siblings, other relatives), Q4 (children), Q5 (spouse or significant other), and Q6 (close friends). Items C2 and C3 evaluated affective responses to relationships: "Being surprised at the behavior of people whom you thought you knew well" and "being disappointed by people who you counted on", respectively. Only QOL items of satisfaction with "relationships with parents, siblings, and other relatives: communicating, visiting, helping" (Q3) and "close friends" (Q6) were significantly related to "being surprised..." ($r = .23$, $p = .006$, and $r = .20$, $p = .015$, respectively) and "being disappointed..." ($r = .30$, $p < .001$, and $r = .28$, $p = .001$, respectively). That is, satisfaction with "close relations with spouse or significant other" and "having and rearing children" were not related to the "surprise" and "disappointment" items on the Sense of Coherence Questionnaire. These four significant correlations all were less than the average inter-item correlation for either the Modified Flanagan Quality of Life Scale ($r = .40$) or the Sense of Coherence Questionnaire ($r = .34$). Thus, it seems that overlaps in the context of relationships did not contribute substantially to the very high zero-order correlation between QOL and SOC.

The other area of concern with overlap was measurement of meaningfulness. Four items on the sense of coherence scale concerned meaningfulness: "Do you have the feeling that you don't really care what goes on around you? *Very often...very seldom or never*" (C1); "Until now your life has had: *No clear goals or purposes at all...very clear goals and purpose*" (C4); "Doing the things you do everyday is: *A source of pain and boredom...a source of deep pleasure and satisfaction*" (C7); and "How often do you have the feeling that there's little meaning in the things you do in your daily life? *Very often...very seldom*" (C12). The relationships of each of these items with the QOL item that seemed most directly reflective of satisfaction with meaningfulness, "Understanding yourself: knowing what life is about" (Q10), were strong (r=.52, .48, .48, and .51, p<.001, respectively). To assess their effect on the relationship between QOL and SOC, for demonstration purposes only, a new quality of life scale without item Q10 was created. Its correlation with SOC was .72 (p<.001). Thus, elimination of the item that seems most directly responsible for the overlap in meaningfulness did not alter the strength of the correlation between SOC and QOL.

Based on these analyses, it seemed that the constructs are distinct but do have some overlap. The overlap appears contextual—that is, affective responses take place within life domains. Although the most apparent overlap was eliminated in the new quality of life scale, one cannot remove the overlap of finding meaningfulness (or comprehensibility or manageability) in physical and material well being, relations with other people, personal development and fulfillment, recreation, or independence.

Sense of coherence as the dependent variable. The second study hypothesis was: After controlling for social status variables related to poor health vulnerability, perceived support, and the chronic illness trajectory shape and work variables, self esteem will contribute significantly to sense of coherence. As hypothesized, the relationship between sense of coherence and self esteem was strong ($r = .50$). However, a stronger relationship existed between sense of coherence and emotional comfort ($r = .68$).

Explained variance in sense of coherence was 57% (adjusted $R^2 = .48$) using the 16 other predictors from the maximum model. Emotional comfort had the largest beta weight (β weight =.54, $p < .001$) after all other variables had been entered in the model. Self esteem had the only other significant beta weight (β weight =.23, $p < .001$) at the last step of the sense of coherence regression. Using the 16-variable model, for the predicted SOC score, holding all other independent variables constant, on the average, for every 1 unit increase in the EMOTIONAL score, there is a corresponding 0.32 increase in the SOC score; and for every 1 unit increase in the SELF ESTEEM score, there is a corresponding 0.18 increase in the SOC score. In standardized (Z-score) format, for the predicted SOC score, holding all other independent variables constant, on the average, for every one standard deviation increase in the EMOTIONAL score, there is a corresponding 0.54 standard deviation increase in the SOC score; and for every one standard deviation increase in the SELF ESTEEM score, there is a corresponding 0.23 standard deviation increase in the SOC score.

As self esteem independently contributed 4% to explained variance in sense of coherence ($p = .002$), the second hypothesis was supported. However, the strong effect of emotional comfort on sense of coherence had been underestimated. That the social status variables related to poor health vulnerability—age, gender, race, education (reflecting socioeconomic status), and marital status—were not significant contributors was somewhat surprising as sense of coherence is described by Antonovsky (1987) as a global and enduring orientation that develops over time. Thus, it would seem reasonable that, on the average, the sense of coherence would be stronger in middle-aged to older persons, stronger in males, and stronger with higher education/socioeconomic status. It also was surprising that the chronic illness trajectory variables—symptoms before first cardiac arrest, time since last cardiac arrest, and number of cardiac arrests—did not make statistically significant contributions to explained variance in sense of coherence. These three variables would seem to be indicative of control—an important component of the manageability dimension of the sense of coherence. Adequate social support was hypothesized to contribute to sense of coherence indirectly, through self esteem. Thus, the hypothesis that social support would not contribute directly to sense of coherence was supported.

These findings partially support the work of Sagy, Antonovsky, and Adler (1990) who demonstrated relationships on their path analysis model between sense of coherence and instrumental activities ($\beta = .26$, $p < .001$), social interaction ($\beta = .22$, $p < .001$), and health ($\beta = .34$, $p < .001$). In this study, functional capacity as reflected by reported NYHA Functional Class and social function were similar to Sagy's instrumental activities and social interaction. Additionally, the Multidimensional Health Scale included items similar to both physical comfort and functional capacity. In this study, the construct chronic illness trajectory work contributed 44% to explained variance in sense of coherence.

Predictors of Quality of Life other than Sense of Coherence

Social status variables related to poor health vulnerability. The social status variables of age, gender, race, education, and marital status were included in the maximum-model regression in spite of their nonsignificant relationships with the dependent variable quality of life. As expected, none of these variables contributed significantly to explained variance in quality of life in the maximum model. Consequently, they were excluded from the parsimonious model.

The contribution of age to explained variance in quality of life was thought to be indirect, through its association with other independent variables. It seemed that age would be related to sense of coherence ($r = .07$, $p = .42$), physical comfort ($r = -.20$, $p = .02$), emotional comfort ($r = .05$, $p = .58$), social function ($r = -.04$, $p = .66$), NYHA Functional Class ($r = .10$, $p = .23$), having other medical problems ($r = .17$, $p = .05$), and socioeconomic status (as reflected by education) ($r = -.13$, $p = .13$). Since its only significant relationships were with physical comfort and other problems, its lack of a significant contribution to explained variance of sense of coherence was not surprising.

Gender (coded 1 = female, 0 = male) was significantly associated with physical comfort ($r = -.16$, $p = .05$). That is, being male was related to having greater physical comfort. Except for a nonsignificant relationship between gender and education level (reflecting socioeconomic status), the findings of this study support Haug and Folmar's (1986) conclusions that after controlling for health, income adequacy, and living alone, neither age nor gender contributed significantly to life satisfaction. As expected from its zero-order correlation with sense of coherence (*r* =.01, *p* =.89), gender also did not make a significant contribution to explained variance in sense of coherence.

In this study, education, as a proxy measure of socioeconomic status (i.e., higher educational level reflects higher socioeconomic status), also did not make a significant contribution to explained variance in either quality of life or sense of coherence. However, education was significantly related to physical comfort (*r* =.29, *p* =.001), time since last cardiac arrest (*r* =.18, *p* =.03), and NYHA Functional Class (*r* = -.31, *p* <.001). These findings seemed reasonable, as one would expect that higher levels of financial resources would be related to better health management.

Lack of contribution to explained variance of both quality of life and sense of coherence by education may have resulted from the fairly strong negative correlation with NYHA Functional Class (and thereby, overlap in the amount of variance that was explained), the use of this proxy measure, or the characteristics of the sample itself. For this proxy measure of socioeconomic status, five categorizations of education were used. However, it may be that the critical educational level was completion of high school. That is, perhaps a dichotomous classification (high school graduate vs. not a high school graduate) would have been more sensitive to differences in socioeconomic class. For example, in terms of quality of life, whether or not one graduated from high school may have been a deciding factor in having a job or retiring with some financial stability and, consequently, with having health care insurance. For the sense of coherence, whether or not one graduated from high school may have been important in having the ability to comprehend and to manage everyday situations. As only 16% of this sample had less than a high school education, the number of persons in that category may have been too small to detect any relationships with the dependent variables. Additionally, having less than 12 years of education was the lowest educational level assessed and may not have been a sensitive enough classification. That is, the implications on socioeconomic status of having completed 11 years of education might be very different than having completed only 6 years of education.

This sample also may not have been representative in terms of socioeconomic status. Although information about health insurance was not obtained, this sample clearly had access to health care as all participants were recruited from health care facilities. Thus, inferences could be made regarding both quality of life and sense of coherence: (a) other material comfort needs may have been met as well, and (b) there may have been some degree of perceived manageability of the chronic illness problem, either directly or via delegation to responsible others.

Race was not significant because of its clear lack of variability (95% Caucasian), with subsequent restriction of range. As the majority of respondents were married or living with significant others (82%), lack of variability of marital status also may have contributed to its nonsignificant relationship with quality of life. Many studies have shown that being married or living with a significant other does result in increased life satisfaction. Wood and colleagues (1989) found that married persons had higher levels of well being than nonmarried persons, and that married women had higher levels of well being than married men.

Although not significantly related to quality of life or sense of coherence regressions, relationships between the variables not included in the parsimonious model and other variables of interest provided additional information about the sample. Associations were found between males and being married ($r = -.27$, $p = .001$) and females and being widowed ($r = .38$, $p < .001$). Younger respondents were more apt to be single ($r = -.35$, $p < .001$) and older respondents were more likely to be widowed ($r = .25$, $p < .001$). These relationships seemed plausible. Additionally, married respondents had fewer cardiac arrests ($r = -.17$, $p = .04$) and widowed respondents had more cardiac arrests ($r = .27$, $p = .001$). An explanation for these relationships between marital status and the number of cardiac arrests might be that persons having a spouse were more likely to take care of themselves or to have help in following the prescribed medical plan, whereas widowed respondents might not have received the same encouragement and help to take care of themselves and follow the medical regimen. However, marital status was not associated with perceived support, although widowed persons were more likely to have higher levels of social function ($r = .21$, $p = .01$). Although marital status and gender were related, the relationship between gender and number of cardiac arrests was not significant.

Chronic illness trajectory shape variables. None of the illness trajectory shape variables were related significantly to quality of life or sense of coherence. This was surprising in that stability of the trajectory seems so important. It may be that these variables did not adequately reflect the construct.

Chronic illness trajectory work variables. The construct of chronic illness trajectory work made large and significant contributions to explained variance of both quality of life (17%) and sense of coherence (44%). Reported other medical problems was not significantly related to either quality of life or sense of coherence; it was not included in the parsimonious model.

The type of medical management used to prevent recurrent cardiac arrest also was excluded from the parsimonious-model quality of life regression analysis when it was entered into the model as a construct (via dummy coding) and found to be nonsignificant. Correlations between types of treatment and the regression variables as well as the excluded social status variables provided additional descriptive information about the sample. Females were more apt to be treated by antiarrhythmic drug management alone ($r = .28$, $p = .001$), whereas males were more likely to receive both antiarrhythmic drug management and surgery to prevent recurrent cardiac arrest ($r = -.18$, $p = .03$). These findings supported a growing national concern that women with heart disease are managed much less aggressively than their male counterparts (Ayanian & Epstein, 1991; Steingart, Packer, Hamm, Coglianese, Gersh, Geltman, et al., 1991). Drug management alone also was associated with higher levels of social function ($r = .16$, $p = .05$), but this apparent relationship may have been confounded with being widowed, or being female.

Physical comfort, as measured by the Modified Duke Health Profile Physical Scale, was significantly correlated with emotional comfort ($r = .53$, $p < .001$), social function ($r = .30$, $p < .001$), self esteem ($r = .22$, $p = .008$), age ($r = -.20$, $p = .02$), gender ($r = -.16$, $p = .05$), education ($r = .29$, $p < .001$), time since last cardiac arrest ($r = .21$, $p = .01$), reported NYHA Functional Class

(r = -.67, p <.001), and other medical problems (r = -.35, p <.001).

The strongest zero-order correlation of emotional comfort was with sense of coherence (r =.68, p <.001). Other significant correlations included: quality of life (r =.50, p <.001); physical comfort (r =.53, p <.001); self esteem (r =.39, p <.001); and reported NYHA Functional Class (r = -.33, p <.001). On the last step of the sense of coherence regression, emotional comfort had the largest beta weight of any other variable in the model; its squared partial correlation coefficient was .29. This finding partially supports McCorkle and Young's (1978) and McCorkle and Quint-Benoliel's (1983) position of the importance of symptom distress as a variable after diagnosis of a life-threatening condition.

The level of social function, as measured by the Modified Duke Health Profile Social Scale, was fairly high (M = 60 on a scale of 0 to 100) in this sample. Using the original Duke Social Scale, a direct comparison of this sample to the adult, primary care group studied by Parkerson and his colleagues (1990) revealed no apparent difference in average social function (Table 5-2). Zero-order correlations between social function and both quality of life and sense of coherence were moderately strong (r =.40, p <.001; and r =.32, p <.001, respectively). The association with reported NYHA Functional Class was moderate (r = -.27, p <.001). The conceptualization of functional capacity in this study was based on role theory rather than on the traditional medical model in which functional capacity is equated solely with physical activity and tolerance (i.e., the NYHA Functional Class and exercise testing). That is, functional capacity was viewed as role enactment involving personal, professional, and social roles. Personal and social role functions were incorporated in the variable social function. That the squared zero-order correlation of social function with NYHA Functional Class was only .07 supports role theory's position that one's ability to function socially is much more than simply physical function.

