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PREDICTORS OF CAPACITY TO DIRECT ATTENTION IN CARDIAC SURGERY PATIENTS

A Dissertation Presented

by

MARILYN S. STAPLETON

Submitted to the Graduate School of the
University of Massachusetts Amherst in partial fulfillment
of the requirements for the degree of

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School of Nursing

INFORMATION TO USERS

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James Fain, Chair

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DEDICATION

to

Dr. Dennis Ross

A nurse who served as an inspiration, role model
and a constant companion in spirit.

He is missed.

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ABSTRACT

PREDICTORS OF CAPACITY TO DIRECT ATTENTION

IN CARDIAC SURGERY PATIENTS

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The purpose of this descriptive correlational study was to examine the relationship between psychologic, physiologic and situational factors and the extent to which these impact a cardiac surgery patient's capacity to direct attention. The theory of unpleasant symptoms (Lenz, Pugh, Milligan, Gift and Suppe, 1997) was used to explore the influence of psychologic, physiologic, and situational factors on the CABG surgery patient's symptoms of pain and fatigue and consequently the impact of these symptoms on capacity to direct attention (CDA).

Data was collected from 41 participants at two points in time, (1) from the subject during Preadmission Testing, and (2) while recovering on the cardiac step down unit. Self report scales (Chalder Fatigue Scale, Self - Efficacy Expectation Scale, MOS Social Support Scale, Hospital Anxiety, Depression Scale – D, Lewis Anxiety Scale, pain visual analog scale), interviews, medical record review and the cognitive measures of DSF, DSB, SDMT, Trail Making Test, Part A and subsets of the Folstein Mini-Mental State questionnaire were used to obtain data.

There was a significant difference in the capacity to direct attention before and after surgery ($p < .001$). The SDMT and Trail Making Test, Part A were the most sensitive measures of attentional decline. There was no statistical difference in attention between the group on the bypass pump versus off the bypass pump ($p < .639$). Of the physiological, psychological and situational factors, length of anesthesia and years of formal education were significantly correlated with attention. The regression of preoperative Total Attention Score (TAS) on social support and years of formal education, accounted for 21% of the variance. Years of formal education contributed most significantly at the .01 level of significance. The regression of postoperative TAS on seven predictor variables (TAS preoperative z score, anxiety, hours since analgesia, pain, self-efficacy, hours on anesthesia and total fatigue) accounted for 60% of the variance and was significant at the .000 level; preoperative attention and length of anesthesia contributed most significantly ($p < .01$) to explaining the variance in postoperative attention.

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CHAPTER 1

THE PROBLEM

Introduction

In 2000 approximately 519,000 coronary artery bypass graft (CABG) surgery procedures were performed on 314,000 patients (American Heart Association, 2003). Ten-year trends in the cardiac surgery population show this population is older and sicker with more extensive coronary stenosis and more frequent comorbid conditions (Foster, Alexander, & O'Rourke, 2001). Patient education is an essential intervention used by nurses in managing the postoperative recovery of clients in acute and ambulatory care settings to achieve optimal self-care. Hospital protocols dictate that patients recovering from CABG surgery are expected to engage in learning activities as early as 24 – 48 hours after surgery. These patients are prepared for home self-care and subsequently discharged, usually the 4th or 5th day after surgery. Assessment of barriers to learning and ability to attend to the learning is necessary in order to benefit from patient teaching.

During the postoperative phase, CABG patients experience the effects of anesthesia and symptoms such as pain, nausea, fatigue, stress, poor appetite, and temperature elevation. Studies (Carr & Powers, 1986; DiMattio & Tulman, 2003; Gregersen, 1988; Gortner, Rankin, & Wolfe, 1988; Kupperburg & Grubbs, 1997; Lenz & Perkins, 2000; Moore, 1994; Moore, 1995; Watt-Watson & Stevens, 1998; Watt-Watson, Stevens, Costello, Katz, & Reid, 2000) have suggested that CABG surgery patients experience symptoms that impact on recovery and functioning during and after hospitalization. Identified factors such as physiological abnormalities, intense emotions,

unmet needs, and sensory overload or underload are experienced by postoperative patients, and these impact on a patient's ability to learn and the effectiveness of patient education (Holms & Lenz, 1997; Rakel & Bulechek, 1990). Effective learning is dependent on complex neurocognitive processes. Cimprich (1992) identifies the importance of the attentional mechanisms of focus and concentration to learning. There is evidence that links the impact of illness and treatment to the capacity to focus and concentrate. Although the patient education literature suggests an appropriate attention span is necessary for learning, there is little evidence specifying the impact of alterations in attention on learning in illness states during hospitalization (Brown, 1995).

Despite current knowledge about factors impacting on postoperative recovery of CABG patients, factors that affect a patient's ability to learn require further research. Within a clinical climate of rapid recovery programs in cardiac surgery services (Barnason & Rasmussen, 2000), a greater understanding of the variables that impact a postoperative patient's cognitive performance would provide insight into what constitutes the optimal "teachable moment" for this group.

Theoretical rationale

The framework for this study is based on the concepts of capacity to direct attention (CDA), learning outcomes for the CABG surgery population, and the impact of unpleasant symptoms on function. Linkages between unpleasant symptoms, physiological, psychological, and situational variables, and the capacity to direct attention are supported using the theory of unpleasant symptoms (Lenz, Pugh, Milligan, Gift, & Suppe, 1997).

Lenz, et al. (1997) theorize that physiological, psychological, and situational factors influence symptoms that consequently impact patient performance. It is proposed that the psychological and cognitive factors of anxiety, self-efficacy, depression, recognition and recall (subsets of the Folstein Mini-Mental State [MMS]questionnaire), the physiological factors of oxygenation status, length of anesthesia, whether the procedure was done on or off the bypass pump, length of time on the bypass pump, body temperature, serum potassium, calcium, sodium, albumin, hemoglobin and hematocrit, platelet count, hydration and nutrition status, length of time since analgesia administration and the presence of sustained dysrhythmias; and the situational factors of social support, discharge plans, and perception of physical environment influence patient performance. The theory of unpleasant symptoms was used to explore the impact of the unpleasant symptoms of pain and fatigue, and the impact of the above factors on specific cognitive performance, which in this study is the capacity to direct attention.

Postoperative protocols for the CABG surgery patients involve the delivery of patient education to patients in an environment in which the length of stay is ever decreasing (Penque, Peterson, Ratner, & Halm, 1999; Society of Thoracic Surgeons, 2000). Benchmarks for learning outcomes are established and accomplished within an average length of stay of 7 days and in many cases less (Beggs, Willis, Maislen, Stokes, White, Sanford, Becker, Barber, Pawlow, & Downs, 1998). In this study of 300 CABG surgery patients, the patients rated themselves as "prepared" to "very prepared" in 10 patient education categories (e.g., possible complications, incision care, diet).

The impact of a person's illness and treatment can influence a person's ability to learn. Disruptions to perception from a variety of sources during the illness experience

impact the ability to learn (Rakel & Bulechek, 1990). Cimprich (1992) implicates both the internal and the external patient environments in the overall ability of a person to attend to learning activities. Brown (1995) suggests if patients are too ill to learn, they may not recall instructions given during hospitalization. In a study by Arenth and Mamon (1985), 33% – 53% of subjects who received instruction did not recall receiving the instruction after discharge. Studies have demonstrated that cognitive dysfunction is a sequela in a significant proportion of the cardiac surgery population.

Lenz et al. (1997) have proposed that unpleasant symptoms impact on performance outcomes. These performance outcomes can be functional or cognitive activities (Lenz et al., 1997). Theoretically, the unpleasant symptoms of pain and fatigue may impact on the cognitive performance outcomes of the recovering CABG surgery patient.

Definition of Terms of the Question

Postoperative cardiac surgery patient is any patient who has undergone coronary artery bypass surgery involving any or all of the coronary arteries.

Attention is defined as the cognitive ability to concentrate and focus in a deliberate way. It includes the ability to focus on information while eliminating other information or stimuli, the ability to hold this focus, as well as the capacity of information a person can attend to at one time (Cimprich, 1992 &1998).

Physiological variables include hemoglobin and hematocrit levels, length of time of anesthesia, whether the procedure was done on or off the bypass pump, length of time on the bypass pump, oxygenation saturation, body temperature, serum potassium, serum albumin, potassium, calcium, sodium, platelet count, hydration and nutrition status,

length of time since analgesia administration, and the presence of sustained dysrhythmias.

Psychological variables included in this study are anxiety, self-efficacy, and depression. **Anxiety** is defined as the subjective feeling of uneasiness. **Self-efficacy** is defined as the level of confidence a patient has in his or her ability to perform activities successfully. **Depression** is differentiated from the normal lows of life.

Cognitive variables include registration and recall. These variables were measured by the respective memory subsets of the Folstein Mini – Mental State questionnaire.

Situational variables include social support, discharge plans, the perception of physical environment, and years of formal education. **Social support** is defined as the patient's perception of types of social support such as emotional - informational, affectionate, tangible, and positive social interaction.

Fatigue is defined as a multidimensional symptom. The severity of fatigue was measured through the constructs of mental and physical fatigue using the Chalder Fatigue Scale.

Pain is defined as a personal, subjective experience that varies in intensity over time. The intensity of pain was measured using a visual analog scale.

Statement of Significance

In light of the decreasing length of stay for CABG surgery patients (Beggs et al., 1998; Frantz & Walters, 2001) and the paucity of research linking the impact of physiological, psychological, and situational factors on cognitive function (Diehl, 1989; Moss, 1994; Rakel & Bulechek, 1990; Vance, 1992), there is opportunity to further

factors impacting on postoperative recovery of CABG surgery patients, the issue of examining factors that affect a patient's ability to learn requires further research. Middle - range theories, because of their limited scope, have been useful in framing nursing research and thus in testing linkages among concepts. The emerging nursing middle - range theory of unpleasant symptoms (Lenz et al., 1997) provides a framework to uncover these relationships as well as to further test this theoretical model. Few empirical studies examining the utility of the theory of unpleasant symptoms as a theoretical framework were found in the literature.

The purpose of this study was to compare capacity to direct attention in the coronary artery bypass surgery population before and after surgery and examine its relationship to physiological, psychological, and situational factors in the postoperative period.

Research Questions

1. Is there a significant difference between pre- and postoperative ability to direct attention?
2. What is the relationship between physiological factors (i.e., fatigue, pain, oxygenation status, length of anesthesia, whether the procedure was done on or off the bypass pump, length of time on the bypass pump, body temperature, serum potassium, calcium, sodium, albumin, hemoglobin and hematocrit, platelet count, hydration and nutrition status, ambulatory status, length of time since analgesia administration, and the presence of sustained dysrhythmias) and the capacity to direct attention following the CABG procedure?

3. What is the relationship between psychological factors (i.e., anxiety, self-efficacy, depression, and the registration and recall subsets of the Folstein Mini-Mental State questionnaire) and the capacity to direct attention following the CABG procedure?
4. What is the relationship between situational factors (i.e., social support, discharge plans, and perception of the physical environment) and the capacity to direct attention following the CABG procedure?
5. To what extent do physiological, psychological, and situational factors predict the capacity to direct attention?

CHAPTER 2

THE REVIEW OF THE LITERATURE

This review examines the literature pertaining to cognitive function in the coronary artery bypass graft (CABG) surgery population. The theoretical model, which was used to link the variables under study, will consequently be explored. The findings from the emerging literature on the capacity to direct attention (CDA) will be reviewed. Studies examining the symptoms of pain and fatigue experienced after CABG will be presented with results from studies exploring the variables of anxiety, depression, self-efficacy, and social support.

Cognitive function

Boss (1993) states that learning is dependent on a variety of cognitive systems working together such as the attention, memory, concept formation/abstraction, and reasoning systems. A recommendation is made to nurses who work with spinal cord injury patients to assess both the type of learning and the cognitive systems prior to initiating patient teaching. Cimprich (1992) identifies two components of mental activity: involuntary and voluntary (directed) attention. She cautions that in health environments, patients may experience an increase in the mental effort required to direct attention in order to maintain effective mental functioning and to learn. Rakel and Bulechek (1990) relate the ability to learn to the capacity to perceive stimuli and process information presented, as well as any deficits in attention. Learning ability has also been linked to cognitive style, intelligence, and memory (Gessner, 1989). Inadequate circulation, respiratory insufficiency, fluid and electrolyte imbalance, and pain demonstrated an

impact on levels of perception in myocardial infarction patients (Haferkorn, 1971). Fluctuating glucose levels were related to altered perception by Resler (1983). Studies have shown disruptions in circadian periodicities following surgery (Farr, Campbell-Grossman, & Mack, 1988). Sleep pattern disturbance has been documented (Simpson, Lee, & Cameron, 1996) and implicated in relation to cognitive disturbance in the hospitalized cardiac surgery population (Redeker & Hedges, 2002).

Cognitive function and ability to learn are linked to patient symptom experience. The following symptoms are believed to influence ability to learn: pain, fatigue, auditory or visual impairment, anxiety, fear, anger, worry, grief, depression, sensory overload/underload, inadequate circulation, respiratory insufficiency, fluid and electrolyte imbalance, metabolic changes, fluctuations in glucose, fever, and anemia (Moss, 1994; Rakel & Bulechek, 1990). Barriers to learning have been identified as: pain, level of comfort, level of energy, environmental conditions (noise, room temperature, lighting), anxiety, fatigue, fear, anger, denial, and lack of support (Diehl, 1989; Moss, 1994; Vance, 1992).

Theoretical Framework

The theory of unpleasant symptoms (Lenz, Pugh, Milligan, Gift, & Suppe, 1997) provides the conceptual framework to explore the relationship between the variables of pain, fatigue, depression, self-efficacy, anxiety, and the capacity to direct attention. Unpleasant symptoms are the focus of a nursing middle - range theory, the theory of unpleasant symptoms, developed by Lenz et al. (1997). The three components that comprise this theory include "the symptoms that the individual is experiencing, the influencing factors that give rise to, or affect the nature of, the symptom experience, and

the consequence of the symptom experience". Symptoms have dimensions of distress, time, intensity, and quality. The theory of unpleasant symptoms can be used to explore the influence of psychological, physiological, and situational factors on the CABG surgery patient's symptoms of pain and fatigue and consequently the impact of these symptoms on an aspect of cognitive performance, capacity to direct attention. In this model, (see Figure 1) physiological factors (i.e., oxygenation status, length of anesthesia, length of time on the bypass pump, body temperature, hydration and nutrition status, sodium, potassium, calcium, albumin, hemoglobin, hematocrit, platelet count, ambulatory status), psychological factors (i.e., anxiety, self-efficacy, depression), and situational factors (i.e., social support, discharge plans, the perception of physical environment) impact the nature of symptom experience. This model posits that a reciprocal relationship exists between symptom experience and performance.

Patients who undergo thoracic surgery can experience numerous symptoms that include pain, fatigue, stress, nausea, poor appetite, and temperature elevation. Symptoms can impact performance in areas such as mobility, deep breathing and coughing exercises, activities of daily living, and interpersonal interaction. According to the theory of unpleasant symptoms, unpleasant postoperative symptoms can also affect clients' cognitive function. It would be expected that as pain and fatigue levels increase, patients would experience a decrease in CDA (Hammeke & Hastings, 1988).

The theory of unpleasant symptoms (Lenz et al., 1997) was developed as a vehicle to link information about an array of symptoms. The authors report that the findings of several studies, although not directly testing the theory, have lent support to the model (Lenz et al., 1997). In a secondary analysis of longitudinal data, Parks, Lenz,

Milligan, and Han (1999) examined fatigue and maternal and infant health. Persistent fatigue was associated with declining maternal health and delayed infant development but not infant health. Using the technique of emergent fit, Hutchinson and Wilson (1998) evaluated a set of qualitative data in a study examining the planning of nursing interventions for clients with Alzheimer's disease. Findings demonstrated the blurring of the components of the theory when applied to Alzheimer's disease client behaviors. For example, the differentiation between a symptom (tension, guilt, anger) and a psychological factor (the mental state of agitation) was not clear. Nonetheless, the usefulness of the theory as an organizing framework was cited as a positive consequence of the application of the theory to this population.

More recently, the theory of unpleasant symptoms has been used to frame studies directly exploring the relationships between symptoms and physiological, psychological, and situational factors. Through a study in the end-stage renal failure population ($n = 39$) using descriptive correlational study design, McCann and Boore (2000) found that the physiological and psychological factors influence and are influenced by fatigue. However, situational factors were found to have no effect on fatigue. Therefore, the authors made the recommendation that the theory be revised for the population under study.

A secondary analysis of a data set ($n = 263$) related to cancer patients who were undergoing chemotherapy treatment in outpatient settings was analyzed using a descriptive correlational study design (Redeker, Lev, & Ruggiero, 2000). Fatigue, insomnia, anxiety and depression were positively correlated with one another, $r = .26$ to $r = .69$ ($p < .001$) and negatively correlated with perceived quality of life ($p < .001$).

Multiple regression analysis showed that symptoms and psychological variables predicted perceived quality of life ($R^2 = 0.47$) with depression accounting for the largest proportion of the variance. Depression was closely related to insomnia and fatigue; however, depression was more closely related to quality of life than either insomnia or fatigue. Findings, in relation to the theoretical framework, show there is no support for the notion that psychological factors enhance the influence of symptoms on performance outcomes. The authors suggest further research is needed to clarify the nature of "influencing" psychological factors. Since the psychological factors of anxiety and depression were not studied for stability, it is uncertain if these factors were change over time. If these psychological factors were stable then they could potentially be predictors of symptom experience across the illness trajectory.

The experience of dyspnea (the subjective report of breathlessness as described by the patient) and the influence of its duration in the heart failure population were explored using the theory of unpleasant symptoms in a study by Parshall, Welsh, Brockopp, Heiser, Schooler, & Cassidy (2001). This study of 57 heart failure patients confirmed the importance, measurability, and interconnectedness of three of the dimensions of dyspnea (duration, intensity, and quality). In 23% of the patients, dyspnea interfered with ability to walk and perform daily activities, and this interference influenced the decision to seek care. The study validated symptom experience impacted the outcomes (e.g., functional status).

The theory of unpleasant symptoms was used to identify a constellation of factors thought to contribute to fatigue in a well population. In a study of 40 healthy young adults, Corwin, Klein and Rickelman, (2002) found that subjects who were moderate to

heavy smokers were significantly more fatigued than were nonsmokers ($p < .01$). Self-report of fatigue did not correlate with body mass index, baseline inflammatory or immune status, or blood pressure. Within the psychological and situational factors, depression, state anxiety, sleep quality, and sleep quantity were significant predictors of fatigue.

Gift, Stommel, Jablonski, and Given (2003) using the theory of unpleasant symptoms as a framework conducted a secondary analysis of a data set to study symptom cluster in patients with lung cancer. Attempting to determine predictors of outcome in their study (death or survival 19 months after diagnosis), Gift et al. identified situational factors of gender and age, physiological antecedents of stage of cancer at diagnosis, type of therapy and the number of comorbid conditions. Psychological factors were not included. A cluster of symptoms (fatigue, weakness, loss of appetite, weight loss, and altered taste) were in place 3 and 6 months after diagnosis. Death 6 –19 months after diagnosis was predicted by age, stage of cancer, and symptom severity at 6 months. One dimension explored in this study was symptom severity over time. In this study, the mean symptom severity decreased 3 and 6 months after diagnosis, with each of the symptoms decreasing in severity. This was a surprising finding in that the cluster of symptoms at diagnosis was predictive of future symptoms and death.