Significant zero-order correlations of social function with other independent variables were: physical comfort ($r=.30$, $p<.001$), emotional comfort ($r=.26$, $p=.002$), self esteem ($r=.27$, $p=.001$), perceived support ($r=.21$, $p=.017$), educational level ($r=.17$, $p=.037$), and time since last cardiac arrest ($r=.17$, $p=.042$). These findings seem logical as one would expect persons with greater physical and emotional comfort, self esteem, social support, financial resources, and greater elapsed time since last cardiac arrest to be more active socially.

Reported NYHA Functional Classification had significant correlations with both quality of life and sense of coherence ($r = -.39$, $p<.001$; and $r = -.29$, $p<.001$, respectively). Other significant zero-order correlations with NYHA Functional Class (the higher the class the greater the physical activity limitation) were: physical comfort ($r = -.67$, $p<.001$); emotional comfort ($r = -.33$, $p<.001$); social function ($r = -.27$, $p<.001$); self esteem ($r = -.17$, $p=.04$); and having other medical problems ($r=.30$, $p<.001$).

Social support. Dimond and Jones (1983) suggested that, in chronic illness, different types of situational distress—crisis, transition, or deficit situations— require different types of social support. It may be that each family member and friend can provide only one or two kinds of support— emotional (e.g., social time), information (e.g., advice), or compensation for specific deficits (e.g., physical or financial help)—to the degree that support is expected if wanted or needed. For this study, Table 5-1 displays frequencies of the degree of social support expected to be received from each of six supporters. Apparent from the column of highest degree of support (3, or *a lot*), there were differences in the categories of available support. That is, for the first supporter listed (presumably the first person that came to mind, or the person from whom the greatest amount of support would be expected), *a lot* of physical help was available from 105 supporters, whereas *a lot* of financial help was available from only 73 supporters. Availability of advice and social time were more closely grouped. For the first supporter listed, 90 would provide *a lot* of advice and social time. As the density of the networks grew (i.e., at the 4th, 5th or 6th social supporter), the number of supporters who would provide *a lot* of social support dropped and the number of missing responses increased. Thus, these findings lend some support to Dimond and Jone's assertion.

Self esteem. Relationships between self esteem and both quality of life and sense of coherence were equally strong ($r = .50$, $p < .001$). Self esteem's contributions to explained variance in both the quality of life and the sense of coherence regression models were described in earlier sections. In this sample, higher self esteem was associated with having greater physical and emotional comfort ($r = .22$, $p = .008$; $r = .39$, $p < .001$, respectively), engaging in social activities ($r = .27$, $p = .001$), and having less activity restrictions from heart disease ($r = -.17$, $p = .042$). Unfortunately, the low Cronbach's alpha (.50) estimated for the Duke Health Profile Self Esteem scale is a threat to statistical conclusion validity.

Table 5-1

Frequencies of the Perception of Degree of Social Support that Would be Given by Each of Six Supporters [a] (N = 149)

Support Category	***None* (0)**	***A little* (1)**	***Some* (2)**	***A lot* (3)**	**Missing Response**
First Supporter					
Physical help	3	5	15	105	21
Financial help	21	14	17	73	24
Advice	3	8	23	90	25
Social time	2	11	24	90	22
Second Supporter					
Physical help	14	7	29	76	23
Financial help	39	19	25	43	23
Advice	6	17	41	61	24
Social time	8	28	32	57	24
Third Supporter					
Physical help	10	16	28	70	25
Financial help	44	23	19	38	25
Advice	15	24	37	50	23
Social time	5	31	43	46	24
Fourth Supporter					
Physical help	13	17	25	66	28
Financial help	40	16	32	30	31
Advice	5	28	33	53	30
Social time	4	26	44	47	28
Fifth Supporter					
Physical help	18	16	32	51	32
Financial help	49	21	27	20	32
Advice	11	34	33	39	32
Social time	10	18	47	44	30
Sixth Supporter					
Physical help	17	22	30	44	36
Financial help	44	17	30	19	39
Advice	15	17	33	48	36
Social time	10	29	29	44	37

[a] Measured by the Modified Burckhardt Perceived Support Score

Validity of the Findings

Evidence of design validity is inferred from statistical conclusion validity, internal validity, construct validity, and external validity. Threats to each are described below.

Statistical Conclusion Validity

Aspects of design affecting statistical conclusion validity that were addressed in this study are low power, violation of assumptions, "fishing" (in this study, multiple testing) and the error rate, and reliability of measures and implementation (Cook & Campbell, 1979). Each is addressed below.

Power. Power, or the ability to include an independent variable in the equation that has a truly significant correlation coefficient, was optimized by the large final sample ($N = 149$) and by selection of .05 as the level of significance. Therefore, lack of power was not a concern.

Statistical assumptions. Statistical assumptions of the linear model (normal distribution, linearity, and homoscedasticity) were assessed using descriptive statistics, histograms, and residual analyses of the regression equations. These assumptions did not appear to be violated. The assumption of independence of the dependent-variable values was not considered relevant as data were gathered by mailed questionnaire rather than by an interviewer (who may have become more skillful over time). Therefore, tests of significance appear to be valid.

Multiple testing and the error rate. To minimize the chance of Type I errors, the number of multiple regression analyses was restricted to those hierarchical regressions planned a priori and to those necessary to assess the importance of missing predictor variables to explained variance of quality of life and to sense of coherence. Following the method recommended by Cohen and Cohen (1983), to assess the contribution of missing predictor variables, nine additional regression analyses were performed (three for each of the hierarchical regressions: maximum-model quality of life, parsimonious-model quality of life, and sense of coherence). Although unlikely, it was possible that in the parsimonious model the significant contribution to explained variance in quality of life of *missing a predictor variable including perceived support* or *missing perceived support alone* occurred by chance. On the other hand, it was viewed as important to identify any possible biasing influence of missing values on predictors.

Reliability of measures. Two scales had lower than recommended (Nunnally, 1978) internal consistency reliability: the Modified Duke Social Scale (.65) and the Duke Health Profile Self Esteem Scale (.50). Although Cronbach's alpha for the Modified Duke Health Profile Social Scale was low, it actually improved over that estimated by Parkerson and his colleagues (1990) in their psychometric study of the Duke Health Profile (Cronbach's alpha =.55, N = 683 primary care adult patients). When the 5 items on the original Duke Health Profile Social Scale were decreased to 2 items on the modified scale, the strength of the alpha coefficient increased by .10. As internal consistency reliability is related directly to the number of scale items (Nunnally, 1978), this finding was contrary to what one might expect. The improvement may have resulted from eliminating the overlap by 3 of the 5 items with the Duke Health Profile Self Esteem Scale, thus enhancing its internal consistency.

The internal consistency reliability of the Duke Health Profile Self Esteem Scale in this study was much lower than the Cronbach's alpha of .64 estimated by Parkerson and his group (1990). The Cronbach's alpha of .50 estimated in the current study may have reflected the complexity of self esteem as a construct or inadequate sampling of its content domain by five items. The test-retest (1-to-8 week interval) reliability of .78 for the Duke Health Profile Self Esteem Scale estimated by Parkerson and his colleagues (*n* = 55) was much higher than that scale's internal consistency reliability either in this study or the Duke University study. The strength of the test-retest reliability in Parkerson's sample demonstrates an adequate degree of temporal stability.

The relationships between self esteem and both quality of life and sense of coherence are important. The zero-order correlations between SELF ESTEEM and QOL and between SELF ESTEEM and SOC were equally strong (r =.50, p <.001). SOC and SELF ESTEEM were the only two predictors having significant beta weights (.58 and .18, respectively) at the last step of the maximum-model regression for predicting quality of life. On the sense of coherence regression, after all variables were added to the model, only EMOTIONAL and SELF ESTEEM maintained significant beta weights (β weight =.54, p<.001; and β weight =.23, p<.001, respectively). Since low internal consistency reliability may reflect measurement error, and measurement error attenuates relationships between variables, the relationships between quality of life, sense of coherence, and self esteem could be even stronger had one or more been measured with more reliable instruments.

Reliability of implementation. Inconsistency of implementation of the questionnaire could be inferred from the number of missing values on the Modified Burckhardt Perceived Support Score and selected items on the Modified Flanagan QOL Scale. That is, did ambiguous directions affect the manner in which persons responded? Assessment of social support was complicated. Respondents were asked to think of six individuals, and to rate each of those individuals on four items using a 4-point scale. Twenty-one persons (14% of the sample) left that section blank. Burckhardt (1985) administered the scale during an interview, where presumably clarification could be made and encouragement given for the participant to complete the question. Additionally, on the original scale there were only three dimensions to rate (physical help, advice, and social time). Burckhardt suggested that social support was an important predictor of quality of life. In this study, social support contributed 5% to explained variance of quality of life (p =.008) in both maximum and parsimonious models.

As presented in Table 4-4 differences were seen in quality of life, sense of coherence, social function, and coronary heart disease symptoms depending on group membership: having one, two or three missing predictor variables including perceived support or missing only perceived support. These differences may have been due to the complexity of measurement of the construct or to correlated error: the correlation between group membership and an unmeasured variable, such as mental acuity or fatigue. That is, responding completely to the social support question may have been more of an assessment of intellectual capacity or perseverance than of perceived social support. Those persons who were unable to think through categorizing supporters by type and degree of support provided, or those who were simply too tired to complete the 24 items, would have left the items blank. It stands to reason that these respondents would be different from those persons answering the items, but the differences may not have been due to the variable being assessed—social support. Therefore, it seems plausible that persons missing one, two or three predictors including perceived support, or missing only perceived support, might have had a lower quality of life, a lower sense of coherence, or a lower amount of socialization from either inadequate social support, decreased intellectual capacity, or extreme fatigue. Differences in the variable related to having coronary heart disease symptoms before cardiac arrest seems unlikely based on the face value of missing one, two or three predictors including perceived support, or missing only perceived support. For these respondents, a history of coronary heart disease prior to their first cardiac arrest implied increased likelihood of ongoing fatigue. Additionally, they may have required longer resuscitation times with resultant anoxic dysfunction. Thus, it seemed apparent that having these missing values was not random.

On the Modified Flanagan Quality of Life Scale, there were a total of 46 missing (i.e., blank) responses for the 16 items. As can be seen in Table 4-1, four items in particular had a number of missing responses: having and rearing children (7%); work: job or home (4%); expressing yourself creatively (4%); and learning: attending school, improving knowledge (4%). Respondents were given the option of writing *not applicable* next to any item. A number of respondents did chose to mark certain items as *not applicable*: having and rearing children (43%); learning: attending school, improving knowledge (25%); participating in organizations and public affairs (17%); close relations with spouse or significant other (8%); and helping and encouraging others, volunteering (8%). Therefore, it was unclear whether leaving an item blank was related to not understanding the question, to regarding the items as too personal, or to not considering the item salient. There was some support for the explanation of salience as all respondents answered the item related to satisfaction with "independence, being able to do things for yourself." *Independence* had been added to the Flanagan Quality of Life Scale by Burckhardt and her colleagues (1989) as a result of their qualitative interviews of chronically ill persons; independence seemed particularly relevant to this chronically ill sample, as well. Thus, missing data on the Modified Flanagan Quality of Life Scale also did not appear to be random.

Internal Validity

The major threat to internal validity in this study was self selection into the sample. Those persons who chose to respond to the questionnaire may have been different from those who chose not to respond. Those persons not responding may have perceived themselves to be healthy or may have denied that they had a health problem. For them, the study would have had limited relevance. Other persons who chose not to participate may have perceived their health to be very frail, and may have felt that the time commitment to complete the questionnaire was too great. Therefore, an alternative hypothesis to consider was: data obtained from persons surviving a cardiac arrest but not participating in this study will not fit the same model as the data obtained from respondents completing the mailed survey. Of particular concern was the question: Would sense of coherence be as important to nonrespondents' quality of life as it was found to be in the respondents of this study? On the other hand, as suggested by the strong sense of coherence demonstrated by respondents in this study compared to other studies (Antonovsky, 1987; Sagy et al., 1990) and by the importance of finding new meaning and purpose in life, perhaps the overall relationship between sense of coherence and quality of life would be strengthened by the addition of the persons who did not respond.

As health may have been a factor in self selection, indicators of health and functioning in this sample were compared to the sample studied by Parkerson and his colleagues (1990). In order to make the comparison, for this study sample, the original Duke Health Profile Scales were used. As Table 5-2 illustrates, on the average, this sample had lower scores on perceived health and much lower scores on physical comfort than did Parkerson's respondents (t = -4.42 and -7.55, respectively). There was no significant difference in average emotional comfort, social function, or self esteem.

Construct Validity

Three potential threats to construct validity (the match between operations and theory) exist in this study: inadequate preoperational explication of the self esteem and chronic illness trajectory shape and work constructs, mono-operation bias, and mono-method bias (Cook & Campbell, 1979). Each is addressed below.

Table 5-2

Comparison of Mean Scores on the Duke Health Profile between Maximum-Model Regression Subjects and Duke University Subjects [a]

Scale	Maximum-Model Regression (N = 149)	Duke University (N = 683)
Perceived Health [b]	63.5 (SD = 35.3)[e]	76.9 (SD = 26.4)
Physical Health [c]	50.8 (SD = 24.2)[f]	67.1 (SD = 22.2)
Mental Health [d]	73.8 (SD = 19.6)[f]	72.8 (SD = 20.6)
Social Health [d]	68.9 (SD = 18.8)[f]	67.6 (SD = 17.6)
Self Esteem [d]	77.4 (SD =17.2)	76.9 (SD = 18.3)

[a] From "The Duke Health Profile. A 17-item measure of health and dysfunction" by G.R. Parkerson, Jr., W.E. Broadhead, and C-K. J. Tse, 1990, *Medical Care*, *28*, 1061. [b] t = -4.42, p <.01. [c] t = -7.55, p <.001. [d] p >.05. [e] n = 148. [f] For comparison, scores obtained using the original Duke Health Profile scales are presented.

Preoperational explication of the self esteem, and chronic illness shape and work constructs. Complexity of the self esteem construct may have been underestimated. Although Parkerson and his colleagues (1990) addressed construct validity of the Duke Health Profile Self Esteem Scale by comparing the scale to 82 of 100 items on the Tennessee Self Concept Scale (Fitts, 1972) (Spearman rank-order r =.80, $p \leq .001$), it may be that the 5-item Duke Self Esteem Scale inadequately sampled the complex self esteem domain. Fitts and Hamner (1969) described self concept, as operationalized by the Tennessee Self Concept Scale (Fitts, 1964), as how the individual describes himself or herself from three internal frames of reference (i.e., "What he or she is", "How he or she feels about himself or herself", and "What he or she does") in relation to five external frames of reference: physical self; moral-ethical self; personal self (personal self-worth, psychological traits and characteristics); family self (self in relation to the primary social group, family and close friends); and social self (self in relation to the secondary social group). Because self esteem was so important to both quality of life and sense of coherence, use of a more mature scale that is more reliable, and has accrued more evidence of construct validity is recommended for future research.

Chronic illness trajectory shape probably is more complex than can be captured in the three variables used: heart disease symptoms prior to first cardiac arrest, number of cardiac arrests, and time since last cardiac arrest. Thus, their nonsignificant contributions to both quality of life and sense of coherence was not surprising. Because of the importance of chronic illness trajectory shape to the theoretical model used in this study, it will be important to find appropriate indicators for this construct.

Theoretically, functional capacity was based on role enactment, one component of role theory as defined by Sarbin and Allen (1968). Role enactment would include personal, professional, and social roles. However, functional capacity as a reflection of role enactment was not operationalized congruently with its theoretical definition. Only two indicators of functional capacity were used to explain variance in quality of life: reported NYHA Functional Class and the Modified Duke Health Profile Social Scale. The NYHA Functional Class provided only an indication of the amount of physical activity restriction related to heart disease. However, 52% of persons had other medical problems that might have influenced physical activity as well. The Modified Duke Health Profile Social Scale assessed only time spent socializing with other persons, and time spent taking part in social, religious or recreational activities. The correlation between reported NYHA Functional Class and SOCIAL was significant and in the direction expected, but the squared zero-order correlation coefficient ($r^2 = .07$) indicated that there was a great deal more to social functioning than simply activity restrictions as a result of heart disease. Work status was used for descriptive purposes only because employment was not thought to be a valid indicator of either activity level or quality of life. No other measurement of professional role was made. Had there been a more complete assessment of role enactment, the model explaining quality of life might have been different.

Mono-operation bias. Single indicators were used to reflect the two primary constructs of interest in this study: sense of coherence and quality of life. Although the scales contained multiple items, the constructs potentially were underrepresented by the data. The tradeoffs considered a priori were respondent burden of a lengthy questionnaire, investigator time, and financial cost. Validity of the model could be enhanced by use of multiple indicators as a means of triangulating the referent. For future direction, utilization of multiple indicators of constructs is the foundation for structural modeling.

Mono-method bias. All data were obtained through self report on a mailed, structured questionnaire. Use of a single method introduces correlated error, such as expressed self-desirability. Additionally, some persons may not be as comfortable with, or respond as openly to, closed-ended questions. Including the open-ended question about change in life and life view after cardiac arrest was an attempt to alter the format of the questionnaire in order to reduce mono-method bias and to gain a better understanding of the sample.

External Validity

If the major purpose of this project was to be able to generalize back to all cardiac arrest survivors, external validity would be threatened because random sampling was not done, not all persons who were queried responded to the questionnaire, and not all persons completed all questions. However, the purpose of this project was to generalize across persons with chronic illness, and back to the theories of sense of coherence (Antonovsky, 1979, 1987), quality of life (Burckhardt et al., 1989; Flanagan, 1982), and chronic illness (Corbin & Strauss, 1988; Strauss et al., 1984). Cook and Campbell (1979) posited that external validity is enhanced more by smaller studies with haphazard samples (i.e., samples of convenience) than by large studies with initially representative samples that become haphazard over time (i.e., as a result of attrition). Since this research effort is the first step in a research plan that will involve persons with chronic illnesses and other types of acute exacerbations and come-back phases, it seems that, at this point, external validity is adequate.

Limitations of the Study

In addition to the threats to design validity noted above, limitations of this study include the using the short-form version of the Sense of Coherence Questionnaire, the sample itself, and having an individual rather than a dyadic or family focus. Each is described below.

Choice of Sense of Coherence Questionnaire, Short Form

In an attempt to reduce respondent burden and increase the study response rate, the 13-item version of the Sense of Coherence Questionnaire was selected over the 29-item version. Unfortunately, the implications of having less information about the independent variable of interest were not given adequate consideration. The longer version of this instrument probably would not have unduly increased respondent burden or reduced the response rate but would have provided more information.

The Sample

This predominantly Caucasian sample was not reflective of society at large, or of the racial distribution of heart disease. Thus, the study findings may not hold true for minority individuals. It may be that this sample, obtained through highly specialized medical facilities, did not include persons with lower socioeconomic status. Thus, restriction of range may have contributed to lower relationships between socioeconomic status and other variables of interest. Improving the measure of socioeconomic status, for example, by including income level and health care insurance, would provide more information about the representativeness of the sample as well as the contribution of socioeconomic status to sense of coherence and quality of life.

In this study, women composed 27% of the sample. Women, historically, have been underrepresented in studies of persons with cardiovascular disease. However, women were reported to have a lower incidence of cardiac arrest than men: after adjusting for known risk factors, their sudden cardiac death rate was 32% of that in men (Cupples et al., 1992). It was not reported how resuscitation rates compared. One could hypothesize that resuscitation rates might be lower since women with symptomatic heart disease, on the average, were older than their male counterparts. Additionally, older women often are not employed outside the home. In a typical working environment, in event of a cardiac arrest, other persons would be available to initiate cardiopulmonary resuscitation and call for help. If women were home alone when the arrest occurred, help would not be available. This hypothesis is supported by Case and his co-investigators (Case, Moss, Case, McDermott, & Eberly, 1992) who found that living alone was an independent risk factor for prognosis after myocardial infarction. Another reason that resuscitation rates might be lower in women is that the aggressiveness of treatment of women with heart disease has been questioned (Ayanian & Epstein, 1991; Steingart et al., 1991).

The two female representative cases that fit the model well *described* the importance of relationships to their life quality. Even though for the entire sample, quality of life items about satisfaction with relationships had the highest mean scores, men who fit the model well did not describe the importance of relationships to life quality. Since attachment through relationships was thought to be very important to women's development (Gilligan, 1982), it may be that a different model of predictors of quality of life would have been found if there had been more women in this study.

Individual Focus

The chronic illness theory of Strauss and his colleagues (1984) and of Corbin and Strauss (1988) was a theoretical guide to this research. Strauss and his colleagues used a dyadic approach. Although it was important to understand what the individual is experiencing as a result of his or her coronary heart disease and cardiac arrest, an individual focus was very restrictive as the consequences of heart disease and all other chronic illness involve the family as well. Not using a dyadic approach may have resulted in the nonsignificant contribution of the chronic illness trajectory shape construct to explained variance in quality of life and sense of coherence. Unfortunately, no instruments measuring the shape or work of chronic illness for either the individual or family were found. Such measures may have provided more explanation of quality of life than those indicators used in this study.

Implications for Theory, Practice, and Research

Three theories guided the development of this research: quality of life, as proposed by Flanagan (1982) and modified by Burckhardt and her colleagues (1989); the chronic illness theory of Strauss and his colleagues (1984), with further refinement by Corbin and Strauss (1988); and Antonovsky's (1979, 1987) salutogenic theory. A discussion of how findings from this study can be generalized back to theory follows, along with the implications for practice and research.

Theory

The theoretical model used in this study (see Figure 2-3) proposed a number of relationships between variables that could be evaluated only by path analysis and structural modeling techniques. Path analysis will not be used until longitudinal data are available. In addition, a larger sample size is required for structural modeling. However, some tentative conclusions still can be drawn from the results of the multiple regression analysis. The relationship between sense of coherence and quality of life was supported, although it is possible that it was quality of life that contributed to sense of coherence. Work of the illness trajectory contributed significantly to both quality of life and sense of coherence. Based on zero-order correlations and beta weights obtained at the last step of each equation, it seemed that the work of emotional comfort contributed more to sense of coherence, and that the work of physical comfort and functional capacity contributed more to quality of life.

Perceived support contributed 5% to the explained variance in quality of life; it made a nonsignificant contribution to sense of coherence. These findings partially supported the proposed model as it was hypothesized that perceived support would contribute directly to quality of life but indirectly (via self esteem) to sense of coherence. Although variance of self esteem was not estimated, the zero-order correlation of perceived support and self esteem was not significant. The low internal consistency reliability estimated for the Duke Health Profile Self Esteem Scale (.50) was identified as a threat to statistical conclusion validity. Low internal consistency reliability may reflect measurement error. Additional measurement error probably resulted from the ambiguity and difficulty of the Modified Burckhardt Perceived Support Score. Measurement error can attenuate relationships, and may have been a factor in the nonsignificant association between self esteem and perceived support.

Chronic illness trajectory shape did not make significant contributions to explained variance of quality of life or sense of coherence. As discussed earlier, it may be that inadequate operationalization of this construct resulted in its nonsignificant contribution. Thus, even though this part of the model was not supported, evidence to refute it was not obtained. Social status variables related to poor health vulnerability did not contribute significantly to either quality of life or sense of coherence. It may be that socioeconomic status was the most important of the social status variables, in that gender, race, age, and marital status affect it. However, the indicator of socioeconomic status used in this study—educational level—may have been inadequate, resulting in its nonsignificant contribution to explained variance. Hypothesized relationships between the construct of poor health vulnerability and other variables were not evaluated.

Thus, the importance of the sense of coherence to quality of life, and the importance of the work of the chronic illness trajectory to both sense of coherence and quality of life, seem apparent. Evidence to refute the importance of the shape of the chronic illness trajectory to quality of life and sense of coherence was not obtained. In fact, that disease-specific indicators of trajectory shape (symptoms of coronary heart disease before cardiac arrest, number of cardiac arrests, and time since cardiac arrest) and work (type of medical treatment to prevent cardiac arrest, and having other medical problems) did not contribute to explained variance in quality of life or sense of coherence in some respects supported the generalist approach of using the chronic illness trajectory rather than medical diagnoses (Corbin & Strauss, 1988; Strauss et al., 1984).

Practice

Using patient perception of satisfaction with life provides an approach to evaluation of quality of life in which quality of life is viewed through the eyes of the client. Such perceptions can guide nursing practice. Nurses are holistic in their view of patients, but often are hindered in practice and research by lack of a holistic theory. Much of nursing practice and research is based on medical theory related to specific disease processes. Many nurses, like many physicians, have specialized around disease or organ processes (e.g., cancer or heart disease). However, disease often does not exist in isolation. Most persons, especially as they age, have more than one chronic illness. To optimize the effectiveness of nursing practice, most nurses practicing outside of acute care institutions (i.e., in the community) need to be generalists who are guided by holistic theories. Thus, this theory of chronic illness (Corbin & Strauss, 1988; Strauss et al., 1984) seems useful as a practice framework.

The salutogenic theory provides another holistic theory from which nurses can focus on maintaining and restoring wellness. Sullivan (1989) suggested that nurses help mobilize patients' generalized resistance resources, and in fact, that nurses themselves are generalized resistance resources. Thus, nurses could use the knowledge of the importance of the sense of coherence to quality of life by providing structured life experiences to shape the illness trajectory. Structured experiences could take the form of giving information (increasing comprehensibility—understanding the unpredictability of chronic coronary heart disease), or providing either direct care or caregiving strategies that the patient, family member, or health care agency can institute (increasing manageability—accomplishing trajectory-shaping work and minimizing the impact of coronary heart disease).

Shaping the illness trajectory in those ways most likely would result in a temporary change in sense of coherence. Listening to persons who have an unstable trajectory describe changes in their life and view of life might provide the nurse with information about aspects of life that are troublesome and aspects in which meaning is or could be derived. Devising strategies to help persons with chronic illness find meaningfulness in life would be more difficult than developing strategies to enhance comprehensibility and manageability. Perhaps a more reasonable expectation would be in helping persons reflect on aspects in life in which meaning had been strengthened or renewed. Recently, the work of Archbold and Stewart (1992) suggested that development of enrichment strategies around symbolic activity (connectedness through traditions, values, and ceremonies) may strengthen or renew meaningfulness. This strategy may require consultation with a mental health clinical nurse specialist or advanced training for the cardiovascular nursing specialist.

Research

As about 40% of the variance in quality of life and 52% of the variance in sense of coherence were unexplained in this study, a number of unanswered questions remain. Some of the unexplained variance may have been due to problems with measurement error that must be resolved. Further explication of the chronic illness trajectory construct is required, especially as it relates to the trajectory shape. Additionally, other unidentified and unmeasured constructs seemed to have contributed substantially to explained variance in a number of the representative cases that did not fit the model. For some cases, based on sense of coherence, comfort, functional capacity, self esteem, and perceived support, one would expect quality of life to be higher (e.g., Case 1163). On the other hand, for some cases, one would expect quality of life to be lower (e.g., Case 1118). A qualitative study may help to identify these constructs and clarify their relationships with quality of life and sense of coherence.