The following model, based on the Lenz et al. (1997) middle-range theory of unpleasant symptoms, depicts the relationship of the variables:

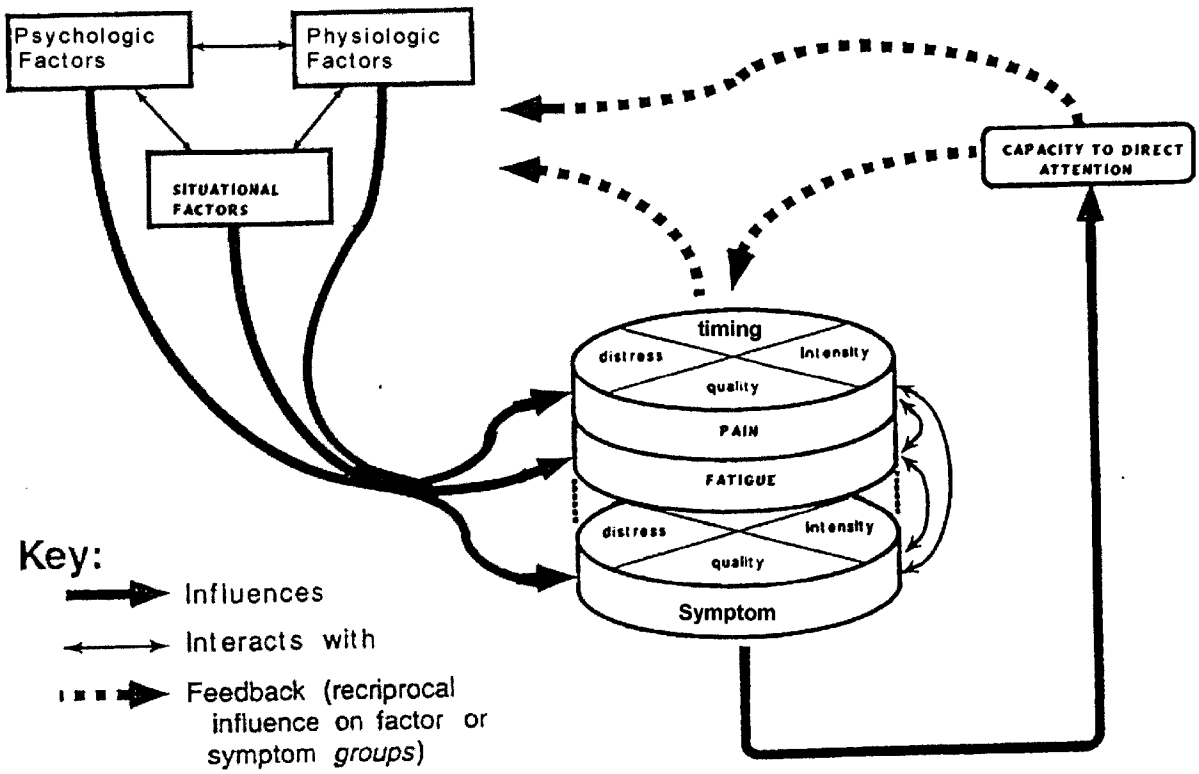


Figure 1. Model of the Theory of Unpleasant Symptoms

Capacity to Direct Attention

The current research studies concerning capacity to direct attention have concentrated on the breast cancer and multiple sclerosis populations (Cimprich & Ronis, 2001; Lehto & Cimprich, 1999; Cimprich, 1998; Cimprich, 1990; Jansen & Cimprich, 1994). In a longitudinal study design, a group of women with newly diagnosed breast cancer (n = 47) were assessed for CDA and symptom distress before surgery, about 2 weeks after surgery, and 3 months after surgery. A comparison (control) group of 48 women were measured at two points in time: during a routine mammogram and 3 months later. Age was correlated with decreased CDA. A pattern of the loss of attentional

functioning with gradual recovery of CDA occurred in the older women newly diagnosed with breast cancer. Of interest is the finding that the overall level of symptom distress at 2 weeks after surgery accounted for a significant portion of variance in CDA at 3 months after surgery (Cimprich & Ronis, 2001).

Lehto and Cimprich (1999), using a descriptive cross-sectional study design, measured CDA, anxiety, age, and extent of anticipated surgery in a sample of women (n = 45) diagnosed with breast cancer. Level of anxiety was inversely related to perceptions of attentional functioning, but not to any objective measure of CDA pretreatment. Findings supported earlier results showing that increased age is associated with lower performance on attentional measures.

A study of 74 women with newly diagnosed breast cancer found that age and extent of surgery impacted capacity to direct attention. Women aged 65 – 79 demonstrated a decline in CDA; women who experienced mastectomy (vs. breast-conserving surgery) experienced a decline in CDA (Cimprich, 1998). Jansen and Cimprich (1994) investigated 33 multiple sclerosis outpatients in symptom remission. They found an unanticipated negative correlation between age and performance measures of CDA; this was attributed to the length of time since diagnosis.

Cognitive Functioning in Cardiac Surgery Patients

Studies have confirmed the presence of neuropsychological deficits in patients who have experienced cardiac surgery (ACC/AHA Practice Guidelines, 1999; Robinson, Blumenthal, Burker, Hlatky, & Reves, 1990). Mechanisms implicated as responsible for the cognitive changes are intraoperative microemboli (dislodged atheroma, air emboli, antifoaming agents, platelet and fibrin aggregates) and hypoperfusion (Newman, Stygall,

& Kong, 2001). Correlates of cognitive impairment include advanced age, longer bypass time, intraoperative insertion of an intra-aortic balloon, mean perfusion pressure during extracorporeal circulation, and postoperative depression (Robinson et al., 1990). The evidence supports procedure-related factors such as the cross clamping of the aorta and postoperative temperature control (vs. patient characteristics) as the genesis of cognitive dysfunction in this population (Mark & Newman, 2002). A recent study suggests that the use of a single-clamp technique instead of a double-clamp technique reduces neurological injury following CABG surgery (Grega, Borowicz, & Baumgartner, 2003). It is speculated that the changes in magnetic resonance spectroscopy on brains of cardiac surgery patients are not reflective of neuronal damage but of transient metabolic changes within the neurons (Bendszus, Reents, Franke, Mullges, Babin-Ebell, Koltzenburg, Warmuth-Metz, & Solimosi, 2002). Additionally, it is speculated that the stay in ICU and sleep deprivation contribute to cognitive abnormalities (Raymond, Conklin, Schaffer, Newstadt, Matloff, & Gray, 1984).

Cognitive sequelae may not be related to exposure to the bypass pump alone (Rodig, Rak, Kasparak, & Hobbhahn, 1999). In an effort to identify predictors of cognitive change after CABG surgery, Selnes, Goldsborough, Borowicz, Enger, Quasky, and McKhann (1999) studied 127 patients at 1 month and 1 year after surgery. Among the medical variables, diabetes was associated with change in executive function and psychomotor speed. Some of the variables were associated with short-term changes but not with long-term outcomes. Cognitive domains that were associated with medical variables were different from those associated with surgical variables. The specific cognitive changes associated with the medical and surgical variables were manifest at

differing points in time. The study concluded there are multiple etiologies for the cognitive effects of surgery, with the nonspecific effects of anesthesia and prolonged surgery interacting with the more specific effects of the surgical procedure.

Recently there has been controversy regarding the cognitive sequelae of CABG surgery on and off the bypass pump. In a randomized control trial of 281 patients at 3 months after surgery, cognitive decline was evident in 21% of the off-pump group (n = 142) and 29% of the on-pump group (n = 139). At 12 months, cognitive decline occurred in 30.8% of the off-pump group and 33.6% of the on-pump group. Standardized change scores were calculated for each variable in each patient by subtracting the preoperative score from the postoperative score and dividing the difference by the standard deviation (SD) of that variable. The overall postoperative change (mean of the change scores) at 12 months was 0.19 for the off-pump group and 0.12 for the on-pump group. The p value for the off-pump versus on-pump groups at 12 months was 0.09. In conclusion, there was no negligible beneficial effect of cardiac surgery off-pump 12 months after the procedure (Van Dijk, Jansen, Hijman, Nierich, Diephuis, Moons, Lahpor, Borst, Keizer, Nathoe, Grobbee, Jaegere, & Kalkman, 2002).

In a study by Dumas, Dupuis, Searle, and Cartier (1999), 48 cardiac surgery patients were randomly assigned to two groups. One group was exposed to a longer period of mechanical ventilation and sedation. Cognitive function was measured before surgery, postoperatively, and 8 weeks after surgery. No differences were found between the two groups. Dumas et al. concluded that early extubation and a shortened period of anesthesia did not affect cognitive functioning at 3 – 5 days and 8 weeks after surgery.

In a study of 93 cardiac rehabilitation patients, patients with a history of chronic systolic hypertension demonstrated greater neuropsychological impairment than patients without hypertension. Patients with a low ejection fraction demonstrated greater neuropsychological impairment than those without reduced ejection fraction. When the impact of cardiac events on neuropsychological function was examined, patients who had undergone CABG exhibited a greater neuropsychological impairment than those who had a history of myocardial infarction (MI) or angioplasty (Moser, Cohen, Clark, Aloia, Tate, Stefanik, Forman, & Tilkemeier, 1999).

In a study of 20 clinically stable older post-MI or cardiac surgery rehabilitation patients, cognitive impairment was determined by performance in relation to preset criteria on a battery of neuropsychological tests (e.g., WAIS-R subtests, Mattis Dementia Rating Scale). Functional status was determined by the ability of the patients to adhere to a self-medication schedule. Findings indicated 14 patients were mild to moderately cognitively impaired, while 7 patients were impaired enough that they were unable to appropriately self-administer medications (Barclay, Weiss, Mattis, Bond, & Blass, 1988).

In a study comparing 31 CABG surgery patients to 16 general surgical patients, cognitive function, anxiety, and depression were measured at three times: 1 – 2 days before surgery, before discharge, and 6 – 8 weeks after surgery. In the CABG group, abnormalities of neurocognitive function were found for visual-spatial performance, attention span, concentration, and auditory memory. Within 6 – 8 weeks the abnormalities disappeared. Depression scores that had increased before discharge returned to or below preoperative levels after 6 – 8 weeks. Anxiety was high preoperatively, but it declined at discharge and again at 6 – 8 weeks after surgery

(Raymond et al., 1984). More recently, a study comparing the cognitive outcomes of coronary angioplasty and coronary artery bypass surgery revealed that the long-term cognitive consequence is similar in both groups (Hlatky, Bacon, Boothroyd, Mahanna, Reves, Newman, Johnstone, Winston, Brooks, Rosen, Mark, Pitt, Rogers, Ryan, Wiens, & Blumenthal, 1997).

A number of studies conducted throughout the 1980s document the incidence, prevalence, duration, and related factors of cognitive dysfunction after coronary artery bypass surgery. Approximately 30% – 79% of patients were found to have neuropsychological impairment while in the hospital. However, follow-up studies at 6 months to 5 years found significant improvement in cognitive function (Savageau, Stanton, Jenkins, & Frater, 1982; Shaw, Bates, Cartlidge, French, Heaviside, Julian, & Shaw, 1986; Sotaniemi, Mononen, & Hokkanan, 1986; Townes, Basein, Hornbein, Coppel, Goldstein, Davis, Nessly, Bledsoe, Veith, Ivey, & Cohen, 1989). Among the perioperative factors found to correlate with cognitive dysfunction were duration of the surgery, time on the pump greater than 2 hours, age over 60, moderately to severely enlarged heart, use of propranolol or chlodiazepoxide, blood loss of greater than 2,000 cc, hypotension, difficulty with intubation, and the use of an intra-aortic balloon pump (Savageau, Stanton, Jenkins, & Klein, 1982). Advanced age has consistently been documented as a predictor of cognitive dysfunction.

In a 5-year longitudinal study of neurocognitive function after coronary artery bypass surgery, 261 patients were measured at baseline (preoperatively); before discharge; and at 6 weeks, 6 months and 5 years after surgery. The incidence of cognitive decline was 53% at discharge, 36% at 6 weeks, 24% at 6 months, and 42% at 5 years.

Cognitive function at discharge was a significant predictor of long-term cognitive function (Newman, Kirchner, Phillips-Butte, Gaver, Grocott, Jones, Mark, Reves, & Blumenthal, 2001). In a more recent longitudinal study, 107 participants were examined at three points in time: 6 days, 8 weeks, and 5 years after surgery. Cognition declined at 6 days, showed improvement at 8 weeks, and declined again at 5 years. A regression analysis explained 43% of the variance in cognitive change at 5 years by three predictor variables: the number of microemboli recorded during surgery ($p < .05$), postoperative short-term cognitive change (from 6 days to 8 weeks) ($p < .001$), and the degree of recovery at 8 weeks ($p < .001$) (Stygall, Newman, Fitzgerald, Steed, Mulligan, Arrowsmith, Pugsley, Humphries & Harrison, 2003).

In a study by Selnes, Grega, Borowicz, Royall, McKhann, & Baumgartner (2003), a nonsurgical group of patients with coronary artery disease (who did not undergo surgery) was used as a control when studying the impact of CABG surgery on cognition. At 12 months after surgery, there were no statistically significant differences between the two groups, suggesting that the cognitive consequences of surgery were transient and reversible.

In a study designed to identify risk factors, processes of care, and complications associated with cognitive decline, 939 patients were studied at 14 sites. Cognition was measured at 72 hours prior to surgery and 6 months after CABG surgery. Of the characteristics entered into a regression analysis, cerebrovascular disease, peripheral vascular disease, chronic disabling neurologic illness, and living alone were significant as predictors of cognitive decline at 6 months after surgery. Years of education and bypass time were inversely related to cognitive decline. This study suggests that patients with

noncoronary manifestations of atherosclerosis are at risk for cognitive dysfunction after CABG surgery (Ho, Arciniegas, Grigsby, McCarthy, McDonald, Moritz, Shroyer, Sethi, Henderson, London, Villanueva, Grove, Hammermeister, 2004).

In summary, many studies over the past two decades have documented the incidence and duration of cognitive decline after CABG surgery. Studies have documented that the etiology of these deficits is multifactorial. Microemboli passing into the brain during surgery and hypoperfusion have been established as sources of cognitive decline. Controversy continues over whether the use of the bypass pump contributes to cognitive decline.

Anxiety and Depression in the Cardiac Surgery Population

In a study examining self-reported symptoms of depression in 306 patients (82% men) with cardiovascular disease, Doerfler, Pbert, and Decosimo (1997) used the Inventory to Diagnose Depression (IDD) to determine instrument validity as a screening instrument for depression in this population. Affective and cognitive symptoms were stronger indicators of depression than somatic symptoms.

Duits, Duivenvoorden, Boeke, Taams, Mochtar, Krauss, Passcjier and Erdman (1998) studied not only the variation in anxiety and depression over time but interindividual fluctuations as well. The Dutch State version of the State-Trait Anxiety Inventory and the Hospital Anxiety and Depression scale were used to measure anxiety and depression at two points in time before coronary artery bypass graft surgery and at two points in time postoperatively in 217 patients (176 men, 41 women). Mean anxiety and depression levels decreased from before surgery to 7 days after surgery, stabilizing at 6 months after surgery. Overall mean anxiety and depression levels were higher for

women than for men but demonstrated a stronger decrease in the early postoperative phase. Age had no significant effect on anxiety or depression level. Because the number of women in the sample is small, the authors suggested caution when interpreting these data. In a follow-up analysis, Duits et al. (1999) used structural equation modeling to explore the structural relationships between anxiety and depression. They found the interrelationships at the same point in time for anxiety and depression; preoperative anxiety led to preoperative depression, and postoperative depression led to postoperative anxiety. Within the model, self-esteem, rigidity, hostility, and background factors did not contribute to the course of anxiety and depression when measured in the preoperative and postoperative time periods.

Using a longitudinal study of 31 CABG surgery patients, McCrone, Lenz, Tarzian, and Perkins (2001) described patterns of anxiety and depression at five points in time: postoperatively 2-3 days, and 2, 4, 8, and 12 weeks. The Spielberger State-Trait Anxiety Scale was used to measure anxiety and the Center for Epidemiological Studies Depression Scale was used to measure depression. The highest level of depression was at 2-3 days after surgery. The incidence of depression dropped at 2 weeks and continued to fall at 12 weeks. Anxiety was at its peak preoperatively and decreased at 4 weeks but demonstrated a rise at 12 weeks. Younger subjects were depressed at 2-3 days after surgery and at weeks 2 and 4. Women (n = 12) reported a higher level of state and trait anxiety than men. This study validated previous findings by Burker, Blumenthal, Feldman, Burnett, White, Smith, Croughwell, Schell, Newman, and Reves (1995) showing that female gender was associated with depression as well as higher states of anxiety. In contrast, Cronin, Logsdon and Miracle (1997), using the Profile of Mood

States in a study of 86 postoperative CABG surgery female patients, demonstrated little evidence of depression for each of three time periods (before hospital discharge, 1 month after discharge and 3 months after discharge).

In a study of 38 males, Edell-Gustafsson and Hetta (1999) found 30 were moderately anxious prior to surgery and 6 were depressed. One month after surgery patients with persistent anxiety were more likely to suffer from sleep disturbances. Six months after surgery, 38.9% of the group demonstrated a moderate level of anxiety. These patients reported a significantly poorer sleep pattern and were more restricted in their physical functioning than nonanxious patients.

Using the Beck Depression Inventory (BDI), Timberlake, Klinger, Smith, Venn, Treasure, Harrison, and Newman (1997) investigated the incidence and pattern of depression following coronary artery bypass surgery in 121 patients (109 men, 12 women) at 8 days, 8 weeks, and 12 months after surgery. Preoperative depression scores were the best predictors of postoperative depression at all times of measurement. Thirty seven percent of patients were found to be depressed preoperatively. Preoperative trait anxiety scores best predicted depression in patients 8 days after surgery. The BDI (at 8 days) and age together predicted 81% of the cases of depression at 8 weeks.

In a study investigating the psychology of 60 men and 30 women 3 days or more after coronary artery bypass surgery, Con, Linden, Thompson, and Ignaszewski (1999) used the Beck Depression Inventory, subscales of the West Haven – Yale Multidimensional Pain Inventory and the Interpersonal Support Evaluation List to examine the relationships between disease, functional impairment, pain, depressive symptoms, and social support. Pain and depressive symptoms were correlated positively

with functional impairment for women ($r = .30$, $p < .05$; $r = .46$, $p < .01$); pain and functional impairment were correlated negatively with social support for men ($r = -.20$, $r = -.33$, $p = < .01$). In a hierarchical regression analysis of the data for women, age, marital status and severity of disease accounted for 3% of the variance in pain; depressive symptomatology and social support accounted for 43% of the variance in pain in the second step of the analysis. This finding was not significant when the data were analyzed for men. In men, higher levels of social support were related to lower levels of pain and less depressive symptomatology.

Depression has been documented as a risk factor for cardiac events (Connerney, Shapiro, McLaughlin, Bagiella, & Sloan, 2001). For example, Borowicz, Royall, Grega, Selnes, Lyketsos & McKhann (2002) linked depression 1 month after cardiac surgery to cardiac morbidity (e.g., angina) up to 5 years after surgery. Blumenthal, Lett, Babyak, White, Smith, Mark, Jones, Mathew, & Newman (2003) followed 817 patients undergoing CABG surgery for 12 years. Controlling for age, sex, number of grafts, diabetes, infarction, smoking, and left ventricular ejection fraction, analyses showed that patients with moderate to severe depression at baseline, and mild or moderate to severe depression that persisted from baseline to 6 months. had higher rates of death than those patients with no depression. Depression was identified as an important independent predictor of death after CABG surgery.

Social support

There is evidence in the literature that social support positively impacts the psychological well-being of patients hospitalized with cardiovascular disease (Ell & Dunkel-Schetter, 1994). Kulik and Mahler (1989) studied 56 men recovering from

coronary bypass surgery (CABS) and found that married men who received higher hospital social support (as measured by number of spousal visits) recovered more quickly and received less pain medication than men who received less support. However, the findings of a longitudinal study of 159 CABS patients (at baseline, 3 months after surgery, and 1 year after surgery) measuring functional activities, physical working capacity, anxiety, and depression demonstrated that social support factors had a limited role in recovery. The best predictor of recovery was the level of each of the above factors prior to the 1-year measure (Hamalainen, Smith, Puuka, Lind, Kallio, Kuttila, & Ronnemaa, 2000).

Using a longitudinal design, King, Reis, Porter, and Norsen (1993) investigated the outcomes of social support with 155 coronary artery bypass patients. Subjects were measured at five points in time: preoperative, 1 month, 4 months, and 1 year after surgery. Social support was measured using the Interpersonal Support Evaluation List, emotional outcome was measured using the Bipolar Profile of Mood States and functional outcome was measured using the Sickness Impact Profile. Patient's emotional well-being improved over time, and levels of perceived social support remained high across time. The investigators found a significant relationship between support and emotional outcome. Esteem support, when regressed on social support, contributed significantly to the prediction of emotional well-being at all four time periods.

Coping is enhanced by a match between what is expected and what is received in relation to the expectation. This match, along with the self-esteem of women who experienced coronary artery bypass surgery, was studied in relation to emotional and functional adjustment (Logsdon, Usui, Cronin, & Miracle, 1998). Instruments used to

measure the variables were the Personal Resource Questionnaire 83, the Rosenberg Self-Esteem Scale, the Profile of Moods States scale and the Sickness Impact Profile at three points in time: before hospital discharge, 1month after discharge, and 3 months after discharge. Women were found to adjust well after surgery with few disruptions to psychosocial or functional outcomes. Perceptions of the needed support were accurate. Social support enhanced self-esteem, thereby positively influencing outcomes. King's study (2000) of 60 men and 60 women supports the finding that there were few differences in the outcome measures (life quality, life satisfaction, expected/perceived recovery, functional status, global health status, and social support) of women and men at 3 months after surgery. However, women reported less social support and realized greater improvement in functional status than men.

In an effort to describe the type of social support received by CABG patients and their significant others, Rantanen, Kaunonen, Astedt-Kurki & Tarkka (2004) conducted a pilot study with 103 respondents. Patients reported spouse, children, and friends as the major sources of social support. Patients reported higher levels of all types of social support from both their social network and nurses than did significant others.