Why survivors of cardiac arrest had such comparably high scores for sense of coherence was not clear. It may have been that a nonnormative event (e.g., a cardiac arrest) may have amplified the differences in sense of coherence between persons experiencing or not experiencing such an event. Surveying other persons with chronic illness but without such an event may provide additional information.

The distinction and overlap of the sense of coherence and quality of life constructs requires additional investigation. A psychometric study examining their convergent and divergent validity may help address this issue. If persons with chronic illness could be evaluated before and after a specific, nonnormative, stressful event (e.g., coronary artery bypass surgery), additional information about the distinction and overlap may be obtained. Factor analysis of a combined Quality of Life-Sense of Coherence scale might provide data to support distinctiveness or overlap of the items.

Recommendations and Future Directions

Recommendations

Other recommendations include expanding the sample to include more women and minorities and studying persons having coronary heart disease either with stable or with unstable illness trajectories as a result of acute manifestations other than cardiac arrest (i.e., acute myocardial infarction, bypass graft surgery). Subsequently, studying persons with other chronic illnesses is recommended.

Future Directions

Longitudinal data would provide additional evidence of validity of the conceptual model. After the sample was expanded and longitudinal data were obtained, path analysis and structural modeling should be used as an indicator of cause and effect.

If a strong sense of coherence empowered persons with chronic illness to have a better quality of life, nursing strategies to enhance sense of coherence should be developed and tested. Particular attention should be paid to the sensitivity to change of the Sense of Coherence Questionnaire as an outcome measure. Stewart and Archbold (1992) noted that measures developed for use in correlational studies to maximize individual differences may not be the best measures to use in experimental studies in which reflections of within-individual change are desired. They suggested that the technique utilized by Guyatt (1988) of tailoring individualized outcome measures may be important for nursing research. Thus, for an experimental study testing the effectiveness of one or more strategies to enhance sense of coherence, from the list of 29 items on the Sense of Coherence

Questionnaire, the 5 items that were most important personally to each respondent would be used as their outcome measure. In this way, documentation of the effectiveness of the nursing interventions to enhance sense of coherence would be facilitated.

Summary

This study focused on understanding the quality of life in persons who have had a cardiac arrest as a manifestation of chronic coronary heart disease. Specifically, it assessed the influence of the sense of coherence (Antonovsky, 1987), a variable that previously had not been studied in relationship to heart disease in exploring quality of life. The proposed theoretical model (Figure 2-3) was derived from a theory of chronic illness (Burckhardt et al., 1989; Flanagan, 1982), the salutogenic theory (Antonovsky, 1979, 1987), and a theory of chronic illness (Corbin & Strauss, 1988; Strauss et al., 1984).

A nonexperimental, correlational design was used to test the study hypotheses:

1. After controlling for social status variables related to poor health vulnerability, perceived support, self esteem, and the chronic illness trajectory shape and work variables, the addition of sense of coherence will significantly improve estimation of quality of life.
2. After controlling for social status variables related to poor health vulnerability, perceived support, and the chronic illness trajectory shape and work variables, self esteem will contribute significantly to sense of coherence.

After approval for this study was obtained from the Human Subjects

Review Committees of the Oregon Health Sciences University, Portland, and the University of Washington, Seattle, the entire population of survivors of cardiac arrest of two medical facilities was given the opportunity to participate in the study: the Oregon Health Sciences University and the Virginia Mason Medical Center, Seattle. Thus, of a total of 303 questionnaires mailed, 162 persons responded; 149 persons met study criteria and composed the final sample.

The questionnaire packet consisting of a cover letter, questionnaire, and return envelope was designed and implemented based on the Total Design Method, developed by Dillman (1978) to increase mail survey response rates. The total response rate was 57%. As illustrated in Figure 3-1, the response rate of the Oregon Health Sciences University sample (74%) was much greater than the response rate of the Virginia Mason Medical Center sample (40%). Self selection into the sample was seen as the major threat to internal validity.

The sample of 149 persons was largely male (73%) and predominantly Caucasian (95%). Ages ranged from 30 to 85 years, with a mean of 63 years (*SD* = 11.1). Most respondents were married or living with significant others (82%) and had greater than a high school education (55%). Nearly 36% were still working. Of those who were no longer working (*n* = 96), the majority retired for reasons other than health (58%). Table 3-1 summarizes the social status characteristics and the work status of the sample.

For 40% of the respondents, the cardiac arrest was their first manifestation of coronary heart disease. Most of the sample (64%) had experienced a single cardiac arrest. For the majority of respondents, the last cardiac arrest occurred between 6 months and 3 years prior to this study (55%), although for 19%, more than 5 years had elapsed. Slightly more than half had no other medical problems. Treatment to prevent another cardiac arrest was variable. About three-fourths considered themselves as NYHA Functional Class I or II. These chronic illness trajectory shape and work variables are summarized in Tables 3-2 and 3-3.

Four standardized instruments were combined into a single questionnaire, along with social status variables related to poor health vulnerability, an item about work status, and several open-ended questions. The measurement model used in this study is illustrated in Figure 3-2. The study questionnaire can be found in Appendix A. The evidence of reliability and validity accrued in other studies for all instruments used in both the pilot study and the larger study is presented in Appendix B. An open-ended question, "Please describe how your life and your view of life has changed as a result of your cardiac arrest," was added to enrich and clarify the quantitative results.

Internal consistency reliabilities were obtained for all scales used in this study, and are displayed in Table 3-4. Two scales had lower than recommended internal consistency reliability (Nunnally, 1978): the Modified Duke Social Scale (.65) and the Duke Health Profile Self Esteem Scale (.50). Since low internal consistency reliability may reflect measurement error, and measurement error attenuates relationships between variables, these low Cronbach's alpha values were seen as a threat to statistical conclusion validity.

The dependent variable, quality of life, as measured by the Modified

Flanagan Quality of Life Scale, had a scale score that ranged from 36 to 112 (possible range is 16 to 112), and averaged 84.8 (*SD* = 14.0) in this sample. Stated differently, the mean QOL score of each of the 16 items was 5.3 (on the 7-point delighted-terrible scale, where 7=delighted and 1=terrible). Satisfaction was highest for "close relations with spouse or significant other" (*M* = 6.1) and "having and rearing children" (*M* = 6.0), and lowest for "participating in organizations and public affairs" (*M* = 4.3) and "participating in active recreation (*M* = 4.5). Satisfaction with health ranked 13th out of 16, with a mean value of 4.7. Three items in particular were considered by many respondents to have no applicability to their lives: "having and rearing children" (43%), "learning" (25%), and "participating in organizations and public affairs" (26%). Only one item, "independence, being able to do things for yourself," was answered by all respondents. Table 4-1 presents all QOL scale items in order of respondent satisfaction, along with their mean scores and standard deviations.

The primary independent variable of interest, sense of coherence, as measured by the Sense of Coherence Questionnaire (Short Form), had a scale score that ranged from 31 to 91 (possible range is 13 to 91), and averaged 69.2 (*SD*=13.0). Stated in another way, the average of each of the 13 items was 5.3 (on a 7-point scale, with 7 representing the strongest SOC and 1 representing the weakest SOC). Along with the SOC scale and item descriptive statistics, Table 4-2 groups the SOC items under the three domains of comprehensibility, manageability, and meaningfulness. Scores for all other independent-variable scales used in the regression models are summarized in Table 4-3.

The mean sense of coherence score obtained in this sample (*M* = 5.3) was higher than the mean score of any other population sampled in a variety of studies (Antonovsky, 1987; Sagy et al., 1990) except for Israeli army officer trainees (*M* = 5.5). The army trainees had been hypothesized to have a strong sense of coherence. Antonovsky used the differences in mean sense of coherence scores between groups as evidence for the construct validity of the instrument. Why survivors of cardiac arrest had such high scores was not clear. It may have been that a nonnormative event (e.g., a cardiac arrest) may have amplified the differences in sense of coherence between persons experiencing or not experiencing such an event.

Stepwise, hierarchical multiple regression was used to test the primary and secondary hypotheses. Partial *F* tests were obtained after each stepwise addition. The a priori level of significance was $p < .05$. For the maximum-model quality of life regression, the contributions of the variables were: (a) social status variables related to poor health vulnerability—5% (nonsignificant); (b) perceived social support—5% ($p = .008$); (c) self esteem—23% ($p < .001$); (d) chronic illness trajectory shape variables—2% (nonsignificant); (e) chronic illness trajectory work variables—17% ($p < .001$); and (f) sense of coherence—14% ($p < .001$). Total explained variance was 67% (adjusted $R^2 = .59$). A parsimonious model excluding social status variables, trajectory shape variables, other medical problems, and medical treatment was created to facilitate clinical use. In the smaller model, sense of coherence contributed 17% to explained variance, for a total explained variance of 62% (adjusted $R^2 = .60$). These findings support the primary study hypothesis. The substantial contribution of the sense of coherence to explained variance in quality of life of chronically ill persons in both models was a new finding. However, for the parsimonious model, having one missing predictor variable including perceived support or missing perceived support alone contributed small but significant amounts to explained variance (R^2 change =.01, p =.03, and R^2 change =.01, p =.02, respectively). The pattern of missing data for the perceived support variable appeared to be nonrandom and was thought to be related to the difficulty of understanding or completing the Modified Burckhardt Perceived Support Score.

For the sense of coherence regression, the contributions of the variables at each step were: (a) social status variables related to poor health vulnerability—6% (nonsignificant); (b) perceived social support—2% (nonsignificant); (c) chronic illness trajectory shape variables—2% (nonsignificant); (e) chronic illness trajectory work variables—44% (p <.001); and (f) self esteem—4% (p =.002); (d). Total explained variance was 57% (adjusted R^2 =.48). Thus, the secondary hypothesis also was supported. However, the strong relationship of emotional comfort with sense of coherence had been underestimated. Having any missing predictor variables did not contribute to explained variance in sense of coherence.

Qualitative data generated by responses to the open-ended question about change in life and view of life since cardiac arrest were used to describe the sample and enrich the quantitative findings. Representative cases (n = 22) were selected based on how well they fit the partial regression plot (Figure 4-2). For those cases that fit the model well, finding new meaning or purpose in life and changing priorities seemed most apparent: "...taking time to smell the flowers and enjoy life very much" (Case 1067); "...became much more aware of the importance of my relationship with family and friends....took time to 'smell the roses' and prioritize my involvement in relationships and activities....have enjoyed a rewarding career....perhaps my mission was nothing more than continuing to be a wife, mother, grandmother or friend" (Case 1073); "I had faith before the attack and it has been strengthened because of the events that happened immediately after the attack....I believe my life wasn't meant to end yet. So life is more meaningful and has a stronger purpose" (Case 1115); "Values have changed—life is more balanced with what is important. My spiritual life has become more important" (Case 1109).

The theoretical model used in this study (see Figure 2-3) proposed a number of relationships between variables that could be evaluated only by path analysis and structural modeling techniques. Some tentative conclusions still can be drawn from the results of the multiple regression analysis. The relationship between sense of coherence and quality of life was supported, although it is possible that it was quality of life that contributed to sense of coherence. Work of the illness trajectory contributed significantly to both quality of life and sense of coherence. Based on zero-order correlations and beta weights obtained at the last step of each equation, it seemed that the work of emotional comfort contributed more to sense of coherence, and that the work of physical comfort and functional capacity contributed more to quality of life.

Perceived support contributed 5% to the explained variance in quality of life; it made a nonsignificant contribution to sense of coherence. These findings partially supported the proposed model as it was hypothesized that perceived support would contribute directly to quality of life but indirectly (via self esteem) to sense of coherence. Although variance of self esteem was not estimated, the zero-order correlation of perceived support and self esteem was not significant.

Chronic illness trajectory shape did not make significant contributions to explained variance of quality of life or sense of coherence. It may be that inadequate operationalization of this construct resulted in its nonsignificant contribution. Thus, even though this part of the model was not supported, evidence to refute it was not obtained. Social status variables related to poor health vulnerability did not contribute significantly to either quality of life or sense of coherence. It may be that socioeconomic status was the most important of the social status variables, in that gender, race, and age seem to be affected by it, and marital status affects it. However, the indicator of socioeconomic status used in this study—educational level—may have been inadequate, resulting in its nonsignificant contribution to explained variance. Hypothesized relationships between the construct of poor health vulnerability and other variables were not evaluated.

The importance of the sense of coherence to quality of life, and the importance of the work of the chronic illness trajectory to both sense of coherence and quality of life, seem important. Evidence to refute the importance of the shape of the chronic illness trajectory to quality of life and sense of coherence was not obtained. In fact, that disease-specific indicators of trajectory shape and work (symptoms of coronary heart disease before cardiac arrest, number of cardiac arrests, time since cardiac arrest, type of medical treatment to prevent cardiac arrest, and having other medical problems) did not contribute to explained variance in quality of life or sense of coherence supported the generalist approach of using the chronic illness trajectory rather than medical diagnoses (Corbin & Strauss, 1988; Strauss et al., 1984).

Using patient perception of satisfaction with life provides an approach to evaluation of quality of life in which quality of life is viewed through the eyes of the client. Such perceptions can guide nursing practice. Nurses are holistic in their view of patients, but often are hindered in practice and research by lack of a holistic theory. This theory of chronic illness proposed by Strauss and his colleagues (1984) and refined by Corbin and Strauss (1988) seems useful as a practice framework.

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Shaping the illness trajectory in those ways most likely would result in a temporary change in sense of coherence. Listening to persons who have an unstable trajectory describe changes in their life and view of life might provide the nurse with information about aspects of life that are troublesome and aspects in which meaning is or could be derived. Devising strategies to help persons with chronic illness find meaningfulness in life would be more difficult than developing strategies to enhance comprehensibility and manageability. Recently, the work of Archbold and Stewart (1992) suggested that development of enrichment strategies around symbolic activity (connectedness through traditions, values, and ceremonies) may strengthen or renew meaningfulness. This strategy may require consultation with a mental health clinical nurse specialist or advanced training for the cardiovascular nursing specialist.

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Why survivors of cardiac arrest had such comparably high scores for sense of coherence was not clear. It may have been that a nonnormative event (e.g., a cardiac arrest) may have amplified the differences in sense of coherence between persons experiencing or not experiencing such an event. Surveying other persons with chronic illness but without such an event may provide additional information.

The distinction and overlap of the sense of coherence and quality of life constructs requires additional investigation. A psychometric study examining their convergent and divergent validity may help address this issue. If persons with chronic illness could be evaluated before and after a specific, nonnormative, stressful event (e.g., coronary artery bypass surgery), additional information about the distinction and overlap may be obtained. Factor analysis of a combined Quality of Life-Sense of Coherence scale might provide data to support distinctiveness or overlap of the items.

Other recommendations include expanding the sample to include more women and minorities and studying persons having coronary heart disease either with stable or with unstable illness trajectories as a result of acute manifestations other than cardiac arrest (i.e., acute myocardial infarction, bypass graft surgery). Subsequently, studying persons with other chronic illnesses is recommended.

Longitudinal data would provide additional evidence of validity of the conceptual model. After the sample was expanded and longitudinal data were obtained, path analysis and structural modeling should be used as an indicator of cause and effect. Finally, if a strong sense of coherence empowered persons with chronic illness to have a better quality of life, nursing strategies to enhance sense of coherence should be developed and tested. Particular attention should be paid to the sensitivity to change (Stewart & Archbold, 1992) of the Sense of Coherence Questionnaire as an outcome measure so that documentation of the effectiveness of the nursing interventions to enhance sense of coherence could be facilitated.

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Appendix A

Study Questionnaire

Quality of Life Following Cardiac Arrest

This research study is funded in part by a Predoctoral Fellowship from the
National Center for Nursing Research, National Institutes of Health, Bethesda, Maryland.
Grant number: 1F31 NR06325-01A1

Quality of Life Following Cardiac Arrest

Purpose: Improving life quality is an important part of health care for persons with heart disease. The purpose of this research study is to examine factors that contribute to quality of life in persons who have had a cardiac arrest. I believe that your responses to this questionnaire will generate new information that will be useful to nurses caring for patients by helping those patients to manage the effects that the cardiac arrest has on their everyday lives. I think that better management of these everyday problems that result from the cardiac arrest will improve quality of life. *Your advice is important because nurses and physicians simply do not have the view of what your life is like on a daily basis.*

Questionnaire information: The questionnaire will take you about 60 minutes to complete. You may use either a pen or pencil. If you wish, someone else can mark the answers for you. Directions are given just before each new set of questions. *There are no right or wrong answers* to any of the questions. When you've finished, please mail the completed questionnaire to me in the self-addressed and stamped envelope.

Thank you for sharing your views about the quality of your everyday life with me.

Sandra L. Underhill, R.N., Ph.C.
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Clinical Instructor, Department of Physiological Nursing, University of Washington School of Nursing, Seattle, Washington

Quality of Life

*These first 16 items relate to your satisfaction with life. Please circle the **one** number that **best** describes your satisfaction for each item using this scale:*

Delighted	Pleased	Mostly Satisfied	Mixed	Mostly Dissatisfied	Unhappy	Terrible
7	6	5	4	3	2	1

If an item does not apply to your life, please write "NA" (for "not applicable") next to the question number.

	Delighted						***Terrible***
Q1. Material comforts: home, food, financial security	7	6	5	4	3	2	1
Q2. Health: being physically fit and vigorous	7	6	5	4	3	2	1
Q3. Relationships with parents, siblings & other relatives: communicating, visiting, helping	7	6	5	4	3	2	1
Q4. Having and rearing children	7	6	5	4	3	2	1
Q5. Close relations with spouse or significant other	7	6	5	4	3	2	1
Q6. Close friends	7	6	5	4	3	2	1
Q7. Helping and encouraging others, volunteering	7	6	5	4	3	2	1
Q8. Participating in organizations and public affairs	7	6	5	4	3	2	1
Q9. Learning: attending school, improving knowledge	7	6	5	4	3	2	1
Q10. Understanding yourself: knowing what life is about	7	6	5	4	3	2	1
Q11. Work: job or home	7	6	5	4	3	2	1
Q12. Expressing yourself creatively	7	6	5	4	3	2	1
Q13. Socializing: meeting other people, doing things	7	6	5	4	3	2	1
Q14. Reading, music, or watching entertainment	7	6	5	4	3	2	1
Q15. Participating in active recreation	7	6	5	4	3	2	1
Q16. Independence, being able to do things for yourself	7	6	5	4	3	2	1

Aspects of Life

*The following set of questions relates to various aspects of our lives. Each question has seven possible answers. Please circle the number which best expresses your answer, with numbers 1 and 7 being the extreme answers. If the words under number 1 are right for you, circle 1; if the words under number 7 are right for you, circle 7. If you feel differently, circle the number that best expresses your feeling. Please give only **one** answer to each question. There are **no** right or wrong answers.*

C1. Do you have the feeling that you don't really care about what goes on around you?

1	2	3	4	5	6	7
very seldom or never						very often

C2. Has it happened in the past that you were surprised by the behavior of people whom you thought you knew well?

1	2	3	4	5	6	7
never happened						always happened

C3. Has it happened that people whom you counted on disappointed you?

1	2	3	4	5	6	7
never happened						always happened

C4. Until now your life has had:

1	2	3	4	5	6	7
no clear goals or purpose at all						very clear goals and purpose

C5. Do you have the feeling you're being treated unfairly?

1	2	3	4	5	6	7
very often						very seldom or never

C6. Do you have the feeling that you are in an unfamiliar situation and don't know what to do?

1	2	3	4	5	6	7
very often						very seldom or never

Questionnaire continues....

The set of questions about various aspects of our lives continues. Please ***circle*** *the* ***one*** *number which best expresses your answer.*

C7. Doing the things you do every day is:

1	2	3	4	5	6	7
a source of deep pleasure and satisfaction						a source of pain and boredom

C8. Do you have very mixed-up feelings and ideas?

1	2	3	4	5	6	7
very often						very seldom or never

C9. Does it happen that you have feelings inside you would rather not feel?

1	2	3	4	5	6	7
very often						very seldom or never

C10. Many people – even those with a strong character – sometimes feel like sad sacks *(losers)* in certain situations. How often have you felt this way in the past?

1	2	3	4	5	6	7
never						very often

C11. When something happened, have you generally found that:

1	2	3	4	5	6	7
you overestimated or underestimated its importance						you saw things in the right proportion

C12. How often do you have the feeling that there's little meaning in the things you do in your daily life?

1	2	3	4	5	6	7
very often						very seldom or never

C13. How often do you have feelings that you're not sure you can keep under control?

1	2	3	4	5	6	7
very often						very seldom

Health

Here are a number of questions about your health and feelings. Please read each answer carefully and check (√) your best answer. You should answer the questions in your own way. There are ***no*** *right or wrong answers.*

	Yes, describes me exactly	**Somewhat describes me**	**No, doesn't describe me at all**
H1. I like who I am	_____	_____	_____
H2. I am not an easy person to get along with	_____	_____	_____
H3. I am basically a healthy person	_____	_____	_____
H4. I give up too easily	_____	_____	_____
H5. I have difficulty concentrating	_____	_____	_____
H6. I am happy with my family relationships	_____	_____	_____
H7. I am comfortable being around people	_____	_____	_____

TODAY *would you have any physical trouble or difficulty:*

	None	**Some**	**A Lot**
H8. Walking up a flight of stairs	_____	_____	_____
H9. Running the length of a football field	_____	_____	_____

DURING THE PAST WEEK*, how much trouble have you had with:*

	None	**Some**	**A Lot**
H10. Sleeping	_____	_____	_____
H11. Hurting or aching in any part of your body	_____	_____	_____
H12. Getting tired easily	_____	_____	_____
H13. Losing consciousness	_____	_____	_____
H14. Heart palpitations	_____	_____	_____
H15. Feeling depressed/sad	_____	_____	_____
H16. Nervousness	_____	_____	_____
H17. Anxiety	_____	_____	_____
H18. Restlessness	_____	_____	_____
H19. Fear of recurrent heart rhythm disturbance	_____	_____	_____
H20. Discouragement	_____	_____	_____
H21. Irritability or tenseness	_____	_____	_____
H22. Having bad dreams	_____	_____	_____

Questionnaire continues.....

Health / Social Support

***DURING THE PAST WEEK,** how often did you:*

	None	Some	A Lot
H23. Socialize with other people *(talk or visit with friends or relatives)*	_____	_____	_____
H24. Take part in social, religious or recreational activities *(meetings, church, movies, sports, parties)*	_____	_____	_____

DURING THE PAST WEEK:

	None	1-4 Days	5-7 Days
H25. How many days did you stay in your home, a nursing home, or hospital because of sickness, injury or health problem?	_____	_____	_____

There are many different kinds of help that people can give to or receive from each other. Please think of six people you are closest to and place their ***initials only*** *on the line to the left of the numbers.* How much help or support would you expect to receive from each of these people if you needed it or wanted it ? *Please rate that help or support on the following scale:*

0 = none, 1 = a little, 2 = some, and 3 = a lot.

On each line, write in the number (0, 1, 2, or 3) that represents how much help you would receive from each person in each area if you needed it or wanted it.

	Write initials here	**Physical Help**	**Financial Help**	**Advice**	**Social Time**
S1.	_____1.	_____	_____	_____	_____
S2.	_____2.	_____	_____	_____	_____
S3.	_____3.	_____	_____	_____	_____
S4.	_____4.	_____	_____	_____	_____
S5.	_____5.	_____	_____	_____	_____
S6.	_____6.	_____	_____	_____	_____

Heart Disease History and Treatment

*I am interested in any physical limitations that you have as a result of heart problems. Please check (√) the **one** statement that most accurately describes the physical limitations that you currently have **from your heart disease:***

D1. _____ 1. I have **no limitations** of physical activity. Ordinary physical activity does not cause me to have undue fatigue, palpitation, shortness of breath, or chest (anginal) pain.

_____ 2. I have a **slight limitation** of physical activity. I am comfortable at rest, but *ordinary physical activity* results in fatigue, palpitation, shortness of breath, or chest (anginal) pain.

_____ 3. I have **marked limitation** of physical activity. I am comfortable at rest, but *less than ordinary physical activity* causes fatigue, palpitation, shortness of breath, or chest (anginal) pain.

_____ 4. I am **unable to carry on any physical activity** without symptoms. I have fatigue, palpitation, shortness of breath, or chest (anginal) pain *even at rest.* If any physical activity is undertaken, my discomfort is increased.

Having some information about your cardiac arrest history and treatment will help me interpret the study's results. Please fill in the blank or check (√) the appropriate responses.

D2. How many cardiac arrests have you had? _____

D3. How long has it been since your last cardiac arrest? *(Check the **one** best answer)*

_____ 1. Less than 3 months
_____ 2. Between 3 and 6 months
_____ 3. Between 6 months and 1 year
_____ 4. Between 1 and 2 years
_____ 5. Between 2 and 3 years
_____ 6. Between 3 and 4 years
_____ 7. Between 4 and 5 years
_____ 8. More than 5 years

D4. How is your physician treating the heart rhythm disturbances that caused your cardiac arrest? *(For this question, check **all** categories that apply):*

_____ 1. Medications *(**Please list medicines you take for your heart** _____________
____)*
_____ 2. Surgery (such as, bypass graft surgery or balloon dilatation)
_____ 3. Implantable cardioverter defibrillator

Questionnaire continues....

D5. Did you have any symptoms of coronary heart disease, angina (chest pain), heart attack, heart failure, and/or heart rhythm disturbances before your first cardiac arrest?

_____ 1. Yes
_____ 2. No

D6. Do you have any other major medical problems?

_____ 1. Yes (***Please list*** ____
____)
_____ 2. No

> *Your answers to the following personal questions also will help me in interpretation of results. Please fill in the blank or check (√) the appropriate responses.*

P1. What is your age? _____ years

P2. What is your sex?

_____ 1. Female
_____ 2. Male

P3. What is your marital status? *(Check only **one** category)*

_____ 1. Married or living with significant other
_____ 2. Separated or divorced
_____ 3. Single
_____ 4. Widowed

P4. What is your educational level? *(Check the **one** category that **best** describes you)*

_____ 1. Less than 12 years
_____ 2. 12 years (for example, high school graduate)
_____ 3. 13-14 years (for example, technical school or associate degree)
_____ 4. 15-16 years (for example, bachelors degree)
_____ 5. 17+ (for example, graduate degree)

P5. Which of the following best describes your racial or ethnic identification?