Self-Efficacy

Self-efficacy is the belief in one's capability to exert control over the demands of the environment (Bandura, 1997). In an experimental study design, Gortner and Jenkins (1990) studied the impact of inpatient education and telephone monitoring on self-efficacy expectations of 149 cardiac surgery patients. The Jenkins Self-efficacy Expectation Scale, the Profile of Mood States, and patient self-reports of activity and performance were used as measures in this study. Both the experimental and control

groups received the usual inpatient teaching; the experimental group was followed by telephone contacts to monitor recovery, provide reassurance, and reinforce previous teachings on a weekly basis for 4 weeks. Between the 4th and 8th weeks, the calls were made every 2 weeks. Significant differences in self-efficacy were found in the experimental group versus the control group. Self-efficacy expectations at 8 weeks were a predictor of activity at 12 weeks. Of the significant findings is that self-efficacy can be influenced by outpatient coaching and in patient education.

The theories of self-efficacy and self-care were tested with elderly patients recovering from coronary artery bypass surgery (Carroll, 1995). In this study, 133 patients were studied at 6 and 12 weeks after surgery to determine changes in self-care agency, self-efficacy expectations, and self-care/recovery. Carroll found that self-efficacy expectation acted as a mediator between self-care agency and self-care/recovery behavior.

Pain

Heye (1991) and Ferguson (1992) describe the sources and attributes of pain associated with the CABG surgical experience. For example, the source of pain can be cutaneous, visceral, and deep somatic (Ferguson, 1992). Ferguson (1992) cites the influence of anxiety on the pain experienced by these patients. More specifically, Nelson, Zimmerman, Barnason, Nieveen, & Schmaderer (1998) determined that state anxiety influences the perception of postoperative pain in the CABG surgery patient. In addition, trait anxiety did not correlate with postoperative pain. A direct relationship between anxiety and pain was found over time, with patients exhibiting the highest relationship on postoperative day 2 ($p < .001$). Gender, marital status, age, previous surgery, and

operative length did not demonstrate an influence on the measures of pain (Nelson, et al., 1998).

An erroneous assumption by nurses is that pain decreases quickly as postoperative CABG patients recover from surgery. Puntillo and Weiss (1994) found in a sample of 74 mixed CABG and abdominal vascular surgery patients that mean pain intensity varied little across 3 consecutive days immediately after surgery. Kuperberg and Grubbs (1997), in a study of 20 CABG surgery patients 2 and 4 days after surgery, corroborated this finding. Most patients on day two and four waited to request pain medication when their pain intensity rating was in the moderate to severe range. Pain medication usage was much less than what was ordered, placing the elderly at greater risk for undermedication. In a study examining pain management in the elderly 3 days after CABG surgery, Celia (2000) corroborated these findings using a retrospective review of 382 patients' medical records. Findings suggest that 99% of patients received less than 28% of analgesics prescribed. Men received more pain medication than women ($p < .0003$) and patients over 61 received less pain medication than younger patients ($p < .0137$). Watt-Watson and Stevens (1998) describe the consequences of unrelieved pain: an increase in oxygen demand, a resultant increase in cardiac work, impaired postoperative pulmonary functioning, and delayed mobilization. A positive finding by Pettersson, Lindskog, and Owall (2000) shows that patient-controlled analgesia, during the immediate postoperative period, resulted in better pain control without an increase in side effects than did nurse-controlled analgesia.

In a more recent intervention study of 45 CABG patients, Watt-Watson, Stevens, Costello, Katz, and Reid (2000) found that for all groups, analgesic administration was

inadequate. Of significance is the finding that on postoperative days 2 and 3, patients rated pain at 6.63 $\pm$ 2.46 on a 0 – 10 scale. This finding is consistent with findings from previous studies. However, pain management was enhanced in the intervention groups who received an additional education booklet, additional education booklet and along with an interview with a research nurse. The intervention groups received 46% more analgesia than the control group, which had received standard hospital preoperative education.

The multidimensional surgical pain experience in the postoperative CABG patient was the focus of a study conducted by Pozehal, Barnason, Zimmerman, Nieveen, and Crutchfield (1995). One hundred ninety-four subjects were asked to use the McGill Pain Questionnaire (MPQ), Parts 1 and 2, to rate and describe pain on postoperative days 2 and 3. On postoperative days 2 and 3 the following words were chosen to describe the experience of pain on Part 1 (sensory, evaluative, and affective subscales): sharp, sore, aching, tender, tiring, exhausting, and annoying. Scores on both Part 1 and Part 2 (Present Pain Intensity [PPI]) decreased significantly from day 2 to day 3. Younger patients (age 63 or less) consistently reported a higher pain level on days 2 and 3. The PPI is scored on a scale from 0 (no pain) to 5 (excruciating pain). On day 2, the average PPI score was 1.8 (mild intensity), and it was 0.67 (mild to no pain) on day 3.

In a recent study by DiMattio and Tulman (2003), a single-group, longitudinal study design was used to describe changes in functional status and the influence of comorbidity, pain, fatigue, and household composition in women who underwent CABG surgery. None of the women had recovered all of their functional status by 6 weeks; the

women continued to experience pain and fatigue at 6 weeks after surgery, although they reported a significant decrease in pain and fatigue symptom experience.

Fatigue

There is little current research on postoperative CABG surgery fatigue. Gortner, Rankin, and Wolfe (1988) studied elder recovery from cardiac surgery. In a sample of 67 postoperative clients, Gortner et al. (1988) found that the elders' (age 70 or above) recovery was more protracted and their fatigue lasted longer than did the fatigue of the younger group of patients. A review of mechanisms that contribute to fatigue in the cardiac surgery patient (Gregersen, 1988) includes withholding of food for 1 – 2 days after surgery, pain, the ICU environment, and sleep disruption.

In a retrospective study of 129 coronary artery bypass surgery patients, Redeker (1993) found that fatigue ranked in the top five symptoms in three measurements: during hospitalization, in the 3^{rd} – 5^{th} postoperative weeks and in the 6^{th} postoperative week. Fatigue was found to be a prevalent symptom after both CABG surgery and minimally invasive direct coronary artery bypass surgery (Zimmerman, Barnason, Brey, Catlin, & Nieveen, 2002). In a study of 20 men and 20 women, Moore (1995) studied recovery symptoms at three measurement points: 1 day before discharge, 2 days after discharge and 3 weeks after discharge. Findings show that more men than women report fatigue, chest incision discomfort, and negative emotional symptoms. Women's reports of fatigue did not increase during the recovery phase. Moore (1995) found that the subjects' reports of activity did not match the reports of fatigue. The types of activities resumed after discharge were linked to gender. The women tended to engage in activities that were

associated with maintaining a household. Men tended to engage in activities that supported recovery (e.g., walking outside their home within 2 weeks of discharge).

In a study of recovery patterns of 192 older adults after major abdominal surgery, Zalon (2004) found pain, depression, and fatigue accounted for 13.4% of the variation in functional status at 3 – 5 days after discharge, 30.8% at 1 month after discharge, and 29.1 % at 3 months after discharge. Fatigue was significantly correlated to pain and depression at each time interval measurement. The symptom that contributed the most to the variation of functional status 3 – 5 days after discharge was depression.

Summary

CABG surgery patients experience levels of pain, anxiety, and fatigue in the immediate postoperative period which interfere with functioning. Concomitantly, people who are recovering from CABG surgery can experience fluctuations in mood and self-efficacy. The relationship between anxiety and depression in the CABG surgery population has been studied across time. Although each of the factors in this study has been examined, the relationship of these variables to each other and the impact of these variables on CDA have not been fully illuminated. The present study explored the nature of the relationship between these factors using the theory of unpleasant symptoms as the theoretical framework.

CHAPTER 3

THE METHOD

Design

The purpose of this study was to compare capacity to direct attention in the coronary artery bypass graft (CABG) surgery population before and after surgery and examine its relationship to physiological, psychological and situational factors in the postoperative period. A descriptive correlational design was employed. Data were gathered at two points in time: during the preadmission testing unit visit and then on the cardiac surgery step-down unit. Data sources included self-report surveys, subject interviews and information from medical records. The following research questions were answered:

1. Is there a significant difference between the pre- and postoperative ability to direct attention?
2. What is the relationship between physiological factors (i.e., fatigue, pain, oxygenation status, length of anesthesia, whether the procedure was done on or off the bypass pump, length of time on the bypass pump, body temperature, serum potassium, calcium, sodium, albumin, hemoglobin and hematocrit, platelet count, hydration and nutrition status, ambulatory status, length of time since analgesia administration and the presence of sustained dysrhythmias) and the capacity to direct attention following the CABG procedure?
3. What is the relationship between psychological factors (i.e., anxiety, self-efficacy, depression, and the registration and recall subsets of the Folstein

Mini-Mental State questionnaire) and the capacity to direct attention following the CABG procedure?

4. What is the relationship between situational factors (i.e., social support, discharge plans, and the perception of the physical environment) and the capacity to direct attention following the CABG procedure?
5. To what extent do physiological, psychological, and situational factors explain variance in the dependent variable, the capacity to direct attention?

Setting

The study was conducted at two acute care facilities in upstate New York. The first is an academic health science center serving 25 counties in eastern New York and western New England. As a 631-bed hospital, it has an average daily census of 448 with the average length of stay as 6.7 days, and it houses a 32-bed critical care step-down cardiothoracic surgery unit. The second facility is a not-for-profit community medical center serving the Capital District region of New York state. As a 368-bed hospital, it houses a 32-bed critical care step-down unit in which the average length of stay for cardiac surgery patients is 7.4 days. The average length of stay for uncomplicated cardiac surgery patients is 5 days or in some cases less (Sarpy, Galbraith, & Jones, 2000).

Sample

A convenience sample of 41 hospitalized postoperative CABG surgical adults met the following eligibility criteria: (a) hospitalization on day 4 after coronary artery bypass surgery; (b) discharge from the critical care unit to the step down unit; (c) an uncomplicated course of recovery (absence of sustained dysrhythmias, infection, neurological pathology, and pulmonary disease); (d) no documented evidence of

presurgical clinical depression, (e) ability to communicate (read and speak) in English and to sign his or her own surgical consent form. Because variables such as pain, anxiety, and fatigue may heighten patient anxiety, patients experiencing complications (e.g., sustained cardiac dysrhythmias) were excluded from participation.

Participants who met eligibility requirements were reapproached and asked to sign the original consent form. To continue in the study, subjects met the eligibility requirements of (1) an uncomplicated course of recovery (absence of sustained dysrhythmias, infection, neurological pathology, and pulmonary disease) and (2) no history of documented presurgical clinical depression. Clinical depression was screened via medical record review. Because persons experiencing clinical depression demonstrate alterations in cognition (Williams, Hagerty, Cimprich, Therrien, Bay, & Oe, 2000), subjects who were determined to be experiencing clinical depression were excluded from the study.

Procedures

Protection of Human Subjects

Each potential subject was given a single sheet of paper explaining the purpose of the study, describing what would be expected of the subject and how much time it would take to participate in the study, specifying the confidential nature of the data, and that the subject could withdraw from the study at any time. This information was also contained in the consent form. The subject was asked to sign the consent form twice: the first time during preadmission testing and again prior to data collection in the cardiac surgery step-down unit.

The Principal Investigator (PI) served as the only data collector. Each subject was assigned a code number and this number was used to track the subject throughout the study. Subjects' names were separated from their code number to protect confidential information. The data collection forms (raw data) were kept by the Principal Investigator at the PI's home until the study ended, when data collection forms were destroyed.

The research protocol was approved by the Institutional Review Boards of the hospitals and the University of Massachusetts Amherst School of Nursing Scholarship and Human Subjects Review Committee.

Data Collection

Data collection procedures for first contact

Procedures of the study required two contacts. The first was in the preadmission testing unit. Nursing staff of the cardiothoracic surgeon's office gave potential participants a letter that introduced the study during an office visit with the surgeon. This letter informed the potential participant that the study was under way at the participating hospitals and this letter invited him or her to join the study during the time of preadmission testing. This step allowed potential participants an opportunity to learn of the research study and begin to consider participating early in their journey through their surgical experience.

Training procedure for preadmission testing unit and staff

The PAT unit staff, the Coordinator, and the technicians were trained in the procedures for identifying potential participants of the study. This training included a description of the purpose and eligibility requirements for potential subjects. In addition, the PAT staff was given the name and telephone number of the PI and instructed to

contact the PI when a potential participant, who met the eligibility requirements, presented for preadmission testing.

The Principal Investigator (PI) was informed by the Coordinator or the technicians of the preadmission testing (PAT) units by telephone of possible participants for the study, typically the day before the potential participant was scheduled to appear in the PAT unit. The PAT unit technicians arranged an optimal time for the PI to meet with potential participants.

Potential participants were screened using the following preliminary criteria for inclusion in the study: (1) the potential participant was scheduled for coronary artery bypass graft surgery; (2) the potential participant could communicate (read and write) in English; and (3) the potential participant could sign his or her own surgical consent form. The PI introduced herself to each potential participant during the time of preadmission testing. At this time, the purpose of the research study was explained, and, if preliminary eligibility criteria were met, the potential participant was invited into the study. Once written consent was obtained, the dependent variable measures of attention and cognition were administered, and the participant was asked to complete the MOS Social Support Scale (MOS SSS) instrument. The MOS SSS was administered during the preadmission testing period by the PI to decrease the research burden on participants at 4 days after surgery. This phase involved 30 minutes of the participant's time.

The PI estimated the 4th day when the participant would be on the cardiothoracic surgery unit for contact with the participant. The cardiothoracic surgery unit was contacted to determine if a participant was present on the unit. If so, the investigator screened the participant for continued eligibility in the study.

Procedure for second contact

While on the cardiac surgery step-down unit, the PI approached participants in the afternoon or early evening of postoperative Day 4, because at this time of day patients were most likely to be available. However, if the participant was to be discharged on postoperative Day 4, the PI met with the participant at his or her earliest convenience on that day. Subjects were told that if fatigue occurred while completing the instruments, the subject could delay the completion of the instruments until a later time. It took approximately 1 hour of the subject's time to collect data during the hospitalization phase of data collection.

The PI administered the self-report scales measuring the independent variables anxiety, self-efficacy, depression and fatigue (Lewis Anxiety Scale, Self-Efficacy Expectation Scale, the Hospital Anxiety and Depression Scale-D and the Chalder Fatigue Scale). The investigator administered the measures of attention and cognition (DSF, DSB, SDMT, Trail Making Test, Part A), and the recognition and recall subsets of the Folstein MMS questionnaire. At this time, the investigator asked subjects to rate pain on a visual analog scale (VAS). The attention measures were administered at the same time as the measures of the symptoms of pain and fatigue. Any demographic data that could not be obtained from the medical record along with health care data (i.e., years of formal education, marital status, and number of previous hospitalizations) were obtained through interview. Also, the participant was asked questions about hydration and nutrition status, ambulatory status, perception of the physical environment, and plans for discharge.

Information was collected from the subject's medical record and included the following demographic and health status data: gender, age, smoking status,

comorbidities, number of coronary artery bypass grafts, and if the procedure was a revascularization. The following physiological data (independent variables) were also collected from the medical record: hemoglobin, hematocrit, type of anesthesia used and length of time of anesthesia, length of time on the bypass pump, if the procedure was done on the bypass pump, presence of sustained dysrhythmias, oxygen saturation, body temperature, serum albumin, sodium, potassium, calcium, and platelet count.

The data collected were first kept in a secure area of the hospital and then at the residence of the PI until the entire data set was scanned, coded, and entered into an Statistical Package for the Social Sciences (SPSS) Version 12.0 for Windows data bank.

Pretest of the Procedures

Procedures for data collection were pretested with three subjects to determine sequencing and timing of administration of the instruments, environmental interference (e.g., presence or absence of support persons), and unforeseen technical or scheduling problems. Data collection procedures were adjusted on the basis of feedback from the pretest of the instruments. For example, significant others at the subject's bedside attempted to answer for the participant; subsequently, if significant others were at the bedside, they were asked not to respond for the participant prior to the commencement of data collection during the preadmission testing and hospitalization data collection periods. In addition, the researcher learned that patients could be scheduled for discharge on postoperative Day 4; therefore, adjustments were made to the scheduling of data collection in order to minimize subject loss.

Operational Definitions

Measures of the Dependent Variable

The cognitive ability to concentrate and focus in a deliberate way within a demanding life situation is defined as the capacity to direct attention (CDA) (Cimprich, 1992, 1998). CDA has been measured in a cancer population by Cimprich (1998, 2001) and in a multiple sclerosis population using the Digit Span test (which consists of the (Digit Span Forward [DSF] and Digit Span Backward [DSB] tests), and the Symbol Digit Modalities Test (SDMT) (Jansen & Cimprich, 1994). The DSF is a measure of attentional capacity in that it measures the amount of bits of information a person can attend to at one time. The DSB requires mental tracking and manipulation of multiple stimuli thereby requiring sustained attention (Cimprich, 1990). These standardized tests require the participant to repeat a series of digits read aloud by the examiner (DSF) and then another series to be repeated backward (DSB) (Jansen & Cimprich, 1994). The SDMT requires the participant to substitute numbers for various geometric symbols according to a key and within a 90-second interval. The maximum score is 110. Reliability and validity for these tests have been established in the neurologically impaired populations. The Digit Span test is more vulnerable to left hemisphere involvement than right hemisphere involvement, and has demonstrated sensitivity to cognitive decline in dementia, the head trauma and in the psychosurgery populations (Lezak, 1995).

Trail Making Test, Part A was also used because it is regarded as a more sensitive measure of attention. As a timed test of speed for visual search, attention, mental flexibility, and motor function, it is a test highly sensitive to the effects of brain injury. It involves the use of mental scanning and motor speed activities, and consists of 25

numbered circles randomly scattered on a page. The participant is asked to connect the circles numbered from 1 to 25 beginning with the 1st circle. The individual score is the total number of seconds it takes to complete the task.

The rationale for the selection of Trail Making Test, Part A follows. Normative studies show that performance on Trail Making Test, Part A and Part B, is influenced by age, gender, and education. Performance times increase with age. Studies have demonstrated no performance differences between men and women; however there are studies that indicate the performance of women is slowed on Trail Making Test, Part B. The impact of years of education is greater on Trail Making Test, Part B, than on Trail Making Test, Part A; those with a 10th grade education or less have increased response time. Trail Making Test, Part B asks the respondent to connect letters and numbers sequentially (e.g. 1 to A to 2 to B). It has been demonstrated that the spatial arrangement of Trail Making Test, Part B makes it a more difficult test resulting in increased response times (Lezak, 1995). Therefore, Trail Making Test, Part A was chosen because, as a sensitive measure of attentional deficit, it is the least burdensome of these two measures for the postoperative CABG surgery patient to complete.

The registration and recall subsets of the Mini-Mental State (MMS) questionnaire (Folstein, Folstein, & McHugh, 1975) were used to measure memory. The examiner measured registration by stating three object names and asking the subject to repeat these names. The subject was scored on the number of correct responses (in a range from 0 to 3) and was also scored on the number of trials (up to six) it took to learn all three object names. The examiner measured recall by asking the subject from 5 – 20 minutes later to recall the three objects previously named. Recall was scored in a range from 0 to 3. The

MMS questionnaire has documented reliability and validity and has been used in a variety of clinical situations to discriminate those with cognitive disturbance from those without disturbance. Concurrent validity was determined by correlating the MMS scores with the Wechsler Adult Intelligence Scale. Reliability of the MMS was documented by correlating it to the Wilcoxon T, Pearson r = .887 (Folstein et al., 1975).

Measures of Predictor Variables

Postoperative pain

Postoperative pain was defined as a personal, subjective experience that varies in intensity over time. The variable pain was measured by asking subjects to rate their pain using a visual analog scale (VAS). The VAS is a 10-centimeter horizontal numerical rating scale (from 0 to 10) with anchor words of "no pain" at 0 and "worst possible pain" at 10. Kuperberg and Grubbs (1997, p. 117) state "research has demonstrated that the numerical rating scale and visual analog scales are comparable in terms of construct validity, statistical power, and number of patients who respond similarly on both scales." Correlation coefficients of .82 to .91 between the VAS and the numerical rating scale when measuring levels of pain have been documented. VASs have demonstrated validity and reliability in the measure of symptoms, such as dyspnea, nausea, and fatigue.

Postoperative fatigue

Postoperative fatigue was defined as mental and physical fatigue and it includes the dimension of intensity. The Chalder Fatigue Scale (CFS) is a 14-item self-rating scale that measures severity of fatigue. It was developed for both hospital and community populations (Chalder, Berelowitz, Pawlikowska, Watts, Wessely, Wright, & Wallace, 1993). This scale provides a measure of fatigue intensity versus a measure of fatigue

duration, pattern, or impact on functional status. Fatigue intensity was chosen as a dimension of the theory of unpleasant symptoms because it is relevant for the immediate postoperative period and congruent with the theoretical model used in this investigation. Brevity of the instrument is important; the hospitalized postoperative heart surgery client should not be burdened with a lengthy instrument. Two subscales of 14 items measure fatigue: 8 items measure physical fatigue and 6 items measure mental fatigue. The fatigue scale is scored by summing up the responses for each subscale. The range for the physical fatigue subscale is 8 – 32; the range for the mental fatigue subscale is 6 – 24. The Cronbach's alphas for the two subscales were 0.84 and 0.82, respectively, in a study of patients in a general practice of physicians (Chalder et al., 1993).

Although validity and reliability of the CFS instrument have not been determined in the cardiac surgery population, the instrument has been used with the postoperative population. Aarons, Forester, Hall, and Salmon (1996) used this scale to measure fatigue after major joint arthroscopy. Patients were asked to rate responses to the items on a 4-point scale (1 = less than usual, 2 = same as usual, 3 = more than usual, 4 = much more than usual). Mean responses to physical fatigue items (based on mean scores) were 2.6 on the 4-point scale. Sample items are as follows: "Do you have problems starting things?" "Are you lacking in energy?" "Have you lost interest in the things that you do?"

Anxiety

Anxiety was defined as the subjective feeling of uneasiness, which can be described as feeling jittery, tense, nervous, or irritable. In the present study, anxiety was measured using an instrument developed by Lewis, Firsich, and Parsell (1979) for use with the adult cancer population. The Lewis Anxiety Scale, a nine-item ordinal measure,

assesses the amount of time a person feels jittery, tense, nervous, or irritable. Each item is rated on a 5-point scale (1 = none of the time and 5 = all of the time). The range of scores is 0 – 45. The correlation coefficient is reported as r = 0.90, the split-half reliability as 0.79. Content validity was established through the use of literature review and a panel of content experts. The Lewis Anxiety Scale has been used to measure anxiety in the HIV and nonpregnant women populations (Lee, Lentz, Tatlor, Mitchell, & Woods, 1994; Linn, Poku, Cain, Holzapfel, & Crawford, 1995). Samples of the items are as follows: "I feel tense," "I feel more anxious than usual," and "I feel more nervous than usual."

Self-efficacy

Self-efficacy was defined as the level of confidence a patient has in his or her ability to perform activities successfully. It is believed to be domain specific (Bandura, 1997). Self-efficacy was measured using the Self-Efficacy Expectation Scale (SES), a nine-item self-report scale developed by Barsevick (1991). This scale was developed to measure older patients' perceived self-efficacy in the performance of specific activities that are required in postoperative hip surgery recovery. The 5-point Likert scale ranges from 1 (strongly disagree) to 5 (strongly agree). The SES is scored by summing up the responses for each item. The range of scores is 0 – 36. An example of one of the items is "I am confident I can walk around inside my room easily." Barsevick (1991) reports a high internal consistency, a Cronbach's alpha of 0.90. This self-efficacy scale was chosen in part on the basis of its brevity, in order to decrease the research burden on the subject.

Depression

Depression was defined as a mood disorder that manifests as a constellation of symptoms. It is differentiated from the normal lows experienced through life. This

variable was measured using the Hospital Anxiety and Depression Scale - D (HAD – D), a seven-item depression subscale that was designed to measure depression in patients with medical illness. It was chosen because it is short and has been previously used with the CABG population (Duits et al., 1998). Items are rated on a 0 – 3 scale with a range of scores from 0 to 21; a score of 8 to 10 indicates probable presence of clinical depression (Zigmond & Snaith, 1983). The HAD – D was shown to possess concurrent validity with previously established depression scales (Frank-Stromberg & Olsen, 1997). Samples of items are: "I still enjoy the things I used to enjoy" and "I feel as if I am slowed down."

Social support

Social support was defined as the provision of support that comes from enduring social relationships operationalized by using the MOS Social Support Survey (MOS SSS), a 19- item Likert scale. It measures the following dimensions of social support: emotional/informational, affectionate, tangible and positive social interaction. Respondents rate from 1 (none of the time) to 5 (all of the time) how often support is available if needed. The scale has documented internal consistency, which exceeds 0.50, and validity with documented significance at the .01 level for Pearson product-moment correlations with health measures. Samples of items are: "Someone you can count on to listen to you when you need to talk" and "Someone who shows you love and affection" (Sherbourne & Stewart, 1991).

Data analysis

Descriptive and inferential statistics were used to examine the relationship between physiological, psychological, and situational measures with capacity to direct attention. Data were examined using frequencies, means, standard deviations, ranges, and

measures of skewness and kurtosis. Outliers were identified by visually viewing the data in the form of histograms along with running the SPSS procedure EXPLORE. EXPLORE provided measures of skewness and identified any aberrant values that indicated coding error. In the case of missing values for the platelet count and calcium variables, the mean was calculated and substituted. The missing values for postoperative (time 2 of data collection) cognitive measures were left blank.

Research question 1 asked, "Is there a significant difference between the pre- and postoperative ability to direct attention?" The means of each attention measure were entered into a paired t-test analysis. The attention scores were converted to z-scores for CDA (DSF, DSB and SDMT) and TAS (CDA and Trail Making Test, Part A). Significance of the difference between the pre- and postoperative CABG procedure z scores of attention was determined by performing a paired t test. Z scores were used because the direction of the raw scores for DSF, DSB, and SDMT and Trail Making Test, Part A has opposite meaning. The greater the raw score for DSF, DSB and SDMT, the better the attention; however, the greater the raw score for Trail Making Test, Part A, the worse the attention. Since these measures have different scales, they were converted to z scores to make them comparable. CDA was computed as the average of the z scores for DSF, DSB and SDMT. TAS was computed as the average of the z scores of DSF, DSB, SDMT, and Trail Making Test, Part A.

Research question 2 asked "What is the relationship between physiological factors (i.e., fatigue, pain, oxygenation status, length of anesthesia, whether the procedure was done on or off the bypass pump, length of time on the bypass pump, body temperature, serum potassium, calcium, sodium, albumin, hemoglobin and hematocrit, platelet count,

hydration and nutrition status, ambulatory status, length of time since analgesia administration, and the presence of sustained dysrhythmias) and the capacity to direct attention following the CABG procedure?" The variables pain, fatigue, oxygen saturation, length of anesthesia, procedure done on or off pump, hemoglobin, and hematocrit are reported using descriptive statistics (i.e., mean score, range, and standard deviation). These variables were potential predictor variables in the study. Correlational analyses were performed with the above variables and the capacity to direct attention variable using Pearson product-moment correlation coefficients (r).

Research question 3 asked "What is the relationship between psychological factors (i.e., anxiety, self-efficacy, depression and the registration and recall subsets of the Flostein Minimental State questionnaire) and the capacity to direct attention following CABG procedure?" Descriptive statistics were used to show the mean score, range, and standard deviation of the independent variables anxiety, self-efficacy, and depression. These variables were included because they were potential predictor variables in the study. Correlational analyses were performed with the above variables and the capacity to direct attention variable using Pearson product-moment correlation coefficients (r).

Research question 4 asked " What is the relationship between situational factors (i.e., social support, discharge plans and the perception of the physical environment) and the capacity to direct attention following the CABG procedure?" The variable social support is reported using descriptive statistics (i.e., mean score, range, and standard deviation). This variable was included because it was a potential predictor variable in the

study. Correlational analyses were performed with the above variables and the capacity to direct attention variable using Pearson product-moment correlation coefficients (r).

Research question 5 asked " To what extent do physiological, psychological, and situational factors explain variance in the dependent variable, the capacity to direct attention?" This was analyzed using regression analysis. Use of regression analysis assumes a theoretical linkage among the variables. Therefore, testing the theoretical linkages was required.

Summary

Coronary artery bypass patients from two acute care hospitals participated in a study designed to explore the relationships between physiological, psychological, and situational factors and the capacity to direct attention 4 days after surgery. Fair treatment for participants was ensured by obtaining approval from the institutional IRBs and the University of Massachusetts Amherst School of Nursing Scholarship and Human Subjects Review Committee. Data was collected from participants at two points in time: during the preadmission testing unit visit and on the cardiac surgery step-down unit. The data collection procedure included the use of interviews, the review of medical records, the completion of questionnaires, and the administration of measures of cognition. The data were analyzed using SPSS.

CHAPTER 4

RESULTS

The purpose of this study was to compare capacity to direct attention (CDA) in the coronary artery bypass surgery population before and after surgery and examine its relationship to physiological, physiological, and situational factors in the postoperative period. Data were recorded and examined to determine the relationship between psychological, physiological and situational factors and the capacity to direct attention. Data were collected on the dependent variable, CDA, at two points in time—in the preadmission testing unit and on postoperative day 4—using measures of attention. Data were collected on the predictor variables using self-report scales, interviews, and medical record reviews. The independent variables were as follows: fatigue, pain, oxygenation status, length of anesthesia, whether the procedure was done on or off the bypass pump, length of time on the bypass pump, body temperature, serum potassium, calcium, sodium, albumin, hemoglobin and hematocrit, platelet count, hydration-nutrition status, ambulatory status, length of time since analgesia administration, and the presence of sustained dysrhythmias, anxiety, self-efficacy, depression, registration, recall, social support, discharge plans, and perception of the physical environment. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) for Windows (Version 12.0). Although data were not collected related to day of discharge, most participants were being readied for discharge on postoperative day 4 (time 2 of data collection) or on the following day, postoperative day 5.

Description of the Sample

Of the 90 potential participants approached in the preadmission testing units of the two participating hospitals, 61 people agreed to participate. Of these 61, 41 agreed to continue on postoperative day 4 (time 2 of data collection). The instruments were read to 17% (n = 7) of the participants during time 2 of data collection.

Demographic

The sample consisted of 41 adult men (n = 30) and women (n = 11) undergoing coronary artery bypass surgery in two acute care hospitals. The subjects ranged in age from 42 to 78. The mean age was 63 years (SD = 9.7) with a median age of 65. The mean formal educational level was 13 years with a range of 6 to 22 years (SD = 3.1). Eighty percent (n = 33) of the sample were married, 12% (n = 5) reported being single, 3% (n = 1) were divorced, and 5% (n = 2) were widowed. Demographic characteristics of the sample are shown in Table 1.

Table 1: Demographic Characteristics

Variable	n	%
Gender		
Male	30	73.0
Female	11	27.0
Age		
42–56	11	26.8
57–63	9	24.4
65–71	11	26.8
72–78	10	22.0
Years of formal education		
6–12	22	53.7
13–22	19	46.3
Marital status		
Married	33	80.4
Single	5	12.2
Divorced	1	2.4
Widowed	2	4.9

Medical and Health Characteristics

Number of Vessels Grafted Descriptive data related to medical and health characteristics are found in Table 2. The majority of bypass procedures were three-vessel grafts (44%), with the next most frequent procedure a four-vessel graft (24%). Fifteen percent of the sample underwent a five-vessel coronary artery grafting, and 10% underwent a single coronary artery replacement procedure.

Repeat Surgery Eighty-eight percent (n = 36) of the surgical procedures were participants' first CABG surgical experiences, while 12% (n = 5) were coronary arter revascularization procedures.

Smoking Status Seventy-five percent of the 41 adults in the sample (n = 31) were nonsmokers. This smoking status information was taken from the preoperative medical history on the medical record. Any patient who reported smoking cessation in preparation for undergoing CABG surgery was coded as a smoker (see Table 2).

Cardiac Dysrhythmias No participants were excluded from this study on the basis of this criterion. Participants who experienced acute onset atrial dysrhythmias during their postoperative course of recovery, and who were in normal sinus rhythm at time 2 of data Collection (postoperative day 4), were included in the study. Data regarding the occurrence of cardiac dysrhythmias in this sample were collected to the level of specification as to the type of dysrhythmia present. Of the 41 participants, 12.2% (n = 5) were experiencing a dysrhythmia during the data collection period. Of the five persons experiencing a dysrhythmia, four persons were experiencing ventricular ectopy (premature ventricular contractions) and one person maintained his preoperative chronic atrial fibrillation during his postoperative recovery period.

Table 3 indicates that this postsurgical experience was also the initial hospitalization for four (10%) participants. Ten percent (n = 4) of the sample reported a history of 10 or more hospitalizations. Approximately 30% of the participants had been previously hospitalized twice before this surgical experience. The mean number of previous hospitalizations was 3.4.

Comorbidities The most prevalent comorbidities present in the sample, in descending order of frequency, were hypertension (30%), hyperlipidemia (22%), diabetes (18%), and myocardial infarction (9%). Other less frequently occurring conditions present in this

sample were decreased left ventricular function, congestive heart failure (CHF), gastroesophageal reflux disease (GERD), arthritis, and degenerative joint disease (DJD).

Number of Previous Hospitalizations Ten percent (n = 4) of the sample had not been previously hospitalized. The majority of the participants were previously hospitalized between 1 and 5 times (70%, n = 28); seven persons reported having been hospitalized between 6 and 8 times. One person reported having been hospitalized 12 or more times.

Table 2: Medical and Health Characteristics

Variable	n	%
Number of grafts		
1	4	10.0
2	1	2.5
3	18	45.0
4	10	25.0
5	6	15.0
6	1	2.5
Repeat surgery		
Yes	5	12.2
No	36	87.8
Smoking status		
Nonsmoker	31	75.6
Smoker	10	24.4

continued, next page

Table 2: continued

Variable	n	%
Cardiac dysrhythmia		
Yes	5	12.2
No	36	87.8
Type of dysrhythmia		
Chronic atrial fibrillation	1	3.0
Ventricular ectopy	4	10.0
Comorbidities		
Hypertension	30	73.2
Hyperlipidemia	22	53.6
Diabetes	18	43.9
MI	9	22.0
CHF	6	14.6
Decreased left ventricular function	1	3.0
GERD	7	17.0
Angina	8	19.5
Arthritis	8	19.5
DJD	3	7.5
Number of previous hospitalizations		
0	4	10.0
1	5	12.5
2	12	30.0
3	5	12.5
4	5	12.5
5	1	2.5
6	2	5.0
7	2	5.0
8	0	0
9	0	0
10	3	7.5
11	0	0
12	1	2.5

Descriptive Statistics of the Predictor Variables

The measures used to assess attention were Digit Span Forward, Digit Span Backward, Symbol Digit Modalities Test, and Trail Making Test, Part A. Memory was measured using the subsets of registration and recall from the Folstein Mini-Mental State questionnaire. Subjects were measured preoperatively in the preadmission testing unit and on postoperative Day 4 during hospitalization on all measures of cognition. The measure most sensitive to the decline in attention was the Trail Making Test, Part A instrument. Digit Span Forward was the least sensitive of the measures of attention. Table 3 shows attention and memory scores before and after cardiac surgery. The changes in attention and memory will be described in question 1.

Table 3: Comparison of Attention and Memory Scores Before and After Cardiac Surgery

	Before surgery			After Surgery			
Cognition Variable	Mean	SD	n	Mean	SD	n	% change
Attention							0.
DSF	6.63	1.19	41	6.63	0.95	40	7.0 ↓
DSB	4.66	1.49	41	4.33	1.57	40	22.3 ↓
SDMT	40.85	10.90	41	31.73	11.81	40	32.1 ↓
Trail Making, Part A	37.85	14.90	41	55.76	58.35	40	
Memory							
Registration							
Correct responses	3.00	0	41	3.0	0	40	0
Times to learn	1.00	0	41	1.0	0	40	17.4 ↑
Recall	1.61	0.97	41	1.95	0.93	40	0 7.0 ↓

Physiological Variables

Table 4 depicts the findings on postoperative Day 4 of the physiological variables. Participants reported a mean total fatigue level of 2.66 (SD = .51), which reflects a rating of fatigue level falling between "the same as usual" and "more than usual." The means for physical fatigue and mental fatigue were 2.66 (SD = .54) and 2.35 (SD = .54) respectively. The pain level (measured using a VAS from 0 to 10) for this sample was mild to moderate (M = 3.17, SD = 2.28). The mean time since analgesia administration was over 10 hours, with a wide variation (SD = 8.65). All of the patients received oral analgesics for pain management. The most frequently used analgesics on postoperative ay 4 were Percocet, Tylenol #3, and Lortabs. The mean oxygen saturation (M = 94.54, SD = 2.03) reflects a sample that, as expected, falls within a physiologically clinically acceptable range. The range of oxygen saturation within 24 hours of data collection fell between 77% and 100%. Of the 41 subjects, 19 experienced an oxygen saturation measurement of 92% or below within 24 hours of the time of postoperative Day 4 data collection. As expected, the mean body temperature for this sample is within a physiologically normal range.

The serum physiological parameter findings, which were extracted from the medical record, for calcium, sodium, potassium, hemoglobin, hematocrit, and platelet count were within the expected range for a postoperative Day 4 cardiac surgery patient. The serum values that reflected the greatest variations from normal were hemoglobin and hematocrit. The platelet count demonstrated the greatest variability with a standard deviation of 52. Although data were collected for the albumin variable, there were data

missing for a large portion of the sample; therefore, this variable was excluded from the analysis.

Table 4: Physiological Variables

Variables	Mean	SD	n
Physical fatigue	2.66	0.58	41
Mental fatigue	2.35	0.54	41
Total fatigue	2.53	0.51	41
Pain	3.17	2.28	41
Oxygen saturation	94.54	2.03	41
Time since analgesia	10.70	8.65	38
Hemoglobin	10.75	1.32	41
Hematocrit	31.60	3.93	41
Platelet count	158.56	52.	41
Calcium	8.61	.47	41
Potassium	4.33	.41	41
Sodium	136.17	3.11	41
Body temperature	97.29	1.21	41

Table 5 contains information regarding intraoperative anesthesia time and time on the bypass pump. The average length of anesthesia time for this sample (n = 40) was 6.23 hours (SD = 1.3). The majority (63.4%) of coronary artery bypass procedures (n = 25)

were performed on the bypass pump. For the portion of the sample (n = 25) whose surgery was performed on the bypass pump, the mean time on the bypass pump was 2.25 hours (SD = .73).

Table 5: Bypass Pump and Anesthesia Time

Physiological Variables	Mean	SD	n
Anesthesia time in hours	6. 23	1.30	40 (missing data n = 1)
On-pump time in hours	2.25	0.739	25*

*15 procedures were done off bypass pump

Table 6 depicts the nutritional status of the sample, which shows the expected nutritional intake of the typical postoperative Day 4 cardiac surgery patient. None of the subjects was receiving tube feeding. The majority (73%) were eating as little as a small amount or as much as approximately 50% of the meal.

Table 6: Nutritional Status

Variable	%	n
Tube Feeding	0	0
IV Fluids and drinks clear liquids	0	0
IV Fluids and eats small amounts	9.8	4.0
Eats small amounts	26.8	11.0
Eats at least 50% of meal	43.6	19.0
Eats 100% of meal	17.1	7.0

(n = 41)

Table 7 shows the ambulatory status of this sample; Table 8 shows the frequency of ambulation. Subjects were interviewed regarding ambulatory assistance, frequency of ambulating, and average distance when ambulating. The majority of this sample reporting ambulating independently (68%), with 27% reported they needed the assistance of one person to ambulate; therefore, 95% of the sample were either ambulating independently or ambulating with the assistance of one person. The need for assistance was related to the need for help to get out of the bed or chair, or to take along equipment, such as oxygen therapy equipment, during ambulation.

Frequency of ambulation was defined as ambulation that occurred out of the room in the hallway, excluding the number of times the participant got up to go to the bathroom. The majority (53.7%) of the sample ambulated in the hallway five or more

times per day, with one quarter of the sample reporting they ambulated four times per day. Twenty-three of the 41 patients (56%) stated they walked completely around the unit, with some stating they walked more than once around the unit during an ambulation episode. These were expected findings since the majority of the participants were nearing hospital discharge.

Table 7: Ambulatory Status

Variable	%	n
Ambulates independently	68.3	28
Ambulates with one assist	26.8	11
Ambulates with two assists	4.9	2

(n = 41)

Table 8: Frequency of Ambulation

Variable	%	n
Frequency of ambulating in Times per day		
1	2.4	1
2	7.3	3
3	12.2	5
4	24.4	10
5	9.8	4
6 or more	43.9	18

(n = 41)

When asked about sleep/rest, 71% (n = 29) of the sample reported feeling rested at the time of data collection. However, 71% (n = 29) responded no when asked "did you sleep through the night?" Of these, 22% reported awakening once during the night.

Sixty-six percent (n = 27) of the sample said they slept intermittently through the day and night. In terms of sleep quality, 44% reported not sleeping well through the night. See Table 9 for descriptive data on sleep quality. Approximately 59% of the sample (n= 24) reported that their sleeping hours, in terms of length and when the person went to sleep and awakened, were different at home than in the hospital. See Table 10 for sample descriptors from subjects when asked for reasons for difficulty with sleep quality. Of note, most of the reasons for patients' awaking were internal.

Table 9: Physiological Variables for Sleep/rest Status

Variable	%	n
How well did you sleep through the night		
Very well	22.0	9
Moderately well	31.7	13
Not well	43.9	18

(n = 41)
*missing case = 1

Table 10: Reasons for Decreased Sleep Quality

Internal	
	My pain
	Pain from lower back keeps me awake
	I have nightmares, and I become confused during the night
	I worry about my chest incision
	I feel like I cannot turn over because of my tubes
	I could not get comfortable
	I am not used to sleeping on my back
	I sweat from the medications
	Last night I jerked wide awake and was startled, I didn't know where I was
	Anxiety
	Fear related to my breathing problem
	Thought I couldn't breathe, my daughter died this time last month
	I had a heart episode (bout of atrial fibrillation)
External	
	The nurses wake me up for pain pills, blood pressure checks, finger sticks
	I had to get up three times to go to the bathroom
	I had to get up to go to the bathroom
	This room is too hot for me (2)
	Being in a strange place
	Unfamiliar noises

Psychological Variables.