_____ 1. Black (Negro)
_____ 2. Chicano (Mexican-American)
_____ 3. Native American (American Indian)
_____ 4. White (Caucasian)
_____ 5. Oriental
_____ 6. Other (*Please specify* ________________)

*For this next question, please answer based on whether you consider yourself mainly as working or having worked a) outside the home, **or** b) as a homemaker. Check (√) the **one** category from the following nine responses that best describes your work status.*

P6. **If** your primary occupation has been **working outside the home**, are you now:

______ 1. working full-time
______ 2. working part-time
______ 3. retired because of heart disease
______ 4. retired because of other medical reasons
______ 5. retired because of other reasons

If your primary occupation has been as a **homemaker**, are you now:

______ 6. able to carry out homemaking activities
______ 7. unable to carry out homemaking activities because of heart disease
______ 8. unable to carry out homemaking activities because of other medical reasons
______ 9. unable to carry out homemaking activities because of other reasons

For these next two questions, please take a moment to reflect on your personal experience of having a cardiac arrest.

Q.17 Please describe how your life and your view of your life has changed as a result of your cardiac arrest:

____
____
____
____
____
____
____
____
____
____

Questionnaire continues.....

Health-Related Quality of Life

Q18. Do you have any memories of the cardiac arrest event?

_____1. No
_____2. Yes } ***Please describe any memories below:***
_____3. Uncertain }

____

____

____

____

____

____

____

And finally, I would like to ask you to consider continued participation in this research project.

Q19. *For some people, quality of life changes over time. For others, quality of life remains fairly constant. I am interested in whether the quality of life of persons who have had a cardiac arrest is stable or changes over time. Few other investigators have studied quality of life stability.* Would you be willing to complete a similar questionnaire for me in the next 6 months to 1 year?

_____1. Yes ***(Please supply your name and current mailing address on the next page):*** →

_____2. No, I prefer not to be contacted

Q20. *It is likely that the information you give in this questionnaire will be very helpful. However, the findings may require that I seek additional advice about quality of life after cardiac arrest.* Would you be willing for me to contact you at some future time to discuss your opinions about quality of life in persons surviving a cardiac arrest?

_____1. Yes ***(Please supply your telephone number, including the area code:***

_______________*)*

_____2. No, I prefer not to be contacted

- -

If you are willing to participate in a similar study in the next 6 months to 1 year, please write your name and address below. To maintain confidentiality, this page will be removed from the questionnaire by the investigator:

____

____

____

Thank you very much for completing this questionnaire! Please use the space below if there is any other information that you would like to tell me or you think I should know about the quality of your life since your cardiac arrest.

If you have misplaced the return envelope or have questions regarding this questionnaire, my address and telephone number follow. If you do not live in the Seattle area and you have questions, please do not hesitate to call me collect. *Again, your participation in this research study is greatly appreciated!*

Sandra L. Underhill, R.N., Ph.C.
11910 Lakeside Place, N.E.
Seattle, Washington 98125
206-363-4140

Appendix B

Evidence of Content Validity, Reliability, and Construct Validity of the Measures

Evidence of Content Validity, Reliability, and Construct Validity of the Measures

Measure	*Content Validity*	*Reliability*	*Construct Validity*
Modified Flanagan Quality of Life Scale (QOLS) (Andrews & Crandall, 1976; Flanagan, 1982; Burckhardt et al., 1989)	Flanagan QOLS was developed inductively from 3000 "normal" subjects (500 men and 500 women in each of 3 age groups: 30, 50, 70) providing 6500 critical incidents; 15 factors and 5 domains were evaluated by several independent judges (Flanagan, 1982). Qualitative analysis of a semi-structured interview about QOL of 120 persons with one of four chronic diseases (diabetes, ostomy secondary to colon cancer or colitis, osteoarthritis, rheumatoid arthritis) resulted in only one theme that did not fit the original 5 domains: independence (Burckhardt et al, 1989). Thus, the Modified Flanagan QOLS contains this additional domain.	**For the Flanagan QOLS**, using the 7-point Delighted-Terrible Scale (Andrews & Crandall, 1976): *Cronbach's alphas:* Average for all four chronic illness groups (diabetes, ostomy secondary to colon cancer or colitis, osteoarthritis, rheumatoid arthritis) ranged from .86 to .89 over three time periods (3 weeks apart) (Burckhardt et al., 1989). *Test-retest reliability:* .76 for the 6-week interval, and .78 and .84 for the two 3-week intervals; each of the four chronic illness groups studied would be unlikely to have a changed QOL over the 6-week testing period; the QOLS sensitivity to change has not been established (Burckhardt et al., 1989). Reliabilities for the **Modified Flanagan QOLS** had not been reported.	Burckhardt et al. (1989) used four other measures to assess construct validity of the **Flanagan QOLS**: The Life Satisfaction Index–Short Form (LSI–Z), the Duke-UNC Health Profile (DUHP), the Arthritis Impact Measurement Scales (AIMS), and the Ostomy Adjustment Scale (OAS). Three approaches to construct validation were taken (the hypotheses are in parens): (a) known groups (Because the ostomy group has a stable condition, they will have a significantly higher mean score on the QOLS across time than the diabetes group, who have an unstable condition); (b) convergent validity (Because the LSI–Z and the QOLS are conceptually close, they will be strongly positively correlated); and (c) discriminant validity (Because the DUHP, AIMS, and OAS all measure health status, a concept distinct from QOL, they will have low-to-moderate significant correlations with the QOLS). Each hypothesis was supported: (a) the mean QOLS scores for the ostomy group and the diabetes group were 82.3 and 74.1, respectively ($p < .05$); (b) the correlations between the QOLS and the LSI–Z at the 3 testing periods were .67, .75, and .72 (the highest of any of the scale correlations); and (c) correlations between the QOLS and the DUHP, the AIMS, and the OAS at the 3 testing periods were low-to-moderate (-.28 to .73, except for a -.05 with the OAS at time 2, which could not be explained due to coding error). Evidence of construct validity of the **Modified Flanagan QOLS** was not available.

Appendix continues

Evidence of Content Validity, Reliability, and Construct Validity of the Measures

Measure	*Content Validity*	*Reliability*	*Construct Validity*
Sense of Coherence Questionnaire (SOCQ) (Antonovsky, 1987)	Antonovsky (1987) interviewed persons known to have undergone severe trauma with inescapable severe life consequences but thought to be doing well. The sample consisted of 51 persons, ranging in age from 21 to 91, except for four teenagers. There were 30 men and 21 women. All interviews were conducted in Israel in the homes of the respondents. Except that all were Jewish, the sample was very heterogeneous on marital/family status and occupation. Interviews lasting from 1-to-3.5 hours, revolved around the question "Would you please tell me about your life?" The transcribed interviews were read by three colleagues, who independently classified each respondent as having a strong, moderate, or weak SOC. Moderate agreement about classification was obtained, supporting some degree of consensual validity. Then the interviews of the 16 persons who were classified as having a strong SOC were reviewed for commonalities. Using intuition, literature review, and the commonalities identified in the pilot study, facet design was used to generate 36 items. After testing the questionnaire "time and again" (p. 79), items were revised and/or dropped, resulting in the 29-item SOCQ. Content validity was assessed by a four-member panel consensus on appropriateness and categorization of each item.	As reported by Antonovsky (1987), internal consistency reliability was assessed in ten samples ranging in size from 33 to 338 (total N=1935); Cronbach's alphas ranged from .84 to .93. Sagy et al. (1990) reported a Cronbach's alpha of .88 in their study of 805 on-time Israeli retirees.	Evidence for construct validity has been demonstrated in four ways: (a) known groups, (b) convergent validity, (c) discriminant validity, and (d) hypotheses testing. *Known groups:* Considerable differences in mean SOCQ scores among samples that were expected to differ, for example Israeli officer trainees (n = 338, M = 160.4, SD = 16.7), an Israeli national sample (n = 297, M = 136.5, SD = 19.8), U.S. undergraduates (n = 308, M = 132.4, SD = 22.0), and Edmonton health workers (n = 108, M = 148.6, SD = 17.2). The Israeli officer trainees were an extremely select group, in superb health, and highly motivated to succeed in a very meaningful challenge situation, the national sample was a very heterogeneous group, the undergraduates were at a stage in their lives in which their outlook on life was just being crystallized, and the heath workers (primarily nurses) were middle class and engaged in respected and satisfying work. *Convergent validity:* (a) The correlation between the SOCQ and a 22-item questionnaire developed by Rumbaut (1983) from Antonovsky's *Health, Stress and Coping* (1979) (measuring the same construct, the SOC, by a different instrument), expected to be moderately-to-strongly positive, was .64 (Rumbaut, 1983, cited in Antonovsky, 1987) and .72 (Dana et al., 1985, cited in Antonovsky, 1987); (b) The correlation between the SOCQ and Rotter's Internal-External Locus of Control Scale (measuring the same

SOCQ continues

Evidence of Content Validity, Reliability, and Construct Validity of the Measures

Measure	Content Validity	Reliability	Construct Validity
SOCQ (Antonovsky, 1987) *Continued*			construct, control or manageability), expected to be moderately positive, was .425 (Rumbaut, 1983, cited in Antonovsky, 1987). *Discriminant validity:* The correlation between the SOCQ and anxiety (a different construct measured by a different instrument, the Sarason Test Anxiety Scale), expected to be zero to slightly negative, was -.21 (Rumbaut, 1983, cited in Antonovsky, 1987). *Hypothesis testing:* Sagy et al. (1990) proposed two hypotheses related to the SOC in their path study of 805 on-time Israeli retirees: (a) the SOC will be positively related to instrumental and social interaction activities and subjective health status, and (b) the SOC will be positively related to life satisfaction both directly and indirectly through its relationship to instrumental and social interaction activities and to subjective health status. Their data supported the 1st hypothesis and partially supported the 2nd: (a) relationships between the SOC and instrumental activities, social interaction activities, and subjective health status were .26, .22, and .35, respectively (p <.001); and (b) SOC was directly related to life satisfaction (r=.48, p<.001), and indirectly related through social interaction (r=.12, p <.001).

Appendix continues

Evidence of Content Validity, Reliability, and Construct Validity of the Measures

Measure	Content Validity	Reliability	Construct Validity
Perceived Social Support Score (Burckhardt, 1985)	Developed by Burckhardt (1985) based on a literature review and her clinical experience.	Omega estimate =.92 (Burckhardt, 1985).	In Burckhardt's (1985) path analysis of the impact of arthritis on QOL, perceived social support was hypothesized to have a direct effect on QOL. This hypothesis was supported by a path coefficient of .20 ($p<.05$).
Duke-UNC Health Profile (DUHP) (Parkerson et al., 1981)	The DUHP was developed as a measure to assess adult health status in the primary care setting. Goals for its development were that it should be: (a) based upon information reported by the patient; (b) capable of measuring broad dimensions of health; (c) independent of disease states; (d) applicable across all adult age groups; (e) brief and easy to comprehend; (f) suitable for self-administration; and (g) oriented toward health rather than disease. Based on the developers' professional expertise (internal medicine, family medicine, pediatrics, nursing, epidemiology, psychology, and biostatistics), four health dimensions were identified: symptom status, physical function, emotional function, and social function. From their literature review, it was determined that the last three dimensions contribute independent information to health assessment. Symptom status overlaps with these dimensions but was included because of its importance in primary care. The DUHP was developed by reviewing and adapting items from the following existing health status instruments: Sickness Impact *DUHP Continues*	Three approaches to reliability assessment were taken: (a) internal consistency reliability for unidimensional constructs, using item-remainder reliability and internal criterion analyses (to isolate items which neither measured what other items in the scale measured nor meaningfully discriminated between the two groups of persons who scored low or high on the scale), and Cronbach's alpha (for all remaining items); (b) Guttman scalogram coefficients of reproducibility (indicates the predictability of the respondent's scale score for the resulting response pattern) and scalability (indicates the extent to which the scale is unidimensional and cumulative); and (c) temporal stability (retest within 1-to-8 weeks of the initial visit). The study sample was composed of 395 primary care patients. To establish test-retest reliability, a sample of 55 patients was used who completed the DUHP on two visits, and had no current health problem or problems of unchanged health status from the initial to the return visit. *DUHP Continues*	The developers posit that their conceptualization of health is too complex a state to be considered as a single construct. Therefore, no overall scale was developed and their construct validation involved separate evaluations of the four dimensions. Initial evidence for construct validity was determined through hypothesis testing and by the multitrait-multimethod technique. Correlations between the mean DUHP scores and the demographic characteristics of the initial sample of 395 patients were as predicted by the developers. Evidence for *convergent validity* (same traits measured by different instruments) was demonstrated by correlations between the DUHP and the SIP, and between the DUHP and the Tennessee Self-Concept Questionnaire, which ranged from .34 (social function) to .45 (emotional-psychological symptoms), and .68 (family self-esteem) to .81 (personal self-esteem), respectively. *Discriminant validity* was demonstrated by lower correlations of the DUHP psychological-emotional symptoms with other DUHP components ($r=.10$, .20, .30, .32, and .34) than the correlation of the psychological-emotional symptoms measured *DUHP Continues*

Evidence of Content Validity, Reliability, and Construct Validity of the Measures