Table 11 depicts the results of the self-report scales for the postoperative psychological variables of anxiety, self-efficacy, and depression. Anxiety was measured using the Lewis Anxiety Scale; the sample mean for this variable is 2 (SD = .58) on a 5-point scale. Self-efficacy was measured using the Self-Efficacy Expectation Scale (SES); the sample mean is 3.14 (SD = .55) on a 5-point scale. The variable depression was measured using the Hospital Anxiety and Depression Scale–D (HAD–D); the sample mean is 0.72 (SD = .59) on a sale of 0–3 points. Of note is the little variability of scores within each of the psychological variables.

Table 11: Psychological Variables

Psychological Variable	Mean	SD	n
Anxiety	2.	.58	41
Self-efficacy	3.14	.55	41
Depression	.72	.59	41

Situational Variables

The situational variables of social support, discharge plans, and perception of the environment were measured through the use of a self-report scale (MOS SSS) and participant interviews. Social support data were collected during preadmission testing; the mean for this sample is 4.26 (SD = .63) on a 5-point scale, reflecting an overall high level of social support (see Table 12).

Table 12: Social Support

Situational variable	Mean	SD	n
Social support	4.26	.63	41

Participants' agreement with the hospital discharge plans is shown in Table 13. These data show that there is a high rate of agreement between the patient's plans for discharge and the hospital's plan for discharge (79.5%, n = 33). A large proportion of the sample met the discharge criteria for discharge to home. The hospital had not established the discharge plan for two of the participants; this explains the missing data for the hospital discharge plan.

Table 13: Descriptive Statistics Related to Discharge Plans

Variable	%	n	
Pt's agreement w/hospital plan for discharge	79.5	31	
Patient's discharge Desire			
Home	80.5	33	
Rehabilitation	12.2	5	
Subacute care	7.3	3	
Hospital's discharge plan			
Home	84.6	33	*
Rehabilitation	15.4	6	
Subacute care	0.	0	

*missing data = 2

Subjects were interviewed regarding perceptions of their surroundings; Table 14 summarizes these findings. The majority of participants in this study found their surroundings to be acceptable. About half of the participants found the room to be too hot (46.3%); however, 43.9% found the room temperature to be acceptable. While 73.2%

found the noise level to be acceptable, 22% found the environment to be too noisy. One person said that the environment was noisy, but acceptable. The majority of participants found the light level to be acceptable (85.3%). About 75% of the subjects found the room ventilation to be acceptable or well ventilated. Over,all the majority of the participants found the bed (87.2%) and recliner chair (81.6%) to be comfortable.

Table 14: Perception of the Physical Environment

Variable	%	n
Room temperature		41
Too hot	46.3	19
Too cold	9.8	4
Comfortable	43.9	18
Noise level		40
Too noisy	22.0	9
Acceptable	73.2	30
Noisy, but acceptable	2.4	1
		* 1 person had no opinion
Ventilation		40 (missing 1)
Stuffy	24.4	10
Acceptable	48.8	20
Well ventilated	26.8	11
Light level		
Acceptable	85.3	35
Too dark	0.	0
Not dark enough	0.	0
Too bright	7.3	3
		1 = missing case 2 = no opinion
Is bed comfortable		39 (+2 comments)
Yes	87.2	
No	12.8	
		• One person could not evaluate the comfort of the bed because of his overall "soreness" • One person could not evaluate the comfort of the bed because he did not use the bed.
Is recliner chair comfortable		38 (3 comments)
Yes	81.6	
No	18.4	
		• One person stated that the recliner was adequate • One person stated that the chair could be bigger and work easier and that it bounces • One person said the chair was OK, but that it was not very comfortable
Level of privacy acceptable		41
Yes	92.7	38
No	7.3	3

Research Question 1

The first research question asked, "Is there a significant difference between pre- and postoperative ability to direct attention?" This research question was tested with a paired t-test for each of the measures of attention: DSF, DSB, SDMT, and Trail Making Test, Part A. The results are shown in Table 15. This table reveals there is a significant difference between the pre- and postoperative measures of attention SDMT ($p < .001$) and Trail Making Test, Part A ($p < .039$). There was no statistical significant difference in the pre- and postoperative measures of DSF and DSB.

The variability of scores on all measures of attention increased at time 2 measure with the exception of DSF. Of note is the percentage decline in mean scores in the DSB (7%), SDMT (22.3%), and Trail Making Test, Part A (32.1%) measures of attention. There was no change from time 1 to time 2 measures for the DSF and registration; however, there was a 17.4% increase in recall. This was likely due to the use of the same group of stimulus words at time 1 and time 2 measures. The descriptive statistics for the independent variable can be found in Table 3.

Table 15: Comparison of Individual Pre- and Postoperative Variables of Attention

	Mean difference pre-post	t	df	Sig.
DSF	.025	.138	39	.891
DSB	.350	1.433	39	.160
SDMT	8.675	8.684	39	.000 **
Trail Making Test, Part A	-.274	-2.138	39	.039 *

n = 40
* $p < .05$
** $p < .01$

An overall score for capacity to direct attention (CDA) was derived from the means of the DSF, DSB and SDMT. The total attention score (TAS) was derived from summing the scores for the measures of DSF, DSB, SDMT, and Trail Making Test, Part A. TAS includes all of the attention measures, whereas CDA excludes Trail Making Test, Part A. In order to enter a combined score of the attention measures into the t-test analysis, a composite score of the measures of attention was derived by transforming the raw scores to z scores for CDA and TAS. The results indicate there is a significant difference ($p < .001$) between the preoperative and postoperative attention for both CDA and TAS (see Table 16).

Table 16: Comparison of Preoperative and Postoperative Variables CDA and TAS

	Mean difference	t	df	Sig.
Preoperative CDA z score, to postoperative CDA z score	.3210	3.422	39	.001*
Preoperative TAS z score to postoperative TAS z score	.3443	3.776	39	.001*

* $p < .001$

Research Question 2

The second research question asked, "What is the relationship between physiological factors (i.e., pain, fatigue, oxygen saturation, length of time on the bypass pump, hours since analgesia, body temperature, length of anesthesia, hemoglobin, hematocrit, and platelet count) and the capacity to direct attention following the CABG procedure?" These variables were measured on postoperative Day 4. Table 17 contains the correlations between the measures of attention SDMT and the Trail Making Test, Part A, and the physiological variables. SDMT and Trail Making Test, Part A, were selected for entering into the correlation analysis because they were determined to be the most sensitive measures of attention.

The postoperative scores for SDMT and Trail Making Test, Part A were negatively correlated ($r = -.663$, $p < .01$). Mental and physical fatigue scores were significantly positively correlated with each other ($r = .632$, $p < .01$) and the total fatigue score ($r = .965$, $p < .01$; $r = .935$, $p < .01$). Hours since analgesia were negatively

correlated with SDMT (r = - .328, p <. 05) and total fatigue (r = - .329, p <. 05). Body temperature was negatively correlated with total fatigue (r = - .319, p < .05) and physical fatigue (r = - .355, p <. 05). Hemoglobin and hematocrit were significantly correlated (r = .956, p < .01). Platelet count was positively correlated to SDMT (r = .316, p .05), but negatively correlated to hours since analgesia (r = - .345, p < .05). Length of bypass time was positively correlated with oxygen saturation (r = .421, p < .01), length of anesthesia (r = .322. p < .05) and platelet count (r = .352, p < .05)

The remainder of the physiological variables showed little positive and negative correlation.

The correlation between the physiological variables and combined attention measures of postoperative CDA (z-score) and postoperative TAS (z-score) are reported in Table 19. Length of anesthesia was the only significant correlation with postoperative CDA (r = .332, p <. 05) and postoperative TAS (r = .338, p <. 05).

Table 17: Correlation Between the Physiological Variables and Attention Measures of SDMT and Trail Making Test, Part A

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Postop SDMT	–													
Postop Trails A	-0.663 **	–												
Total fatigue	0.004	0.016	–											
Mental fatigue	0.109	-0.028	0.965 **	–										
Physical Fatigue	-0.061	0.040	0.935 **	0.632 **	–									
Pain	.036	.162	-.024	-.071	.011	–								
Hours since Analgesia	-0.328 *	0.171	-0.329 *	-0.269	-0.320	-.086	–							
Body temperature	0.214	-0.137	-0.319 *	-0.194	-0.355 *	.009	0.130	–						
Oxygen Saturation	-0.010	0.043	-0.182	-0.207	-0.136	-.084	0.284	-0.099	–					
Length of Anesthesia	0.368 *	-0.269	0.191	0.213	0.144	.150	-0.244	0.179	-0.050	–				
Length of time on bypass pump	.059	.019	.096	.054	.110	.154	.054	.075	.421 **	.322 **	–			
Hemoglobin	-0.212	.059	.045	.155	-.044	-099	.278	-.080	-.071	-.010	-.189	–		
Hematocrit	-0.173	-.001	-.028	.099	-.177	-064	.191	-.033	-.145	.035	-.264	.956 **	–	
Platelet count	0.316	-.220	.280	.299	.224	-.022	-.345 *	-.265	-.147	.140	-.352 *	.092	.117	–

Research Question 3

The third research question asked, "What is the relationship between psychological factors (i.e., anxiety, self-efficacy, depression, and the registration and recall subsets of the Folstein Mini-Mental State questionnaire) and the capacity to direct attention following the CABG procedure?" These variables were measured on postoperative Day 4. The correlation between the psychological variables and Trail Making Test, Part A, and SDMT are reported in Table 18. The two high scores for Trail Making Test, Part A, were removed from the analysis; thus the n of 38 for this variable. There is a low but significant correlation between postoperative measure SDMT and self-efficacy ($r = .353$, $p < .05$). This means the greater the self-efficacy, the greater the ability to attend. The post-operative measure SDMT has little correlation with anxiety ($r = -.006$), depression ($r = .187$), and recall ($r = -.127$). There is a low, but significant, correlation between postoperative anxiety and depression ($r = .447$, $p < .05$). Trail Making Test, Part A, demonstrates little correlation with anxiety ($r = -.057$), depression ($r = .028$), self-efficacy ($r = -.237$), and recall ($r = .019$). The psychological variable postoperative recognition was eliminated from the analysis because it demonstrated no change in relation to the preoperative measure of recognition.

Table 18: Correlation Between the Psychological Variables and the Postoperative Attention Measures of SDMT and Trail Making Test, Part A

Variable	1	2	3	4	5	6
Post op SDMT n=40	—	-.663**	-.006	.187	.353*	-.127
Post op Trail Making test, Part A n=38		—	-.057	.028	-.237	.019
Anxiety n=40			—	.447**	-.208	.124
Depression n=40				—	-.268	.092
Self-efficacy n=40					—	-.219
Recall n=40						—

* p<.05
** p<.01

The correlation between the psychological variables and combined attention measures of postoperative CDA (z score) and postoperative TAS (z score) are reported in Table 19. There is a negative but little correlation between anxiety and postoperative CDA (r = -.116) and postoperative TAS (r = -.149). There is a low correlation between self-efficacy and postoperative CDA (r = .259) and postoperative TAS (r = .293). Depression has the highest correlation with postoperative CDA (r = .537), although somewhat lower with postoperative TAS (r = .063). The psychological variable recall demonstrated little relationship with postoperative CDA and postoperative TAS. The relationship between the psychological variables and attention was not significant.

There was a positive significant correlation between years of formal education and postoperative CDA (r = .360, p < .05) and postoperative TAS (r =. 381, p <. 05).

Table 19: Correlations Between the Physiological , Psychological, and Situational Factors and the Combined z Scores for Attention

	Postoperative CDA z score		Postoperative TAS z score	
	r	n	r	N
Psychological variables				
Anxiety	-.116	40	-.149	40
Self-efficacy	.259	40	.293	40
Depression	.537	40	.063	40
Recall	.082	40	.106	40
Physiological variables				
Fatigue -total	.029	40	.051	40
-mental	.024	40	.093	40
-physical	.033	40	.022	40
Pain	-.052	40	-.110	40
Hours since analgesia	-.319		-.275	40
Body Temperature	.049	40	.117	40
Oxygen Saturation	-.054	40	-.049	40
Length of anesthesia	.332*	39	.338*	39
Length of time on bypass pump	-.028	25	-.047	25
Situational variables				
Social support	-.029	40	-.062	40
Other				
Age	-.052	41	-.110	41
Years of formal education	.360*	41	.381*	41

*p<.05

The literature consistently demonstrates that there is a difference in the capacity to direct attention for patients who undergo CABG surgery on the bypass pump and off the bypass pump. Therefore, a t test was conducted on the subsets of the sample comparing

the group done on the pump to the group done off the pump. There was no significant difference in the preoperative or the postoperative total attention score between the group done on the pump and the group done off the pump (see Table 20).

Table 20: Comparison of Total Attention Scores on Bypass Pump Versus Off Bypass Pump

	n	Mean	f	Sig.
TAS, precombined z score				
Off pump	16	.1122	.102	.752
On pump	25	.2097		
TAS, postcombined z score				
Off pump	16	-.3001	.224	.639
On pump	25	-.0932		

Research Question 4

The fourth research question asked, "What is the relationship of situational factors (i.e., social support, discharge plans, and perception of the physical environment) to capacity to direct attention following the CABG procedure?" The variables social support, SDMT, and Trail Making Test, Part A, were entered into a correlation analysis; the results are shown in Table 21. Social support was not significantly related to the attention measures of SDMT ($r = -.076$) and Trail Making Test, Part A ($r = .063$). Discharge plans and perception of the physical environment data could not be entered into a correlation analysis due to the nominal and ordinal nature of these data.

Table 21: Correlation Between Social Support and Attention Measures Of SDMT and Trail Making Test, Part A

Variable	1	2	3
Post –op SDMT N=40	--	-.663**	-.076
Post -op Trail Making Test, Part A N=38		--	.063
Social Support			--

The correlation between the situational variable social support and combined attention measures of postoperative CDA (z score) and postoperative TAS (z score) are reported in Table 19. The situational variable recall demonstrated little relationship with postoperative CDA ($r = -.029$) and postoperative TAS ($r = -.062$).

The literature indicates that age impacts the ability to attend. Therefore, the postoperative attention z scores for the above 65 age group were compared with the scores for the group under age 65 using a t-test analysis. Table 22 contains the results of this analysis. There was no significant difference in attention for CDA ($p = .497$) and TAS ($p = .313$) scores between these groups.

Table 22: Comparison of Postoperative Attention Scores for Subjects Under 65 and 65 and Over

Variable	n	Mean	f	Sig.
CDA, post z score			.471	.497
Under 65	19	-.0141		
65 and over	21	.0071		
TAS, post z score			1.044	.313
Under 65	19	.0505		
65 and over	21	-.0499		

Research Question 5

The fifth research question asked, "To what extent do physiological, psychological, and situational factors predict the capacity to direct attention?" This research question was tested using a multiple regression analysis. The dependent variables of preoperative CDA and TAS were tested by entering the situational variables social support and years of formal education as the independent (predictor) variables into a regression analysis. The results are shown in Table 23. The regression of preoperative CDA on two predictor variables, social support and years of formal education, accounted for 22% of the variance and was significant at the .008 level. The regression of preoperative TAS on two predictor variables, social support and years of formal education, accounted for 21% of the variance and was significant at the .01 level. Social support was not significantly related to CDA or TAS. Years of education positively correlated with both CDA and TAS and significantly contributed to explaining the

variance in CDA and TAS. Preoperative CDA and TAS were positively correlated with postoperative CDA and TAS.

Table 23: Preoperative CDA and TAS Regression Analysis

Variables						
Dependent Variable	Predictor variables	R	R square	Beta	t	Sig.
CDA-Pre z score		.471	.222			
	Social support			.151	1.047	.302
	Years of education			.468	3.240	.002
TAS-Pre z score		.464	.216			
	Social support			.131	.899	.374
	Years of education			.464	3.201	.003

The dependent variables of postoperative CDA and TAS were tested by entering the physiological and psychological variables self-efficacy, anxiety, fatigue (total), pain, hours since analgesia, hours on anesthesia, and preoperative CDA and TAS as the independent (predictor) variables into a regression analysis. The results are shown in Table 24. The regression of postoperative CDA on seven predictor variables (CDA preoperative z score, anxiety, hours since analgesia, pain, self-efficacy, hours on anesthesia, and total fatigue) accounted for 58% of the variance and was significant to the .000 level. The regression of postoperative TAS on seven predictor variables (TAS preoperative z score, anxiety, hours since analgesia, pain, self-efficacy, hours on anesthesia and total fatigue) accounted for 60% of the variance and was significant at the .000 level. The preoperative attention scores positively correlated with both postoperative

CDA and TAS and significantly contributed to explaining the variance in postoperative CDA and TAS. The hours on anesthesia variable was positively correlated and it significantly contributed to explaining the variance in postoperative TAS.

Table 24: Postoperative CDA and TAS Regression Analysis

Psychological and physiological variables						
Dependent Variable	Predictor variables	R	R square	Beta	t	Sig.
CDA-Post z score		.763	.583			
	CDA pre z score			.577	4.032	.000
	Anxiety			-.131	-.925	.363
	Hours since analgesia			-.229	-1.695	.101
	Pain			-.029	-.224	.824
	Self-efficacy			.168	1.143	.263
	Hours on anesthesia			.270	1.869	.072
	Total fatigue			-.166	-1.085	.287
TAS-Post z score		.778	.605			
	CDA pre z score			.533	3.737	.001
	Anxiety			-.185	-1.345	.189
	Hours since analgesia			-.176	-1.334	.193
	Pain			-.069	-.542	.592
	Self-efficacy			.229	1.582	.125
	Hours on anesthesia			.299	2.088	.046
	Total fatigue			-.073	-.496	.624

CHAPTER 5

DISCUSSION

The purpose of this study was to investigate relationships between physiological, psychological and situational variables and the capacity to direct attention in adults 4 days after cardiac surgery. The research framework was based on the literature on capacity to direct attention in ill persons and the theory of unpleasant symptoms. According to this framework, physiological, psychological, and situational factors can impact the cardiac surgery patient's experience of pain and fatigue and thereby influence cognitive processes such as attention.

Research Questions

The Difference Between Pre- and postoperative Measures of Attention

The first research question asked "Is there a significant difference between pre- and postoperative measures of attention?" Results show that there were significant differences in CDA and TAS measured before and after cardiac surgery. These findings are consistent with the medical literature that has documented cognitive deficits following cardiac surgery, especially in complex attentional mechanisms.

The change in attention in this sample demonstrated a decline in the measures of Digit Span Backward, Symbol Digit Modalities Test, and Trail Making Test, Part A. However, there was no change in the measure of Digit Span Forward pre- to postsurgery. The Digit Span Forward test measures the efficiency of attention, which Lezak (1995) refers to as freedom from distractibility. Sample performance on DSF fell within the normal range (6 ± 1 digit) before and after surgery (Lezak, 1995). An explanation for the stability of DSF in this sample is that it requires the least effort of the attentional

mechanisms to maintain. Studies suggest that with aging, forward span stays stable while reversed (backward) span shrinks (Lezak, 1995).

The Digit Span Backward test involves mental double-tracking. The brain must simultaneously remember and double-track. DSB is sensitive to brain compromise; Lezak (1995) states that generally we can expect the more severe the brain lesion, the fewer digits can be recalled. In this study, the mean preoperative DSB was 4.66. The mean of postoperative DSB was 4.33, reflecting a 7% decline in the DSB score. Raw scores of 4 to 5 are considered within normal limits (Lezak, 1995).

The Symbol Digit Modalities Test assesses complex scanning and visual tracking. Test norms for the written version are as follows: ages 55 – 64, mean of 41.5 ($\pm$ 8.6); ages 65 – 74, mean of 37.4 ($\pm$ 11.4) (Lezak, 1995). The postoperative measure mean for this sample was 31.73, a 22.3% decline from the preoperative sample mean of 40.85.

Trail Making Test, Part A is considered to be a measure of attention highly sensitive to brain injury. It involves visual scanning, tracking, and as a motor component (subjects must connect a series of 25 dots using a pencil). Age and education play a role in performance of both the SDMT and Trail Making Test, Part A. Trail Making Test, Part A is a measure of speed in processing. The mean time for the sample during preoperative performance of Trail Making Test, Part A was 37.85 seconds. On postoperative Day 4, the sample mean of 58.35 on Trail Making Test, Part A demonstrated a 32.1 % decline from the preoperative measure.

A set of criteria to define "abnormality" or decline in cognitive performance in the cardiac surgery population has been defined in the medical literature as a negative change from a baseline of 0.5 SD in one or more cognitive domains, a 1 SD decline in

any three cognitive tests, or a 20% drop in performance on any test (Selnes, Grega, Borowicz, Royall, McKhann & Baumgartner, 2003). Applying the criterion of 20% decline in any test means that this study sample met at least one criterion that determines cognitive "abnormality" in the coronary artery bypass surgery population. The extent of attentional postoperative decline in this study sample provides evidence that input is not processing effectively; this study group is compromised in complex attentional mechanisms.

The findings from this study validate the findings of studies previously reported in the literature which investigated the extent of cognitive compromise in the cardiac surgery population in the immediate postoperative recovery period (Raymond, Conklin, Schaffer, Newstadt, Matloff, & Gray, 1984; Dumas et al., 1999; Towne et al., 1989; Savageau et al., 1982; Sotaniemi et al., 1986; Newman et al., 2001). Estimates of the incidence of neuropsychological morbidity range from 12% to 79% in the cardiac surgery population (Newman, 1995). This is consistent with the findings of studies that have shown that coronary artery disease may be associated with significantly lower performance in some cognitive domains (Selnes, Grega, Borowicz, Royall, McKhann, & Baumgartner, 2003).

Persons who are in a divided attentional state have difficulty processing information. Findings from this and other studies provide compelling evidence that the ability of CABG surgery patients to process discharge teaching information is compromised.

The Relationship Between Physiological Factors and Capacity to Direct Attention

The second research question asked, "What is the relationship between physiological factors (i.e., fatigue, pain, oxygenation saturation, length of anesthesia, whether the procedure was done on or off the bypass pump, length of time on the bypass pump, hours since analgesia, body temperature, serum potassium, calcium, sodium, albumin, hemoglobin, hematocrit and platelet count, hydration and nutrition status, ambulatory status, length of time since analgesia administration, and the presence of sustained dysrhtymias) and the capacity to direct attention following the CABG procedure?" Of the physiological variables studied, length of anesthesia was the only variable that significantly correlated with CDA and TAS. However, hours since analgesia significantly correlated with postoperative SDMT. The remaining physiological variables (fatigue, pain, hours since analgesia, body temperature, oxygen saturation, and length of time on the bypass pump) were not statistically significantly correlated with declines in CDA and TAS.

The relationship Between Psychological Factors and Capacity to Direct Attention

The third research question asked, "What is the relationship between psychological factors (i.e., anxiety, self-efficacy, depression, and the registration and recall subsets of the Folstein Mini-mental State questionnaire) and the capacity to direct attention following CABG procedure?" In this study, there was no change from the preadmission testing unit measure to the postoperative measures of memory (recognition

and recall from the MMS questionnaire). This was likely due to the use of the same group of stimulus words during preoperative and postoperative measurement. However, there is evidence in the literature that memory and global cognitive function are affected after cardiac surgery, with peak decline occurring at discharge (Newman et al., 2001).

The findings of this study are consistent with past studies demonstrating the presence of anxiety and depression in postoperative cardiac surgery patients and showing that a relationship exists between anxiety and depression in the cardiac surgery population (McCrone et al., 2001; Timberlake et al., 1997). In the present study, anxiety and depression were significantly correlated; however, these variables did not correlate significantly with postoperative CDA and TAS.

Anxiety and depression levels persist throughout the initial recovery phase (Duits et al., 1998). It has been suggested that self-reported anxiety and depression are not true indicators of actual anxiety and depression experienced by the patient because of the use of denial as a coping mechanism (Vingerhoets, DeSoete, & Jannes, 1995).

Findings of a study of 170 CABG surgery patients indicate there is little relation between objective cognitive performance and perceived cognitive abilities. Postoperative CABG depression and anxiety were significantly related to a perceived decline in cognitive ability. The recommendation was made to include interventions to improve mood, thereby improving cognitive ability (Khatri et al., 1999).

In this study, self-efficacy was significantly positively correlated with the attention measure SDMT. Although the literature does not specifically link self-efficacy with greater attentional functioning in the CABG surgery population, Bandura (1989) suggests that cognitive processes (e.g., thought processes) relate to perceived self-

efficacy. The study by Carroll (1995) of 133 adults who experienced CABG surgery lent support to the theory that self-efficacy expectations act as a mediator between self-care agency and self-care/recovery behavior. Clark and Dodge (1999) studied 570 older women with cardiac disease and found self-efficacy was a predictor of disease management. It is yet unclear, in this cognitively compromised group 4 days after cardiac surgery, to what extent efficacy expectations can be influenced by differing sources of efficacy information during discharge instruction (Bastable, 2003).

The Relationship Between Situational Factors and Capacity to Direct Attention

The fourth research question asked, "What is the relationship between situational factors (i.e., social support, discharge plans, and perception of the physical environment) and the capacity to direct attention following CABG procedure?" In this study, social support did not correlate significantly with the measures of attention. Previous research relating social support to outcomes of cardiac surgery has not examined the variable attention within the context of cognitive compromise. In this sample, there was a high level of agreement (79.5%) between the patient's perception of discharge and the hospital's plans for discharge. Overall perceptions of the physical environment were positive. In addition, years of formal education were significantly positively correlated with CDA. This finding is consistent with reports in the literature that link higher education levels to improved cognitive function (Lezak, 1995).

The fifth research question asked, "To what extent do physiological, psychological and situational factors predict the capacity to direct attention?" When the situational variables age and social support were entered into a regression analysis, they accounted for 22% of the variance in preoperative attention. The physiological and psychological variables anxiety, fatigue, hours since analgesia, pain, self-efficacy, hours on anesthesia, and preoperative attention accounted for 60% of the variance in postoperative attention.

In a recent study, researchers compared the cognitive performance at 3 and 12 months after CABG with those of a control group with comparable risk factors and coronary artery disease. Findings demonstrated that neuropsychological performance of patients who underwent CABG did not differ from that of the nonsurgical group (control) at 3 months or 1 year after baseline examination. The relationship between coronary artery disease and cognitive performance in older adults is documented (Selnes et al., 2003). These studies may explain the finding of this study where the preoperative attention explained the greatest variance in the postoperative attention score.

Conclusions

In the present study, coronary artery bypass graft surgery patients demonstrated significant evidence of decline in attentional mechanisms when compared with preoperative measures. The measures SDMT and Trail Making Test, Part A were the most sensitive to the decline in attention. This study validates previous studies

demonstrating that the postoperative cardiac surgery population is cognitively compromised during hospitalization.

Of the physiological, psychological, and situational factors studied, self-efficacy, length of anesthesia, and years of formal education were significantly related to capacity to direct attention. As the years of education increased, the ability to attend increased. Paradoxically, length of anesthesia was positively related to capacity to direct attention 4 days after surgery.

Findings of this study also indicate there is no one factor or combination of factors that easily or readily inform nurses of a patient's cognitive decline during hospitalization after CABG surgery. Cognitive changes are subtle, and the assessments of physiological parameters or symptoms were not related to cognitive compromise.

Ancillary findings

Of interest is the number of participants (eight) who cited fatigue as the reason for refusing to continue participation in this study. These participants were approached on Day 4 after surgery, a time when nurses are preparing these patients for discharge. The reluctance to continue in this study as a result of fatigue has meaning in relation to a person's readiness to engage in dialogue and mental activity. Since fatigue is a persistent symptom in the cardiac surgery population, occurring during and after hospital discharge (Redeker, 1993), it must be factored into the educational program during and after hospital discharge. Moore (1995) did not find any relationship between fatigue and activity level; therefore, nurses cannot rely on activity level as an indicator of fatigue. Future studies are needed to explore the negative impact of fatigue on readiness to learn in the recovering cardiac surgery patient.

In this study, no significant differences in the pre- and postoperative total attention scores were found between patients who experienced the surgery on the pump (n = 25) and those who did not (n = 16). Also, there was no significant difference in function between the under 65 and over 65 groups.

The middle-range theory of unpleasant symptoms (Lenz et al., 1997) was used to frame this study. This theory provided a useful model to explore the relationships between physiological, psychological, and situational factors and the unpleasant symptoms of pain and fatigue in the hospitalized cardiac surgery population. As this study unfolded, it was unclear if pain and fatigue were to be considered as unpleasant symptoms or physiological factors. Further work is needed to quantify the situational factors and relate them to impact on function, specifically cognitive function. In a previous study using the theory of unpleasant symptoms, Hutchinson and Wilson (1998) speculated that symptoms might not be mutually exclusive of psychological, situational or physiological factors and/or performance outcome. Indeed, there is evidence that cognitive function can play a role in self-efficacy perception.

Limitations

This descriptive study was planned for a larger group of subjects. While the original research questions remained unchanged, in the course of data collection issues with participant recruitment forced the researcher to evaluate the number of participants and modify the plan for data analysis. The initial plan called for the recruitment of 107 individuals who were awaiting CABG surgery. This plan was not possible, as the number of individuals available to participate over a period of 1 1/2 years was substantially less.

While 107 individuals were sought, it became clear after 12 months that it would take significantly longer to recruit the desired number of participants. One third of the

potential participants refused to participate, thereby lengthening the sample recruitment period. It was not possible to predict this refusal to participate prior to the inception of the study.

Since the desired sample size was unattainable, a limitation is the sample size. Therefore, caution is advised when interpreting these results. Also, the sample may not be representative of the population in that patients had a role in deciding whether they would participate in the study. The Appendix contains information regarding reasons for refusal to participate.

Also, the environment in which patients participated in the study differed. The rooms in the PAT units were single occupancy; therefore it was possible to control the noise level. In contrast, most of the participants on the cardiac step-down units were in double-occupancy rooms in which the noise level was generally higher and there were interruptions. Although this level of noise and interruption was expected in the clinical environment, it may have had an impact on the results of the cognitive measures. However, this is the clinical environment in which patient teaching occurs prior to discharge.

Implications for Nursing Practice

The findings from this study indicate that nurses cannot assess the extent of cognitive compromise by commonly used mental measurement assessments, such as the MMS questionnaire. Therefore, commonly used mental assessment tools, symptoms of pain and fatigue, and physiological measures cannot fully predict the need to modify patient education nursing practice protocols.

Because CDA plays a seminal role in cognition, a compromise in CDA can result in how memory systems function and consequently how a person learns (Boss, 1993;

Jansen & Keller, 1998). This will influence the ability of these patients to learn through the use of written material, published documents, and the spoken word. Therefore, there are implications for the process and content of the preparation for CABG patients being readied for discharge.

Jansen and Keller (1998) suggest taking two approaches to counter attentional fatigue. The first approach is to reduce the amount of demand on the attentional mechanism. The second is to restore attentional functioning by resting and recovering capacity to direct attention.

Protocols for postoperative CABG surgery patient education should include a change in content and process used to deliver patient education in the immediate recovery phase. Teaching sessions should be brief; breaking sessions into small chunks is recommended. Competing stimuli, such as noise, should be eliminated. Patient anxiety and pain should be managed prior to any teaching session. The teaching sessions should be scheduled at times when the patient is most rested (e.g., after a nap or when feeling refreshed). Patient education sessions should provide for pauses within statements and a slow pace (both in words and statements) — but not an excessively slow pace. Breaks should be provided to allow for attentional mechanisms to recover. Intentional repetition of key information is useful. The type and amount of educational materials offered at any one time should be limited. For example, "single channel" information sources should be used rather than multiple channel sources (Brewer, 2003) by providing either visual or auditory stimuli at one time, rather than both.

Since postoperative cognitive performance may be significantly compromised, nurses must partner the patient with a family member, significant other, or caretaker in

the discharge teaching sessions. Consider developing a different, but complementary, package of learning materials for the patient and the family member. The readability level and the presentation of the discharge materials developed for the patient should be verified for suitability for this cognitively compromised population. For example, simple instructions with small amounts of information on each page have demonstrated utility in the brain-injured population (Bastable, 2003).

Information regarding the experience of cognitive compromise in the immediate postoperative recovery phase should be shared with patients and significant others. Patients should be informed of potential problems with recall and a sense of mental slowing. Informing patients and significant others that this is an expected, and in some cases temporary, outcome of heart surgery, decreases worry and anxiety about loss of memory and cognitive function, and help them to cope with recovery. This information should be included as part of the formal discharge preparation protocol (Raymond et al., 1984).

Although this is a limited study, it has clinical significance in that results indicate that nurses who work with this population will not be able to rely on common physiological assessment parameters to predict cognitive compromise. Because the cognitive change is subtle, nurses should assume the presence of compromised cognition and a limited ability to attend during patient teaching sessions.

Implications for Nursing Education

Curricula in schools of nursing should include information about the extent of cognitive compromise existing in the cardiac surgery population. Of benefit to nurses is the knowledge that for many patients, cognition is affected for months to years after experiencing this surgery. Textbooks should include this information as well as

information related to the modifications in teaching protocols that support optimal patient teaching outcomes (see above).

Implications For Nursing Research

The preponderance of evidence shows that at the time of discharge, CABG surgery patients are cognitively compromised; an incidence of up to 80 – 90% (Mark & Newman, 2002) was found. Although the medical literature has extensively documented the extent of cognitive decline and the persistence of this decline in 42% of the postoperative cardiac surgery population 5 years after surgery (Newman et al., 2001), nurses have not fully explored the implications of this phenomenon in relation to the care of the recovering CABG surgery patient.

This sample reflected a group free of surgical complications and on an expected recovery trajectory. It would be useful to repeat the study with a larger sample size that includes valve surgery patients, who are more likely to experience complications such as atrial fibrillation. Also, repetition of the study to determine if the clinical environment has a significant impact on the function of attentional mechanisms would be valuable. Exploring the efficacy of a rapid readiness to learn assessment in the cardiac surgery population would assist nurses in determining readiness to learn in individual patients. The efficacy of measures to restore attention or diminish attentional fatigue (conserve attentional capacity) in the cardiac surgery population (intervention study) would provide nurses with the information needed to counter the cognitive compromise evident in this postoperative cardiac surgery population during patient teaching sessions. Further, the efficacy of interventions to improve depressive mood and the capacity to direct attention needs to be explored.

A study of 26 CABG surgery patients documented that after receiving a standard patient education intervention consisting of handouts, videotapes, diet instruction, and cardiac rehabilitation teaching, the majority of patients scored at a minimum to basic level of understanding on a knowledge subscale (Sampson & Doran, 1998). However, evidence exists that after discharge, CABG surgery patients do not recall the hospital-based patient education (McNamee & Wallis, 1999). Exploration is needed regarding level of pain, time since analgesia, CDA, and learning outcomes. An exploration of the relationships between CDA, self-efficacy, and performance on a discharge readiness test and functional status (e.g., ambulatory status) is needed. Researchers are advised to avoid the use of self-report of perceptions of cognitive compromise. It is recommended that neuropsychological measures such as SDMT and Trail Making Test, Part A (which in this study were the most sensitive measures of attention), be used in future studies.

Summary

This descriptive correlational study was designed to explore relationships between physiological, psychological, and situational factors and the capacity to direct attention in CABG surgery patients 4 days after surgery. Findings were indicative of cognitive compromise specifically in complex attentional mechanisms on Day 4 after cardiac surgery. As a physiologically stable group, the study sample was being readied for discharge on postoperative Day 4 or 5 when anxiety and depression levels are elevated, and anesthesia is related to cognitive decline. Self-report of pain and fatigue levels was not related to attentional function.

These findings may contribute to nurses' understanding of the ability of patients to engage in the discharge teaching process on Day 4 after cardiac surgery.

Recommendations are that patient education protocols be modified to accommodate the extent of cognitive compromise that exists in this sample and is evidenced in other studies. For example, the recommendation was made to alter the mode of delivery, the presentation of the materials, and the environment in which patient education occurs.

APPENDICES

APPENDIX A

LETTER TO PARTICIPANTS

May 7, 2002

Dear Sir or Madam:

I am a doctoral student in a graduate-nursing program at the University of Massachusetts. I have worked many years as a nurse taking care of patients who have had heart surgery at Albany Medical Center Hospital. I am asking you to become part of a research study that will be taking place at Albany Medical Center Hospital. The study will involve people who are experiencing heart bypass surgery. The purpose of this study is to learn more about what factors affect a heart surgery patient's ability to concentrate after surgery while hospitalized.

If you agree to participate the study will be explained in more detail and you will be asked to sign a consent form and fill out a questionnaire. Also at this time you will be asked to complete a few brief tests of your ability to concentrate. Your nurse and/or I would approach you again while you are recovering on the nursing care unit 4 days after surgery. At this time we will ask you a few questions and ask you to fill out a few short questionnaires asking about how you feel about such things as your fatigue, pain and your ability to do activities such as walk.

I hope you will consider participating. Please call me if you have any questions or concerns. You can reach me in the local area by telephone at (518) 279-9200. If you prefer, you can reach me by email at mstaplet@excelsior.edu.

Sincerely,

Marilyn Stapleton

Marilyn Stapleton, RN

APPENDIX B

CONSENT FORMS

ALBANY MEDICAL CENTER HOSPITAL
ALBANY, NY 12208

PERMISSION FOR CLINICAL RESEARCH INVESTIGATION

Title of Study: Predictors of Capacity to Direct Attention in Cardiac Surgery Patients

Approved by the Scholarship and Human Subjects Review Committee of the

University of Massachusetts Amherst School of Nursing _____.

Principal Investigator: Marilyn Stapleton, MS, RN, C

Sponsor: University of Massachusetts, Amherst, School of Nursing

We invite you to take part in a research study because you are to undergo heart surgery and can read and write English.

What You Should Know About a Research Study

We give you this consent form so that you may read about the purpose, risks and benefits of this research study. Routine care is based upon the best known treatment and is provided with the main goal of helping the individual patient. The main goal of research studies is to gain knowledge that may help future patients.

We cannot promise that this research will help you. There are no known risks or benefits to participating in this research study. You have the right to refuse to take part now or any time in the future during your hospitalization. Whatever you decide, it will not affect your regular care.

Please review this consent form carefully and ask any questions before you make a decision. Your participation is voluntary.

1. Why is This Research Being Done?

During your hospital stay the nurses will be providing you with information about how to care for yourself when you leave the hospital. We want to know how well patients concentrate on the information for reasons such as being tired, being in pain, taking medications and being in an unfamiliar place.

NOTE: Do not sign the consent form if the expiration stamp is missing or the consent has expired.

AUG 20 2002

EXPIRES
AUG 19 2003
ALBANY MEDICAL COLLEGE
INSTITUTIONAL REVIEW BOARD (IRB)

2. What is the Purpose of This Study?

The purpose of this study is to learn more about what factors affect a heart surgery patient's ability to concentrate while hospitalized. This will help caregivers better understand the effect of surgery on a persons ability to concentrate.

3. Who Is Doing the Study?

Marilyn Stapleton, MS, RN, C, a graduate student from the University of Massachusetts, Amherst, directs this study. We expect about 126 people from Albany Medical Center Hospital will be in the study. The Albany Medical Center Hospital is the only place we will ask people to participate. The study will go on until 126 people agree to participate.

4. What Will Happen To You If You Take Part In This Study?

Your expected total time in the study is one and one half-hours. The expected time during the first part is 30 minutes (today in the Preadmission Testing unit); the second part (while you are on the hospital nursing care unit) will take approximately one hour.

There are five questionnaires and five tests of ability to concentrate. If you agree to participate, you will be asked to sign this consent form and fill out the first questionnaire today and respond to brief tests that help us understand your ability to concentrate.

On your fourth day after surgery, while you are on the nursing care unit, a nurse will approach you in the afternoon or early evening and ask you to fill out three of the remaining questionnaires. Marilyn Stapleton will ask you to rate your pain on a scale from 0-10, fill out the last questionnaire and then ask you to respond to tests that help us understand your ability to concentrate. One of the tests of concentration is a single page where there are numbered circles. You will be asked to connect the circles in order. You will be asked to respond to questions about your discharge plans and your perception of the physical environment.

Your participation will include reading and using information that is kept in your hsopital medical record. This information will include: the type of surgery you undergo, the length of anesthesia, results of your bloodwork, your body temperature and what nurses say about what you are eating.

There are no experimental procedures associated with this study.

NOTE: Do not sign the consent form if the expiration stamp is missing or the consent has expired.

AUG 2 0 2002

EXPIRES
AUG 1 9 2003
ALBANY MEDICAL COLLEGE
INSTITUTIONAL REVIEW BOARD (IRB)

5. What Are the Possible Risks and Discomforts?

There are no known risks associated with this research study. However, it is possible that you may become tired during or after the time you fill in the questionnaires. If this happens you may want to rest and then continue.

6. What are the Possible Benefits?

There are no medical benefits to you from taking part in the study.

7. If You Do Not Want to Take Part In The Study, Are There Other Choices?

No, if you do not want to take part in this study it means you will receive the regular care during your hospital stay.

8. If You Have Questions or Problems, Whom Can You Call?

If you have any questions about this research now or later, or, if you think you have had a research-related injury, you should contact Marilyn Stapleton at 49 Grange Rd, Troy, NY, or call the telephone number (518) 279-9200. If you cannot reach her, or, if you have questions about your rights as a research subject, you may call Albany Medical College, Office for Research at (518) 262-5182.