Measure	*Content Validity*	*Reliability*	*Construct Validity*
DUHP (Parkerson et al., 1981) *Continued*	Profile (SIP), McMaster Heath Index, Older Americans Resources and Services Program Multidimensional Functional Assessment Questionnaire, Tennessee Self-Concept Questionnaire, Zung Self-Rating Depression Scale, California Psychological Inventory, and Self Esteem Inventory. Initial adaptation of the 74 items was based on the clinical experience of the developers. Subsequent reliability testing and clinical evaluation resulted in the final 63-item version (Parkerson et al., 1981).	*Emotional function subscale:* Cronbach's alpha = .85, test-retest reliability =.72. *Physical function subscale:* for the ambulation items, Guttman scalogram reproducibility and scalability coefficients = .98 and .89, respectively; for all items, test-retest reliability =.82. *Symptom status subscale:* test-retest reliability =.68. overall, .68 for emotional symptoms. *Social function subscale:* Guttman scalogram reproducibility and scalability coefficients =.93 and .71, respectively; test-retest reliability =.52. The developers believe this low reliability may be due to the low number of items and the lack of variability for one of the 5 items, "care of self," among the 55 respondents (Parkerson et al., 1981).	by the DUHP and the Tennessee Self-Concept Questionnaire (r=.45) (Parkerson et al., 1981). The psychometric study of Burckhardt et al. (1989) also supports discriminant validity. Based on low-to-moderate correlations over three testings between the Flanagan QOLS and the DUHP emotional function subscale (.61, .61, and .73), the DUHP physical function subscale (.25, .36, and .48), the DUHP symptom status subscale (.46, .45, and .57), and the DUHP social function subscale (.39, .48, and .60), health status as operationalized by the DUHP appears to be related to but different from QOL.
Duke Health Profile (Parkerson et al., 1990)	The new 17-item Duke Health Profile (DUKE) was developed in response to the need for a health outcome measure that addressed basic health measurement issues and improved the potential for research, health promotion, and clinical applicability. The goal for development of the DUKE was to shorten the 63-item DUHP and formulate a revised set of measures to fit a somewhat different conceptualization. The three principal *DUKE continues*	Reliability was established by Cronbach's alpha for internal consistency (N = 683) and test-retest (1-8 weeks) for temporal stability (n = 55). *Physical health* (5 items): Cronbach's alpha = .67, test-retest reliability = .75. *Mental health* (5 items): Cronbach's alpha = .68, test-retest reliability = .70. *Social health* (5 items): Cronbach's alpha = .55, test-retest reliability = .57. *General health* (15 items): Cronbach's *DUKE continues*	Construct validity was determined by comparing observed versus expected correlations of DUKE scores with sociodemographic variables. Also, DUKE scores were correlated with those on similar constructs using the multitrait-multimethod approach (for convergent and divergent validity). The comparison instruments were the original 63-item DUHP, Sickness Impact Profile (SIP), a 136-item multidimensional measure of sickness-related dysfunction; the Tennessee Self-Concept *DUKE continues*

Evidence of Content Validity, Reliability, and Construct Validity of the Measures

Measure	*Content Validity*	*Reliability*	*Construct Validity*
Duke Health Profile (Parkerson et al., 1990) *Continued*	measures of the DUKE were based on three World Health Organization (WHO) dimensions: physical, mental, and social health. Items were selected from the DUHP to fit these constructs, and then re-arranged to form other measures. Item selection was based upon face validity in terms of the investigators' experience in research, health promotion, and patient care, and upon certain psychometric properties: (a) comparable item score variances; (b) strong correlations of item scores with the mean score of the other items in their respective dimension (item-convergent validity); and (c) the ability of these correlations to discriminate each item's dimension from other dimensions (discriminant validity). A general health measure was developed as the aggregate of the physical, mental, and social health measures. Additionally, a single item, perceived health, was included to evaluate respondent's perception of health. Items that were considered to be direct indicators of self-esteem were used to develop a separate measure of self esteem *even though they were included also in the three basic health measures.* Scales for anxiety, depression, pain, and disability also were developed.	alpha = .78, test-retest reliability = .78. *Perceived health* (1 item): test-retest reliability = .56. *Self esteem* (5 items): Cronbach's alpha = .64, test-retest reliability = .78. *Anxiety* (6 items): Cronbach's alpha = .60, test-retest reliability = .62. *Depression* (5 items): Cronbach's alpha = .65, test-retest reliability = .68. *Pain* (1 item): test-retest reliability = .41. *Disability* (1 item): test-retest reliability = .30.	Scale, a 100-item self esteem measure of which 82 items were used in this study (moral self items were not used); and the Zung Self-Rating Depression Scale, a 20-item measure of depression. As expected, correlations among the 3 DUKE scores were positive for physical, mental and social health (*r* = .28 to .42). Correlations between the DUKE and the DUHP physical, mental, and social health were .72, .70, and .61. Correlations between the DUHP symptom scale and the DUKE physical, mental, and social health were .74, .54, and .30. Correlations between the DUKE scores and sociodemographic variables was as expected: physical health scores were correlated higher with younger age (*r* =.20) and male gender (*r* =.12); social health was slightly better for the young (*r* =.08) and for blacks (*r* =.09). Correlations for all 3 health measures (physical, mental, social) were better for patients with higher socioeconomic status (*r* =.21, .19, and .11, respectively). Self esteem was slightly better for whites than blacks (*r* =.08) and for married persons than unmarried persons (*r* =.08), but was not different by age, gender, or socioeconomic status. Convergent validity was demonstrated by strong negative correlations of the DUKE physical, mental, and social *health* with the SIP physical, emotional, and social *dysfunction* (*r* = -.63, -.48, and -.41, respectively). Convergent validity also was demonstrated *DUKE continues*

Evidence of Content Validity, Reliability, and Construct Validity of the Measures

Measure	*Content Validity*	*Reliability*	*Construct Validity*
Duke Health Profile (Parkerson et al., 1990) *Continued*			between the DUKE self esteem scale and the Tennessee Self-Concept Scale total self esteem score (r=.80). Divergent validity was demonstrated by lower correlations between the DUKE physical, mental, and social health scales and the Tennessee Self-Concept Scale total self esteem score: .17, .60, and .63, respectively.

Appendix C

Letter Sent to Potential Study Participants

QUALITY OF LIFE FOLLOWING CARDIAC ARREST

Predoctoral Fellowship funded by the National Institutes of Health,
National Center for Nursing Research

(Date)

(Name)
(Street address)
(City, State Zipcode)

Dear (Name):

WHY YOU HAVE BEEN CONTACTED:
Improving quality of life is an important part of health care for persons with heart disease. Although a great deal is known about what causes heart disease and its complications, such as heart rhythm disturbances and cardiac arrest, not as much information is available about what specific aspects of life affect the life quality of persons after a cardiac arrest. Your physician at the Oregon Health Sciences University Hospital has suggested that you might be willing to participate in this study examining life factors that contribute to quality of life in persons who have had a cardiac arrest. The information from your completed questionnaire may assist hospital or clinic nurses caring for future patients by helping those patients to manage the effects that the cardiac arrest has had on their everyday lives. Better management of those daily problems resulting from the cardiac arrest may improve their quality of life.

IMPORTANCE OF YOUR PARTICIPATION:
As a registered nurse, during the past twenty years, I have been actively involved in caring for cardiac arrest survivors and in teaching cardiac arrest management to nurses, physicians, and other health care professionals. It is through my work with cardiac arrest survivors that I became interested in studying quality of life. It is my belief that you, as a person who has experienced a cardiac arrest, have many useful opinions about factors that contribute to life quality. Persons like yourself are the only people who really know how surviving a cardiac arrest has affected your life and made a difference in your life experience. Your advice is important because nurses and physicians simply do not have the view of what your life is like on a daily basis.

WHAT YOUR PARTICIPATION MEANS:
Your participation, which is entirely voluntary, involves completion of the enclosed study questionnaire, *"Quality of Life Following Cardiac Arrest."* Anticipated time for its completion is about 20 minutes. This study has the potential for contributing needed information about the things in life that

contribute to life quality in persons who have survived a cardiac arrest. Although, you will not receive any direct benefits from your participation, by serving as a subject in this study, you may contribute new information that will be of benefit to patients in the future.

NO COST TO YOU:
There is no cost to you for your participation. A self-addressed, stamped envelope is enclosed for your use in returning the completed questionnaire.

CONFIDENTIALITY:
Your confidentiality will be ensured by not having your name on the questionnaire. The questionnaire has an identification number for mailing purposes only. Using an identification number is so I may check your name off the mailing list when the questionnaire is returned. Lists of names and addresses will be kept separately from the questionnaires, and only your physician or I have access to the lists. Neither your name nor your identity will be used for publication or for publicity purposes.

NO MEDICAL RISKS:
No medical risks are expected in this study. Should any of the questions be uncomfortable or upsetting to you, you do not have to answer the question or you may call me for clarification. The return of your completed questionnaire will imply that you have read this letter and agree to participate in this study. However, you may refuse to participate or you may withdraw from this study at any time without affecting your relationship with or treatment at the Oregon Health Sciences University Hospital.

YOUR ADVICE IS IMPORTANT:
It is likely that responses to this questionnaire will generate new information about quality of life in persons who have sustained a cardiac arrest. *Your input is important*. Please take the time to complete the enclosed questionnaire. Should you have any questions, do not hesitate to call me collect at 206-363-4140.

Thank you very much. I look forward to receiving your completed questionnaire.

Very sincerely,

Sandra L. Underhill, R.N., Ph.C.
Doctoral Student, School of Nursing, Oregon Health Sciences University, Portland
Clinical Instructor, Department of Physiological Nursing,
University of Washington, Seattle

Enclosures

Appendix D

A Priori Power Analysis

Based on past research, it is hypothesized that explained variance using all variables except SOC (set A) is 40%. It seems that the addition of SOC (set B) to this model will explain an additional 10% of the variance in QOL. Thus, using all variables (set A,B), total explained variance in QOL is hypothesized to be 50%. Desirable power is .90 to .95.

According to Cohen (1988), the formula to calculate the λ value is: $\lambda = (f^2)$ (U + V + 1) (p. 410) and the formula to calculate the effect size (f^2) is $f^2 = (R^2_{Y\ A,B} - R^2_{Y \cdot A}) \div (1 - R^2_{Y \cdot A,B})$ (p. 414). W = number of variables in set A, U = number of variables in set B, N = overall sample size, and V = N - U - W - 1. In this study, W = 13, U = 1, *N* = 130, V = 115. The $f^2 = (.5 - 0.4) / .5 = .2$, or slightly greater than what Cohen considered to be a moderate effect size. Thus, $\lambda = (.2)(117) = 23.4$. Therefore, the power of the statistical test will be approximately .93 and .98 for the .01 and .05 significance levels, respectively.

Appendix E

Physician Cover Letter Sent to Potential Participants from Virginia Mason Medical Center

VIRGINIA MASON
Medical Center

August 15, 1991

Dear

This letter is to introduce a study of quality of life in persons who have had a cardiac arrest. The investigator, Sandra L. Underhill is a registered nurse studying for her doctoral degree. Sandy and I have participated together as faculty for American Heart Association classes on cardiac arrest management for health professionals. I am her study's sponsor here at the Virginia Mason Medical Center.

Please take a few moments to read her letter and to look at the questionnaire. Her letter explains the study's purposes, the importance of your participation, and issues related to confidentiality and risk. She estimates that the questionnaire could be completed in about 20 minutes. If you choose to participate in the study, mail your completed questionnaire directly to her in the enclosed stamped and addressed envelope. If you do not wish to participate, simply throw the questionnaire away. Either way, there will be no record of who does and does not participate.

If you have any questions about the sponsorship of this study, please contact me at 223-6661. Questions regarding the study itself should be directed to Sandy Underhill.

Sincerely,

Christopher L. Fellows, M.D.
Department of Cardiology
Virginia Mason Clinic
Seattle, Washington

1100 Ninth Avenue
P.O. Box 900
Seattle, WA 98111
Telephone (206) 223-6600

Appendix F

Post Card Thank You and Friendly Reminder Mailed 1 Week After Initial Questionnaire Mailing to Potential Participants from Oregon Health Sciences University

Last week a questionnaire seeking your opinion about **Quality of Life** was mailed to you. If you have already completed and returned it to me, please accept my sincere thanks. If not, please do so today. Because the questionnaire was sent to only a small number of persons, *it is extremely important that your responses be included in the study.*

If by some chance you did not receive the questionnaire, or if it was misplaced, please call me collect (206-363-4140) and I will get another one in the mail to you.

Sincerely,

♥ Sandra L. Underhill, R.N., Ph.C.