9. What Information Will Be Kept Private?

We will keep any information from your hospital medical record and all research records that would identify you private, to the extent allowed by law. Only Albany Medical Center staff and the investigator will have access to your records. Results of this study may be published; however, we will keep your name and any other identifying information private.

10. Can Your Taking Part In The Study End Early?

You may withdraw from the study at any time. There is no negative effect from withdrawing from this study. Marilyn Stapleton or Debra Levy RN, a nurse on the hospital unit, can withdraw you from the study. A possible reason for withdrawal could be that your recovery period becomes longer than expected or that your medical condition prevents you from participating. We will provide you with any information that becomes available during the study that might affect your decision to stay in the study.

NOTE: Do not sign the consent form if the expiration stamp is missing or the consent has expired.

AUG 2 0 2002

EXPIRES
AUG 1 9 2003
ALBANY MEDICAL COLLEGE
INSTITUTIONAL REVIEW BOARD (IR

11.What Else Do You Need To Know?

There is no charge associated with this study. Neither you nor your insurance company will pay any money. If you agree to participate in this study, we will not pay you for your time.

Although it is not anticipated, if you incur an injury as a result of being in the study, emergency care will be available. Albany Medical Center Hospital does not have any policy to pay you if you have an injury or other bad effects because of the study.

We will give you a copy of this consent form.

NOTE: Do not sign the consent form if the expiration stamp is missing or the consent has expired.

AUG 2 0 2002

EXPIRES
AUG 1 9 2003
ALBANY MEDICAL COLLEGE
INSTITUTIONAL REVIEW BOARD (IRB

Research Subject Approval

SIGNATURE_____DATE_____

NAME_____
(print or type)

Address_____

Consent form administered and explained in person by:

SIGNATURE_____DATE_____

NAME AND TITLE_____

SIGNATURE OF WITNESS: (if required)

SIGNATURE_____

SIGNATURE (when on the patient care unit)

_____ Date_____

Consent form administered and explained in person by:

SIGNATURE_____DATE_____

NAME AND TITLE_____

SIGNATURE OF WITNESS: (if required)

SIGNATURE_____

NOTE: Do not sign the consent form if the expiration stamp is missing or the consent has expired.

AUG 2 0 2002

EXPIRES
AUG 1 9 2003
ALBANY MEDICAL COLLEGE
INSTITUTIONAL REVIEW BOARD (IRB)

ELLIS HOSPITAL
CONSENT FORM

PERMISSION FOR CLINICAL RESEARCH INVESTIGATION

Title of Study: Predictors of Capacity to Direct Attention in Cardiac Surgery Patients

Approved by the Scholarship and Human Subjects Review Committee of the University of Massachusetts, Amherst, School of Nursing through October 1, 2003

Principal Investigator: Marilyn Stapleton, MS, RN, C

Sponsor: University of Massachusetts, Amherst, School of Nursing

We invite you to take part in a research study because you are to undergo heart surgery and can read and write English.

What You Should Know About a Research Study

We give you this consent form so that you may read about the purpose, risks and benefits of this research study. Routine care is based upon the best known treatment and is provided with the main goal of helping the individual patient. The main goal of research studies is to gain knowledge that may help future patients.

We cannot promise that this research will help you. There are no known risks or benefits to participating in this research study. You have the right to refuse to take part now or any time in the future during your hospitalization. Whatever you decide, it will not affect your regular care.

Please review this consent form carefully and ask any questions before you make a decision. Your participation is voluntary.

1. Why is This Research Being Done?

During your hospital stay the nurses will be providing you with information about how to care for yourself when you leave the hospital. We want to know how well patients concentrate on the information for reasons such as being tired, being in pain, taking medications and being in an unfamiliar place.

2. What is the Purpose of This Study?

The purpose of this study is to learn more about what factors affect a heart surgery patient's ability to concentrate while hospitalized. This will help caregivers better understand the effect of surgery on a persons' ability to concentrate.

3. Who Is Doing the Study?

Marilyn Stapleton, MS, RN, C, a graduate student from the University of Massachusetts, Amherst, directs this study. We expect about a total of 126 people from both Ellis Hospital and Albany Medical Center Hospital will be in the study. The study will go on until 126 people agree to participate.

4. What Will Happen To You If You Take Part In This Study?

Your expected total time in the study is one and one half-hours. The expected time during the first part is 30 minutes (today in the Preadmission Testing unit); the second part (while you are on the hospital nursing care unit) will take approximately one hour.

There are five questionnaires and five tests of ability to concentrate. If you agree to participate, you will be asked to sign this consent form and fill out the first questionnaire today and respond to brief tests that help us understand your ability to concentrate.

On your fourth day after surgery, while you are on the nursing care unit, a nurse will approach you in the afternoon or early evening and ask you to fill out three of the remaining questionnaires. Marilyn Stapleton will ask you to rate your pain on a scale from 0-10, fill out the last questionnaire and then ask you to respond to tests that help us understand your ability to concentrate. One of the tests of concentration is a single page where there are numbered circles. You will be asked to connect the circles in order. You will be asked to respond to questions about your discharge plans and your perception of the physical environment.

Your participation will include reading and using information that is kept in your hospital medical record. This information will include: the type of surgery you undergo, the length of anesthesia, results of your bloodwork, your body temperature and what nurses say about what you are eating.

There are no experimental procedures associated with this study.

5. What Are the Possible Risks and Discomforts?

There are no known risks associated with this research study. However, it is possible that you may become tired during or after the time you fill in the questionnaires. If this happens you may want to rest and then continue.

6. What are the Possible Benefits?

There are no medical benefits to you from taking part in the study. This study will benefit other people by helping nurses and doctors learn about the ability of hospitalized patients to concentrate after heart surgery.

7. If You Do Not Want to Take Part In The Study, Are There Other Choices?

No, if you do not want to take part in this study it means you will receive the regular care during your hospital stay.

8. If You Have Questions or Problems, Whom Can You Call?

If you have any questions about this research now or later, or, if you think you have had a research-related injury, you should contact Marilyn Stapleton at 49 Grange Rd, Troy, NY, or call the telephone number (518) 279-9200. You can also contact Dr. DePan by calling (518) 243-3610 or the Ellis Hospital Institutional Review Board Chairperson, Nancy Wells, at (518) 243-4197.

9. What Information Will Be Kept Private?

We will keep any information from your hospital medical record and all research records that would identify you private, to the extent allowed by law. Only Ellis Hospital staff and the investigator will have access to your records. Results of this study may be published; however, we will keep your name and any other identifying information private.

10. Can Your Taking Part In The Study End Early?

You may withdraw from the study at any time. There is no negative effect from withdrawing from this study. Marilyn Stapleton or your nurse on the hospital unit, can withdraw you from the study. A possible reason for withdrawal could be that your recovery period becomes longer than expected or that your medical condition prevents you from participating. We will provide you with any information that becomes available during the study that might affect your decision to stay in the study.

11. What Else Do You Need To Know?

There is no charge associated with this study. Neither you nor your insurance company will pay any money. If you agree to participate in this study, we will not pay you for your time.

Although it is not anticipated, if you incur an injury as a result of being in the study, emergency care will be available. We will give you a copy of this consent form.

Research Subject Approval

SIGNATURE_____DATE_____

NAME_____
(print or type)

Address_____

Consent form administered and explained in person by:

SIGNATURE_____DATE_____

NAME AND TITLE_____

SIGNATURE OF WITNESS: (if required)

SIGNATURE_____

SIGNATURE (when on the patient care unit)

_____ Date_____

Consent form administered and explained in person by:

SIGNATURE_____DATE_____

NAME AND TITLE_____

SIGNATURE OF WITNESS: (if required)

SIGNATURE_____

APPENDIX C

UNIVERSITY OF MASSACHUSETTS AMHERST

SCHOOL OF NURSING

COMMITTEE ON SCHOLARSHIP AND

HUMAN SUBJECTS REVIEW APPROVAL

University of Massachusetts *Amherst*
School of Nursing

Scholarship and Human Subjects Review Committee

APPROVAL FORM FOR NURSING RESEARCH

Title of Study: **Predictors of Capacity to Direct Attention in Cardiac Surgery Patients**

Principal Investigator: **Marilyn Stapleton, MS, RN, C**

Date Submitted: **May 8, 2001**

The above named study has been reviewed for adherence to established guidelines (University and Federal) for the protection of the rights and welfare of human subjects and the following action taken:

1. X** The proposal meets the guidelines.

2. ____ In order to meet the guidelines, the following changes are required:

   a. ____ Resubmission is not needed.

   b. ____ Resubmission is needed.

3. ____ The proposal cannot be reviewed as submitted.

Chair, Scholarship and Human Subjects Review Committee

Member, Scholarship and Human Subjects Review Committee

8/28/01
Date

**A small edit is needed on page 8 in bolded area mid-page. The phrase in parentheses (those who are elective coronary artery bypass surgery) is incomplete and unclear. Resubmission is not necessary.

cc Principal Investigator
Faculty Advisor (if principal investigator is a student)
File

S&HSRC/mbb

University of Massachusetts Amherst

UMASS School of Nursing

MEMORANDUM

To: **Marilyn Stapleton**
From: Sandra A. Founds, Chair
Committee on Scholarship and Human Subjects Review
Date: September 20, 2002
Subject: Capacity to Direct Attention in Cardiac Surgery Patients

The Committee on Scholarship and Human Subjects Review met on September 18, 2002 and reviewed your request for an extension of Human Subjects Review approval. The Committee approved your request, noted your modifications and extended the expiration date to October 1, 2003. Good luck on your research and the Committee looks forward to hearing the results of this initiative.

Sandra Founds, CNM-FNP, PhD

EV/mbb

University of Massachusetts Amherst

UMASS School of Nursing

MEMORANDUM

To: **Marilyn Stapleton, MS, RN**
From: Sandra Founds, Chair, Scholarship & Human Subjects Review Committee
Date: March 6, 2003
Subject: Predictors of Capacity to Direct Attention in Cardiac Surgery Patients

The Committee on Scholarship and Human Subjects Review met on February 26, 2003 to discuss *Predictors of Capacity to Direct Attention in Cardiac Surgery Patients.* The Committee reviewed your letter of January 16, 2003 indicating an additional data collection site – Ellis Hospital in Schenectady, New York. We thank you for updating us and look forward to seeing the results of your study.

Sandra Founds

SAF/mbb

APPENDIX D

INSTITUTIONAL REVIEW BOARD APPROVALS

Ellis HOSPITAL

1101 Nott Street • Schenectady, New York 12308 Phone: (518) 243 4000 • www.ellishospital.org

December 3, 2002

Marilyn Stapleton
49 Grange Road
Troy, New York 12180

Re: Predictors of Capacity to Direct Attention in Cardiac Surgery Patients

Dear Ms. Stapleton:

Thank you for presenting the study "Predictors of Capacity to Direct Attention in Cardiac Surgery Patients" and the Informed Consent to the Institutional Review Board at their November 21, 2002 meeting.

The study is approved to begin January 2003 with an interim report due in June 2003.

I acknowledge receipt of the revised informed consent that was given to the IRB Secretary as requested.

As a reminder, no additional changes may be made to the above protocol without first submitting the changes to the IRB for approval. Any inquiries or unanticipated problems must also be promptly reported.

Thank you.

Sincerely,

Nancy L. Wells, MS RN
Chairperson
Institutional Review Board

ALBANY MEDICAL COLLEGE
COMMITTEE ON RESEARCH INVOLVING HUMAN SUBJECTS
NOTIFICATION OF EXPEDITED REVIEW APPROVAL
PROTOCOL CONTINUATION

Date of Approval: August 20, 2002

Interval of Approval: August 20, 2002 – August 19, 2003

Expiration Date of Approval: August 19, 2003

Principal Investigator: Marilyn Stapleton

Protocol Number/Title: Predictors of Capacity to Direct Attention in Cardiac Surgery Patients (Expedited Review Category 7)

The Committee on Research Involving Human Subjects has approved Continuation Approval of your research protocol (by Expedited Review under the Guidelines listed in 45 CFR 46.110) following careful review of your Progress Report.

Acceptance of this approval indicates your agreement to:

- Obtain legally effective informed consent in the manner reviewed and approved by the IRB.
- Abide by the policies and procedures of Albany Medical Center with regard to the use of human subjects in research.
- Keep a list of the names and addresses of all subjects studied.
- Keep on file the subjects' signed statements of consent.

Sincerely yours,

COMMITTEE ON RESEARCH INVOLVING HUMAN SUBJECTS

Dan R. Thompson, M.D., M.A.
IRB Chair

Rev. 5/02

ALBANY MEDICAL COLLEGE
COMMITTEE ON RESEARCH INVOLVING HUMAN SUBJECTS
NOTIFICATION OF EXPEDITED REVIEW APPROVAL

[ ] New Protocol

[X] Revision to Previously Approved Protocol

Date of Approval: 4/8/01

Principal Investigator: Marilyn Stapleton, MS, RNC

Protocol Number/ Title: Predictors of Capacity to Direct Attention in Cardiac Surgery Patients (minor change to protocol, revised consent)

The Committee on Research Involving Human Subjects has approved the above named research protocol (by Expedited Review under the Guidelines listed in 45 CFR 46.110) following careful review of your request.

Acceptance of this approval indicates your agreement to (1) obtain informed consent from your subjects (unless approved as an exempt study or approved with a waiver of the requirement for informed consent), (2) abide by the policies and procedures of the Albany Medical College with regard to use of human subjects in investigation, and (3) keep appropriate records concerning your subjects. If this is a new protocol, you will be called upon by the Committee at least annually for a report of the status of your project.

Sincerely yours,

COMMITTEE ON RESEARCH INVOLVING HUMAN SUBJECTS

Jeffrey A. Cooper, M.D.
IRB Chair

Sarah Evers Casey
Sarah Evers-Casey
IRB Staff Member

ALBANY MEDICAL COLLEGE
COMMITTEE ON RESEARCH INVOLVING HUMAN SUBJECTS
NOTIFICATION OF EXPEDITED REVIEW APPROVAL

[X] New Protocol Expedited Review Category 7

[ ] Revision to Previously Approved Protocol

Date of Approval: 9/4/01

Principal Investigator: Marilyn Stapleton MS, RN

Protocol Number/ Title: Predictors of Capacity to Direct Attention in Cardiac Surgery Patients

The Committee on Research Involving Human Subjects has approved the above named research protocol (by Expedited Review under the Guidelines listed in 45 CFR 46.110) following careful review of your request.

Acceptance of this approval indicates your agreement to (1) obtain informed consent from your subjects (unless approved as an exempt study or approved with a waiver of the requirement for informed consent), (2) abide by the policies and procedures of the Albany Medical College with regard to use of human subjects in investigation, and (3) keep appropriate records concerning your subjects. If this is a new protocol, you will be called upon by the Committee at least annually for a report of the status of your project.

Sincerely yours,

COMMITTEE ON RESEARCH INVOLVING HUMAN SUBJECTS

Sarah Evers-Casey
Sarah Evers-Casey

Jeffrey A. Cooper, M.D.
IRB Chair

Sarah Evers-Casey
Sarah Evers-Casey
IRB Staff Member

APPENDIX E

DATA COLLECTION INSTRUMENTS

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Pre-Admission Testing **Pre-Admission Date:** _____

Day 4 Date: _____

Mentation

Registration - Ask the patient if you may test his or her memory. Then say the names of three unrelated objects, clearly and slowly, about one second for each. After you have said all three, ask him or her to repeat them. This first repetition determines his or her score, (0-3) but keep saying them until he or she can repeat all three.

Score	⓪	①	②	③

Score	①	②	③	④	⑤	⑥

Recall "Recall three objects above:

Score	⓪	①	②	③

Attention Measures Results

Results of Digit Span Forward	⓪	①	②	③	④	⑤	⑥	⑦	⑧
Results of Digit Span Backward	⓪	①	②	③	④	⑤	⑥	⑦	

Results of Symbol Digit Modalities Test (0-110)		
⓪	⓪	⓪
①	①	①
②	②	②
③	③	③
④	④	④
⑤	⑤	⑤
⑥	⑥	⑥
⑦	⑦	⑦
⑧	⑧	⑧
⑨	⑨	⑨

Results of the Trail making Test, Part A					
(minutes)			(seconds)		
	●			●	
⓪	●	⓪	⓪	●	⓪
①	●	①	①	●	①
②	●	②	②	●	②
③	●	③	③	●	③
④	●	④	④	●	④
⑤	●	⑤	⑤	●	⑤
⑥	●	⑥	⑥	●	⑥
⑦	●	⑦	⑦	●	⑦
⑧	●	⑧	⑧	●	⑧
⑨	●	⑨	⑨	●	⑨

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Social Support Survey - People sometimes look to others for companionship, assistance, or other types of support. How often is each of the following kinds of support available to you if you need it by filling in the circle.

	None of the time	A little of the Time	Some of the time	Most of the time	All of the time
Emotional/informational support					
Someone you can count on to listen to you when you need to talk	①	②	③	④	⑤
Someone to give you information to help you understand a situation	①	②	③	④	⑤
Someone to give you good advice about a crisis	①	②	③	④	⑤
Someone to confide in or talk to about yourself or your problems	①	②	③	④	⑤
Someone whose advice you really want	①	②	③	④	⑤
Someone to share your most private worries or fears with	①	②	③	④	⑤
Someone to turn to for suggestions about how to deal with a personal problem	①	②	③	④	⑤
Someone who understands your problems	①	②	③	④	⑤
Tangible Support					
Someone to help you if you were confined to bed	①	②	③	④	⑤
Someone to take you to the doctor if you needed it	①	②	③	④	⑤
Someone to prepare your meals if you were unable to do it by yourself	①	②	③	④	⑤
Someone to help with daily chores if you were sick	①	②	③	④	⑤

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

	None of the time	A little of the Time	Some of the time	Most of the time	All of the time
Affectionate support					
Someone who shows you love and affection	①	②	③	④	⑤
Someone to love and make you feel wanted	①	②	③	④	⑤
Someone who hugs you	①	②	③	④	⑤
Positive social interaction					
Someone to have a good time with	①	②	③	④	⑤
Someone to get together with for relaxation	①	②	③	④	⑤
Someone to do something enjoyable with	①	②	③	④	⑤
Additional item					
Someone to do things with to help you get your mind off of things	①	②	③	④	⑤

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

ANXIETY - Please rate the following statements according to how you feel right now by filling in the circle.

A. I feel more nervous than usual:

None of the Time | Some of the time | Half of the time | Most of the time | All of the time

○ ○ ○ ○ ○

B. I get irritable over small matters:

None of the Time | Some of the time | Half of the time | Most of the time | All of the time

○ ○ ○ ○ ○

C. I get upset easily:

None of the Time | Some of the time | Half of the time | Most of the time | All of the time

○ ○ ○ ○ ○

D. I feel tense:

None of the Time | Some of the time | Half of the time | Most of the time | All of the time

○ ○ ○ ○ ○

E. I am jittery:

None of the Time | Some of the time | Half of the time | Most of the time | All of the time

○ ○ ○ ○ ○

F. I can't sit still:

None of the Time | Some of the time | Half of the time | Most of the time | All of the time

○ ○ ○ ○ ○

G. I have difficulty getting a good night's sleep

None of the Time | Some of the time | Half of the time | Most of the time | All of the time

○ ○ ○ ○ ○

H. I have nightmares:

None of the Time | Some of the time | Half of the time | Most of the time | All of the time

○ ○ ○ ○ ○

I. I feel more anxious than usual:

None of the Time | Some of the time | Half of the time | Most of the time | All of the time

○ ○ ○ ○ ○

Code Number:

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Mood

This questionnaire is designed to help your nurse know how you feel. Read each item and fill in the circle of the reply which is closest to how you have been feeling in the past week.

Don't take too long over your replies; your immediate reaction to each item will probably be more accurate then a long thought out response.

I still enjoy the things I used to enjoy:

- O Definitely as much
- O No quite so much
- O Only a little
- O Hardly at all

I can laugh and see the funny side of things:

- O As much as I always could
- O Not quite so much now
- O Definitely not so much now
- O Not at all

I feel cheerful

- O Not at all
- O Not often
- O Sometimes
- O Most of the time

I feel as if I am slowed down:

- O Nearly all the time
- O Very Often
- O Sometimes
- O Not at all

I have lost interest in my appearance:

- O Definitely
- O I don't take so much care as I should
- O I may not take quite as much care
- O I take just as much care as ever

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Mood continued

I look forward with enjoyment to things:

- O As much as I ever did
- O Rather less than I used to
- O Definitely less than I used to
- O Hardly at all

I can enjoy a good book or radio or TV program:

- O Often
- O Sometimes
- O Not often
- O Very seldom

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Self-Efficacy - Indicate the extent to which you agree or disagree with each item regarding your confidence in your abilities right now following heart surgery by filling in the circle.

I am confident that:	0 Strongly Disagree	1 Disagree	2 Neutral	3 Agree	4 Strongly Agree
1. I could/can walk around inside my room confidently.	⓪	①	②	③	④
2. I could walk in the hallway easily.	⓪	①	②	③	④
3. I could/can get into or out of the shower easily.	⓪	①	②	③	④
4. I could get assistance from others if I need it.	⓪	①	②	③	④
5. I could/can straighten up my bed area or room if I need to.	⓪	①	②	③	④
6. My incision(s) is healing normally.	⓪	①	②	③	④
7. I can deal with the discomforts I am having from my surgery.	⓪	①	②	③	④
8. I can deal with my emotional ups and downs since my surgery.	⓪	①	②	③	④
9. I can accept help if I need it.	⓪	①	②	③	④

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

FATIGUE - Please answer the following questions according to how you feel right now by filling in the circle

A. Do you have problems with tiredness?

Better than usual | No more than usual | Worse than usual | Much worse than usual

○ ○ ○ ○

B. Do you need to rest more?

Better than usual | No more than usual | Worse than usual | Much worse than usual

○ ○ ○ ○

C. Do you feel sleepy or drowsy?

Better than usual | No more than usual | Worse than usual | Much worse than usual

○ ○ ○ ○

D. Do you have problems starting things?

Better than usual | No more than usual | Worse than usual | Much worse than usual

○ ○ ○ ○

E. Do you start things without difficulty but get weak as you go on?

Better than usual | No more than usual | Worse than usual | Much worse than usual

○ ○ ○ ○

F. Are you lacking in energy?

Better than usual | No more than usual | Worse than usual | Much worse than usual

○ ○ ○ ○

G. Do you have less strength in your muscles?

Better than usual | No more than usual | Worse than usual | Much worse than usual

○ ○ ○ ○

H. Do you feel weak?

Better than usual | No more than usual | Worse than usual | Much worse than usual

○ ○ ○ ○

I. Do you have difficulty concentrating?

Better than usual | No more than usual | Worse than usual | Much worse than usual

○ ○ ○ ○

Code Number:

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Fatigue continued

J. Do you have problems thinking clearly?

Better than usual	No more than usual	Worse than usual	Much worse than usual
O	O	O	O

K. Do you make slips of the tongue when speaking?

Better than usual	No more than usual	Worse than usual	Much worse than usual
O	O	O	O

L. Do you find it more difficult to find the correct word?

Better than usual	No more than usual	Worse than usual	Much worse than usual
O	O	O	O

M. How is your memory?

Better than usual	No more than usual	Worse than usual	Much worse than usual
O	O	O	O

N. Have you lost interest in things you used to do?

Better than usual	No more than usual	Worse than usual	Much worse than usual
O	O	O	O

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑤	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Day 4 Post Operative

Mentation

Registration - Ask the patient if you may test his or her memory. Then say the names of three unrelated objects, clearly and slowly, about one second for each. After you have said all three, ask him or her to repeat them. This first repetition determines his or her score, (0-3) but keep saying them until he or she can repeat all three.

Score	⓪	①	②	③

Score	①	②	③	④	⑤	⑥

Recall "Recall three objects above:

Score	⓪	①	②	③

Attention Measures Results

Results of Digit Span Forward	⓪	①	②	③	④	⑤	⑥	⑦	⑧
Results of Digit Span Backward	⓪	①	②	③	④	⑤	⑥	⑦	

Results of Symbol Digit Modalities Test (0-110)		
⓪	⓪	⓪
①	①	①
②	②	②
③	③	③
④	④	④
⑤	⑤	⑤
⑥	⑥	⑥
⑦	⑦	⑦
⑧	⑧	⑧
⑨	⑨	⑨

Results of the Trail making Test, Part A					
(minutes)			(seconds)		
	●			●	
⓪	●	⓪	⓪	●	⓪
①	●	①	①	●	①
②	●	②	②	●	②
③	●	③	③	●	③
④	●	④	④	●	④
⑤	●	⑤	⑤	●	⑤
⑥	●	⑥	⑥	●	⑥
⑦	●	⑦	⑦	●	⑦
⑧	●	⑧	⑧	●	⑧
⑨	●	⑨	⑨	●	⑨

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

PAIN

Using the 0-10 scale below, draw a line indicating your level of pain vertically through the horizontal line.

0 ——————————————————————————— 10

No Pain Worst Possible Pain

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Pain Scale Measurement

		●		
⓪	⓪	●	⓪	⓪
①	①	●	①	①
②	②	●	②	②
③	③	●	③	③
④	④	●	④	④
⑤	⑤	●	⑤	⑤
⑥	⑥	●	⑥	⑥
⑦	⑦	●	⑦	⑦
⑧	⑧	●	⑧	⑧
⑨	⑨	●	⑨	⑨

Analgesic: **Time since last dose (in hours and minutes):**	**Sedative/Hypnotics:** **Time since last done:**

Anxiolytics: **Time since last dose (in hours and minutes):**

Demographic and Other Variables

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Age

⓪	⓪	⓪
①	①	①
	②	②
	③	③
	④	④
	⑤	⑤
	⑥	⑥
	⑦	⑦
	⑧	⑧
	⑨	⑨

Gender

○ Male
○ Female

Marital Status

○ Married
○ Single
○ Divorced

Was any part of the data collection instrument read to the patient?

Yes ○ No ○

Physiologic Variables:

Number of Coronary Artery Grafts

① ② ③ ④ ⑤

Is this a CABG a redo procedure?

Yes ○ No ○

Smoking Status

Non-smoker ○ Smoker ○

Procedure done

On Pump	Off Pump
○	○

Length Of Anesthesia In Hours And Minutes

Hours		Minutes	
⓪	⓪	⓪	⓪
①	①	①	①
②	②	②	②
③	③	③	③
④	④	④	④
⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨

Type of Anesthesia (print answer below)

○ Midazolam (Versed)
○ Sufentanil
○ Etomidate
○ Pancuronium
○ Furane

Time on bypass pump (print answer below)

Hours	Minutes
_____	_____

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Cardiac Dysrhythmia	
Yes	No
○	○

If Yes, What Type (print answer below)

If Atrial Fibrillation, is it chronic

Yes	No
○	○

Oxygen Saturation (%) last measure

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Oxygen Saturation Range within past 24 hours:

Body Temperature (at last measurement)

			•	
⓪	⓪	⓪	•	⓪
①	①	①	•	①
②	②	②	•	②
③	③	③	•	③
④	④	④	•	④
⑤	⑤	⑤	•	⑤
⑥	⑥	⑥	•	⑥
⑦	⑦	⑦	•	⑦
⑧	⑧	⑧	•	⑧
⑨	⑨	⑨	•	⑨

Co-morbidities

- ○ Hypertension
- ○ Diabetes
- ○ Myocardial Infarction
- ○ CHF
- ○ Decreased LV Function
- ○ Other

List Other: (Please print clearly)

Medications

Cardiac:

Lopressor ○ Captopril ○ Sotalol ○ Vasotec ○ Cardizem ○

Pain: The analgesic the patient is receiving on day 4

Percocet ○ Tylenol ○ Vioxx ○ Other _____

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Albumin

2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	None
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Calcium

8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.8	8.9	9.0	9.1	9.2	9.3	9.4
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
9.5	9.6	9.7	9.8	9.9	10.0	10.1	10.2	10.3	10.4	10.5					
○	○	○	○	○	○	○	○	○	○	○					

Na

132	133	134	135	136	137	138	139	140	141
○	○	○	○	○	○	○	○	○	○
142	143	144	145						
○	○	○	○						

K

3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.3	4.4
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
4.5	4.6	4.7	4.8	4.9	5.0										
○	○	○	○	○	○										

Hemoglobin

⓪	⓪		⓪
①	①		①
②	②		②
③	③		③
④	④		④
⑤	⑤		⑤
⑥	⑥		⑥
⑦	⑦		⑦
⑧	⑧		⑧
⑨	⑨		⑨

Hematocrit

⓪	⓪		⓪
①	①		①
②	②		②
③	③		③
④	④		④
⑤	⑤		⑤
⑥	⑥		⑥
⑦	⑦		⑦
⑧	⑧		⑧
⑨	⑨		⑨

Platelet Count

⓪	⓪	⓪
①	①	①
②	②	②
③	③	③
④	④	④
⑤	⑤	⑤
⑥	⑥	⑥
⑦	⑦	⑦
⑧	⑧	⑧
⑨	⑨	⑨

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Ambulatory Status		
Ambulates Independently	Ambulates with one assist	Ambulates with two assists
○	○	○

The frequency of ambulation in times per day					
1	2	3	4	5	6+
○	○	○	○	○	○

Average distance when ambulating (in feet)

Nutritional Status				
IV Fluids and clear liquids	IV fluids and eats small amounts	Eats small amounts	Eats at least 50% of meals	Eats 100% of meals
○	○	○	○	○

Tube Feeding	
Yes	No
○	○

Sleep Rest Status	Yes	No
Ask "Did you sleep through the night last night? "	○	○
If "no", then follow up with an exploratory question		
Sleeps with one awakening during the night	○	○
Sleeps intermittently through the day and night	○	○

Ask: "How did you sleep last night?"	Very Well	Moderately Well	Not Well
	○	○	○

If response is "Not Well", ask why?

Number of previous hospitalizations										
⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩

Years of formal education														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

	Yes	No
Do you feel rested now?	○	○
Are your sleeping hours the same as they would be at home?	**Same** ○	**Different** ○

If different, ask "Can you explain the difference?" (write a note):

(This question should be asked around 8 pm of Day 4)

How many visitors did you have this:
Morning:
⓪ ① ② ③ ④ ⑤
Afternoon:
⓪ ① ② ③ ④ ⑤
Evening:
⓪ ① ② ③ ④ ⑤
How many visitors did you have yesterday
Morning:
⓪ ① ② ③ ④ ⑤
Afternoon:
⓪ ① ② ③ ④ ⑤
Evening:
⓪ ① ② ③ ④ ⑤

Discharge Plans: Per hospital discharge plan

- ○ Home
- ○ Rehabilitation
- ○ Subacute Care
- ○ In care of family or friends other then patients own residence

Per patients desire
Ask "if you had to choose where to go after you leave the hospital, where would you go?"

Home	○	**Subacute Care**	○
Rehabilitation	○	**In care of family or friend other than patients own residence**	○

Code Number

	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Patient's perception of discharge agrees with hospital discharge plan:

Yes	No
O	O

Physical environment-interview patient for the following:

"How does the room temperature feel?"

Too hot	Too Cold	Comfortable
O	O	O

"How do you find the noise level in your room?"

Too noisy	Acceptable	Noisy but acceptable
O	O	O

"How do you find the ventilation in your room?"

Stuffy	Acceptable	Well ventilated
O	O	O

"How is the light in your room?"

Too dark	Not dark enough	Too bright
O	O	O

"Is your bed comfortable?"

Yes	No
O	O

"How comfortable is your recliner chair?"

Comfortable	Hard
O	O

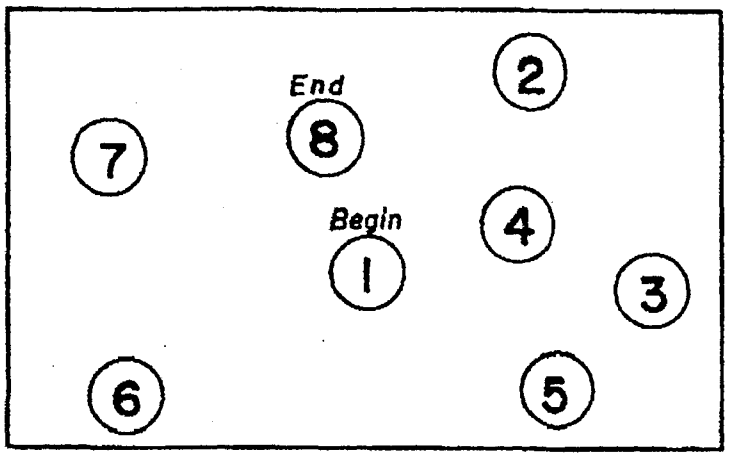
"Is the level of privacy during this hospitalization, acceptable to you?"

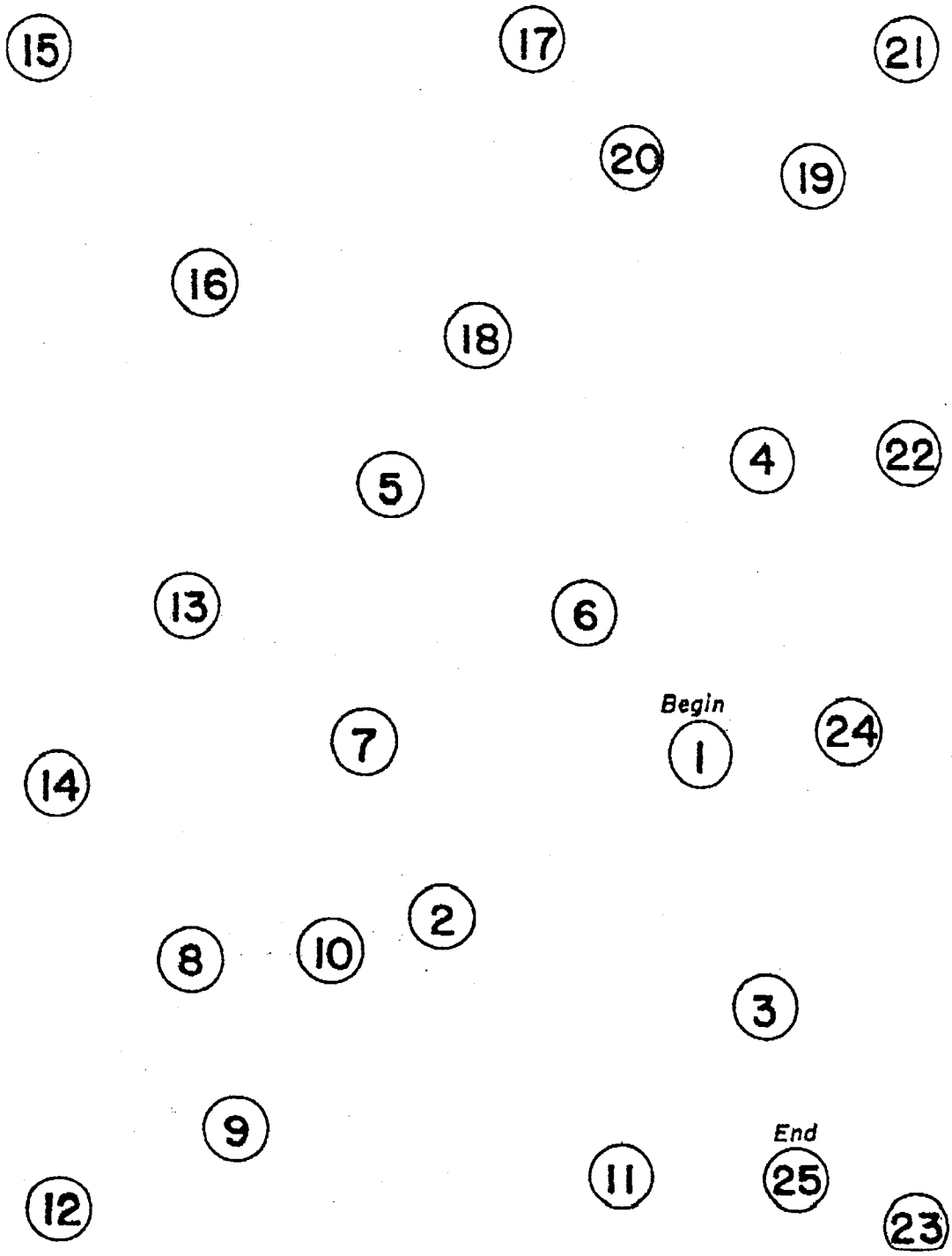
Yes	No	If not acceptable, ask why?
O	O	O

TRAIL MAKING

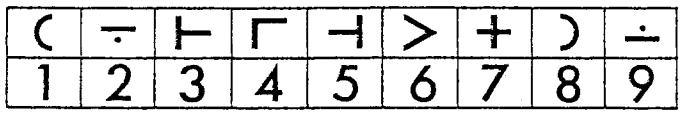
Part A

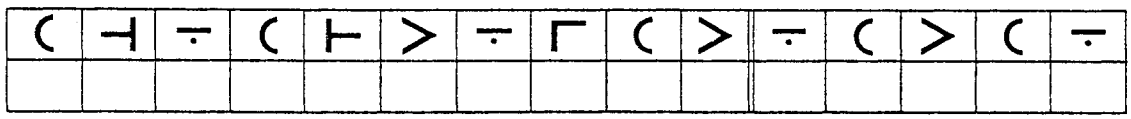
SAMPLE

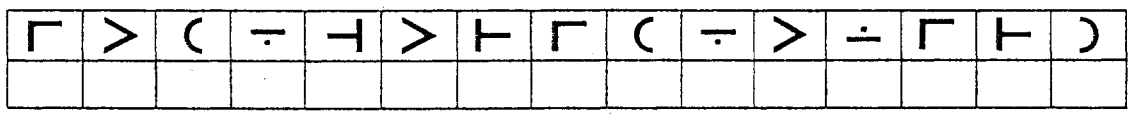


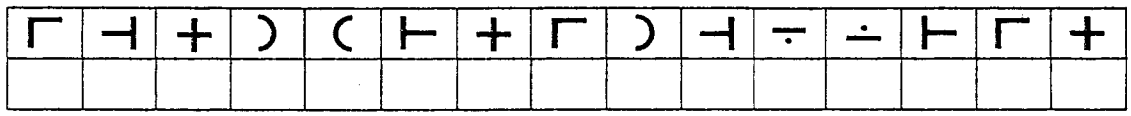


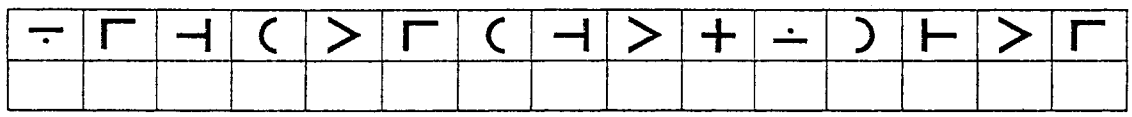
KEY

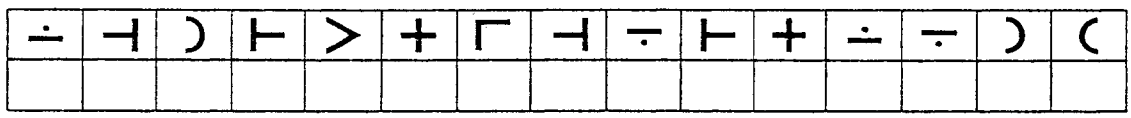


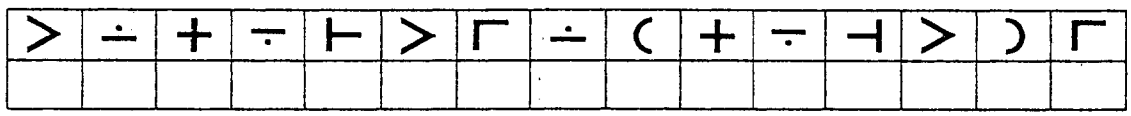


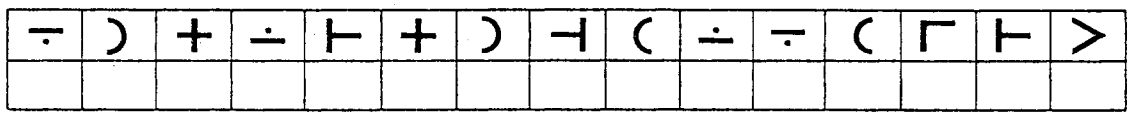


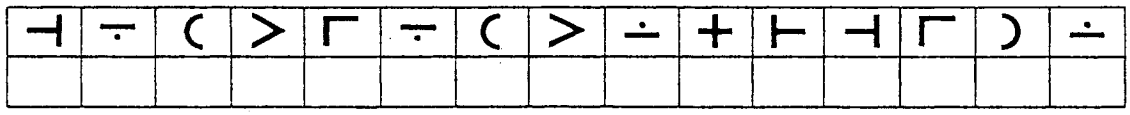












APPENDIX F

ADDITIONAL DATA

ADDITIONAL DATA

Twenty nine (22 male, 7 female) potential participants in the preadmission testing units declined participation in the study citing the following reasons: 9 people gave no reason for not participating, 9 cited they had too much to cope with already, 6 people cited anxiety, 1 person said he was too private to share personal information, 1 person was suspicious regarding the use of the data, 1 person said he does not like paperwork, and 2 persons had physical problems that prohibited participation (arthritis [could not hold a pencil] and visual impairment [could not see the Trail Making Test, Part A instrument]).

Twenty people did not continue with the study on postoperative day 4 (time 2 of data collection). Eight people refused to continue with the study, of these the most frequently reason cited was fatigue. Six of the participants remained in the critical care unit on postoperative day 4: 1 remained for heart rhythm and respiratory problems, 1 person was experiencing hemodynamic instability, 2 for respiratory problems, and 2 remained in critical care due to surgeon preference. One person died in the critical care unit. Two persons were discharged on postoperative day 3 (one of which went to a local to home hospital to continue convalescence) and surgery was postponed for two persons subsequent to the preadmission testing unit visit.

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