Appendix G

Zero-Order Correlation Matrix for Maximum-Model Regression Variables not having Dummy Coding

Zero-Order Correlation Matrix for Maximum-Model Regression Variables not having Dummy Coding

	QOL	SOC	PHYSICAL	EMOTIONAL	SOCIAL	SELF ESTEEM	SUPPORT	SX	AGE	GENDER	EDUC	NUMBER	TIME	NYHA	PROBLEMS
QOL	**1.00** *(n=149)*	**.73** *(p<.001)* *(n=147)*	**.40** *(p<.001)* *(n=149)*	**.50** *(p<.001)* *(n=146)*	**.40** *(p<.001)* *(n=149)*	**.50** *(p<.001)* *(n=149)*	**.25** *(p=.005)* *(n=128)*	**-.12** *(p=.141)* *(n=149)*	**-.01** *(p=.912)* *(n=148)*	**.09** *(p=.250)* *(n=149)*	**.13** *(p=.112)* *(n=149)*	**.09** *(p=.311)* *(n=142)*	**.01** *(p=.940)* *(n=149)*	**-.39** *(p<.001)* *(n=146)*	**-.11** *(p=.186)* *(n=145)*
SOC		**1.00** *(n=147)*	**.37** *(p<.001)* *(n=147)*	**.68** *(p<.001)* *(n=144)*	**.32** *(p<.001)* *(n=147)*	**.50** *(p<.001)* *(n=147)*	**.17** *(p=.051)* *(n=127)*	**.03** *(p=.684)* *(n=147)*	**.07** *(p=.419)* *(n=146)*	**.01** *(p=.888)* *(n=147)*	**.09** *(p=.300)* *(n=147)*	**.06** *(p=.509)* *(n=140)*	**-.02** *(p=.781)* *(n=147)*	**-.29** *(p<.001)* *(n=144)*	**-.04** *(p=.611)* *(n=143)*
PHYSICAL			**1.00** *(n=149)*	**.53** *(p<.001)* *(n=146)*	**.30** *(p<.001)* *(n=149)*	**.22** *(p=.008)* *(n=149)*	**.06** *(p=.513)* *(n=128)*	**-.15** *(p=.066)* *(n=149)*	**-.20** *(p=.015)* *(n=148)*	**-.16** *(p=.050)* *(n=149)*	**.29** *(p=.001)* *(n=149)*	**.11** *(p=.183)* *(n=142)*	**.21** *(p=.011)* *(n=149)*	**-.67** *(p<.001)* *(n=145)*	**-.35** *(p=.289)* *(n=149)*
EMOTIONAL				**1.00** *(n=146)*	**.26** *(p=.002)* *(n=146)*	**.39** *(p<.001)* *(n=146)*	**.08** *(p=.391)* *(n=125)*	**-.02** *(p=.766)* *(n=146)*	**.05** *(p=.580)* *(n=145)*	**-.09** *(p=.278)* *(n=146)*	**.09** *(p=.262)* *(n=146)*	**-.01** *(p=.903)* *(n=139)*	**.02** *(p=.797)* *(n=146)*	**-.33** *(p<.001)* *(n=143)*	**-.08** *(p=.350)* *(n=142)*
SOCIAL					**1.00** *(n=149)*	**.27** *(p=.001)* *(n=149)*	**.21** *(p=.017)* *(n=128)*	**.03** *(p=.743)* *(n=149)*	**-.04** *(p=.663)* *(n=148)*	**.15** *(p=.073)* *(n=149)*	**.17** *(p=.037)* *(n=149)*	**.11** *(p=.202)* *(n=142)*	**.17** *(p=.042)* *(n=149)*	**-.27** *(p<.001)* *(n=146)*	**-.11** *(p=.169)* *(n=145)*
SELF ESTEEM						**1.00** *(n=149)*	**.13** *(p=.154)* *(n=128)*	**.07** *(p=.395)* *(n=149)*	**.08** *(p=.341)* *(n=148)*	**.01** *(p=.895)* *(n=149)*	**-.11** *(p=.183)* *(n=149)*	**.11** *(p=.202)* *(n=142)*	**-.05** *(p=.550)* *(n=149)*	**-.17** *(p=.042)* *(n=146)*	**-.01** *(p=.867)* *(n=145)*
SUPPORT							**1.00** *(n=128)*	**.02** *(p=.837)* *(n=127)*	**-.03** *(p=.744)* *(n=127)*	**.02** *(p.819)* *(n=128)*	**-.07** *(p=.452)* *(n=128)*	**.15** *(p=.102)* *(n=123)*	**-.03** *(p=.763)* *(n=128)*	**-.11** *(p=.222)* *(n=127)*	**-.06** *(p=.531)* *(n=125)*
SX								**1.00** *(n=149(*	**.00** *(p=.991)* *(n=148)*	**-.04** *(p=.663)* *(n=149)*	**-.14** *(p=.082)* *(n=149)*	**-.11** *(p=.198)* *(n=142)*	**.01** *(p=.943)* *(n=149)*	**.15** *(p=.074)* *(n=146)*	**.06** *(p=.458)* *(n=145)*
AGE									**1.00** *(n=148)*	**-.03** *(p=.678)* *(n=148)*	**-.13** *(p=.125)* *(n=148)*	**.07** *(p=.397)* *(n=142)*	**-.09** *(p=.295)* *(n=148)*	**.10** *(p=.226)* *(n=145)*	**.17** *(p=.045)* *(n=144)*
GENDER										**1.00** *(n=149)*	**-.01** *(p=.877)* *(n=149)*	**.12** *(p=.162)* *(n=142*	**.04** *(p=.614)* *(n=149)*	**-.03** *(p=.707)* *(n=146)*	**.10** *(p=.232)* *(n=145)*
EDUC											**1.00** *(n=149)*	**-.06** *(p=.477)* *(n=142)*	**.18** *(p=.027)* *(n=149)*	**-.31** *(p<.001)* *(n=146)*	**-.15** *(p=.065)* *(n=145)*
NUMBER												**1.00** *(n=142)*	**.11** *(p=.212)* *(n=142)*	**-.07** *(p=.414)* *(n=139)*	**.10** *(p=.267)* *(n=138)*
TIME													**1.00** *(n=149)*	**-.30** *(p<.001)* *(n=146)*	**-.03** *(p=.679)* *(n=145)*
NYHA														**1.00** *(n=146)*	**.30** *(p<.001)* *(n=142)*
PROBLEMS															**1.00** *(n=145)*

QOL = Modified Flanagan Quality of Life Scale; SOC = Sense of Coherence Questionnaire, Short Form; PHYSICAL = Modified Duke Physical Scale, EMOTIONAL = Modified Duke Mental Scale; SOCIAL = Modified Duke Social Scale; SELF ESTEEM = Duke Self Esteem Scale; SUPPORT = Modified Burckhardt Perceived Support Score; SX = coronary heart disease symptoms prior to first cardiac arrest (1 = yes, 0 = no); AGE (Years); GENDER (1 = female, 0 = male); EDUC = Education (Years); NUMBER = Number of cardiac arrests; TIME = Time since last cardiac arrest; NYHA = NYHA Functional Class; PROBLEMS = Other medical problems (1 = yes, 0 = no).

Appendix H

Zero-Order Correlation Coefficients for Marital Status and Treatment Type with Maximum-Model Regression Variables

Zero-Order Correlation Coefficients (p Values) for Marital Status and Treatment Type with Maximum-Model Regression Variables

	Marital Status				Treatment Type							
	Married/ Significant Other	Separated/ Divorced	Single	Widowed	Medications	Surgery: Bypass Graft or Angioplasty	Implantable Cardioverter-Defibrillator (ICD)	Medications & Surgery	Medications & ICD	Surgery & ICD	Medications, Surgery & ICD	No Reported Treatment
QOL	-.04 (.66)	-.01 (.92)	-.06 (.50)	.10 (.25)	-.02 (.85)	-.04 (.61)	-.01 (.95)	-.01 (.90)	-.06 (.46)	.14 (.07)	.00 (.97)	.07 (.40)
SOC	-.10 (.99)	.00 (.97)	.00 (.23)	.14 (.10)	-.02 (.84)	.07 (.41)	-.14 (.09)	-.01 .86	-.03 (.68)	.12 (.14)	.06 (.48)	.02 (.81)
NYHA	.05 (.55)	-.14 (.08)	.03 (.74)	.04 (.60)	-.06 (.46)	-.10 (.22)	.08 (.35)	.14 (.11)	.04 (.67)	-.09 (.30)	.02 (.82)	-.07 (.43)
PHYSICAL	.02 (.78)	.01 (.95)	.07 (.38)	-.09 (.30)	.01 (.92)	.12 (.16)	-.05 (.52)	-.17 (.04)	.02 (.78)	.16 (.06)	.02 (.80)	-.01 (.91)
EMOTIONAL	-.08 (.35)	-.05 (.55)	.11 (.19)	.09 (.30)	-.04 (.64)	.12 (.14)	-.14 (.09)	.02 (.77)	-.03 (.72)	.04 (.61)	.11 (.17)	-.08 (.33)
SOCIAL	-.11 (.18)	-.05 (.53)	-.00 (.99)	.21 (.01)	.16 (.05)	-.13 (.11)	-.10 (.22)	-.02 (.77)	.01 (.90)	.08 (.34)	-.07 (.42)	.02 (.82)
SELF ESTEEM	.10 (.23)	-.10 (.23)	-.13 (.10)	.04 (.63)	-.06 (.47)	.05 (.58)	-.05 (.59)	.06 (.49)	.04 (.60)	.03 (.71)	.00 (.98)	-.07 (.37)
SUPPORT	-.02 (.86)	.03 (.70)	-.09 (.33)	.05 (.56)	.06 (.53)	-.17 (.06)	.06 (.52)	.19 (.04)	-.11 (.22)	-.09 (.31)	-.07 (.45)	.04 (.62)
AGE	.00 (1.00)	-.02 (.80)	-.35 (.00)	.25 (.00)	.14 (.10)	-.13 (.13)	-.17 (.04)	.06 (.48)	-.01 (.95)	-.11 (.20)	.15 (.08)	-.05 (.54)
GENDER	-.27 (.00)	.02 (.82)	-.03 (.73)	.38 (.00)	.28 (.00)	-.11 (.17)	.12 (.16)	-.18 (.03)	-.04 (.63)	-.13 (.13)	-.13 (.13)	.06 (.50)
EDUC	-.11 (.18)	.13 (.11)	.01 (.89)	.03 (.74)	-.14 (.09)	.06 (.44)	-.04 (.62)	-.11 (.20)	-.04 (.67)	.25 (.00)	.13 (.11)	.11 (.20)

Appendix continues

Zero-Order Correlation Coefficients (p Values) for Marital Status and Treatment Type with Maximum-Model Regression Variables

	Marital Status				Treatment Type							
	Married/ Significant Other	Separated/ Divorced	Single	Widowed	Medications	Surgery: Bypass Graft or Angioplasty	Implantable Cardioverter-Defibrillator (ICD)	Medications & Surgery	Medications & ICD	Surgery & ICD	Medications, Surgery & ICD	No Reported Treatment
SYMPTOMS	.01 (.89)	-.00 (.98)	-.00 (.99)	-.01 (.88)	-.08 (.34)	.02 (.84)	.12 (.14)	.11 (.18)	.01 (.93)	-.18 (.03)	.04 (.63)	-.11 (.18)
NUMBER	-.17 (.04)	-.02 (.77)	-.01 (.88)	.27 (.00)	.11 (.20)	-.03 (.72)	-.03 (.76)	-.03 (.69)	-.01 (.94)	-.03 (.76)	-.02 (.78)	-.03 (.75)
TIME	.03 (.70)	.07 (.43)	-.14 (.09)	-.01 (.89)	.19 (.02)	.17 (.04)	-.22 (.01)	.06 (.50)	-.21 (.01)	-.08 (.36)	-.16 (.05)	.13 (.12)
PROBLEMS	-.01 (.89)	-.04 (.65)	-.03 (.76)	.07 (.41)	-.05 (.52)	.09 (.30)	-.06 (.51)	-.08 (.35)	-.02 (.80)	-.06 (.49)	.17 (.04)	.07 (.38)
Medications	-.07 (.37)	.05 (.53)	-.02 (.79)	.08 (.41)	1.00	-.23 (.00)	-.22 (.01)	-.32 (.00)	-.25 (.00)	-.14 (.09)	-.20 (.02)	-.16 (.05)
Surgery [a]	.05 (.58)	-.01 (.93)	-.06 (.48)	-.02 (.78)		1.00	-.11 (.17)	-.17 (.04)	-.13 (.12)	-.07 (.39)	-.10 (.21)	-.08 (.32)
ICD	.03 (.74)	.01 (.95)	-.05 (.52)	-.01 (.89)			1.00	-.16 (.06)	-.12 (.15)	-.07 (.42)	-.10 (.25)	-.08 (.35)
Medications & Surgery [a]	-.05 (.55)	.01 (.93)	.03 (.76)	.05 (.58)				1.00	-.18 (.03)	-.10 (.23	-.14 (.08)	-.12 (.16)
Medications & ICD	.06 (.45)	-.10 (.23)	.19 (.02)	-.11 (.18)					1.00	-.08 (.36)	-.11 (.18)	-.09 (.28)
Surgery [a] & ICD	.09 (.25)	-.06 (.50)	-.03 (.68)	-.06 (.46)						1.00	-.06 (.46)	-.05 (.55)

Appendix continues

Zero-Order Correlation Coefficients (p Values) for Marital Status and Treatment Type with Maximum-Model Regression Variables

	Marital Status				Treatment Type							
	Married/ Significant Other	Separated/ Divorced	Single	Widowed	Medications	Surgery: Bypass Graft or Angioplasty	Implantable Cardioverter-Defibrillator (ICD)	Medications & Surgery	Medications & ICD	Surgery & ICD	Medications, Surgery & ICD	No Reported Treatment
Medications, Surgery,[a] &ICD	-.06 (.48)	.02 (.82)	-.05 (.55)	-.09 (.26)							1.00	-.07 (.39)
No reported Treatment	.03 (.70)	.05 (.51)	-.04 (.63)	-.07 (.39)								1.00
Married/ Significant Other	1.00	-.57 (.00)	-.40 (.00)	-.63 (.00)				*Correlations not repeated*				
Separated/ Divorced		1.00	-.05 (.55)	-.08 (.34)								
Single			1.00	-.06 (.50)								
Widowed				1.00								

Note: [a] Surgery includes bypass graft surgery and/or angioplasty.
KEY: QOL = Modified Flanagan Quality of Life Scale; SOC = Sense of Coherence Questionnaire, Short Form; NYHA = NYHA Functional Class; PHYSICAL = Modified Duke Physical Scale; EMOTIONAL = Modified Duke Mental Scale; SOCIAL = Modified Duke Social Scale; SELF ESTEEM = Duke Self Esteem Scale; SUPPORT = Modified Burckhardt Perceived Support Score; AGE (Years); GENDER (1 = female, 0 = male); EDUC = Education (Years); SYMPTOMS = coronary heart disease symptoms prior to first cardiac arrest (1 = yes, 0 = no); NUMBER = Number of cardiac arrests; TIME = Time since last cardiac arrest; PROBLEMS = Other medical problems (1 = yes, 0 = no); ICD = Implantable Cardioverter-Defibrillator.