DISTRESS AND EMOTIONAL STATE THROUGHOUT BONE MARROW TRANSPLANTATION

by

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We accept this thesis as conforming to the required standard

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ABSTRACT

Bone marrow Transplantation causes a variety of symptoms and emotional states which change throughout the treatment. The purpose of this descriptive correlational, repeated measures study was to describe the type and degree of symptom distress and the emotional states experienced by BMT patients at the time of admission, through the administration of chemotherapy and radiotherapy, bone marrow infusion, waiting for engraftment to 25 days following the infusion of bone marrow. In addition, this study investigated the relationship between symptom distress and emotional states of the BMT patient. The conceptual framework was based on Lazarus and Folkman's (1984) theory of stress, appraisal, and coping. The design involved administering McCorkle and Young's (1978) Symptom Distress Scale, McNair, Lorr, and Droppleman's (1971) Profile of Mood States, and two Data Collection Guides to ten patients at five times during the BMT procedure. A convenience sample of 12 subjects participated in the study.

Overall, the participants experienced moderate degrees of symptom distress. Distress related to insomnia and appetite problems caused high levels of distress with moderate amounts of distress reported for distress related to nausea, pain, fatigue, bowel changes, concentration, and outlook. The least amount of distress was associated with appearance, breathing, and coughing problems. Symptom distress changed significantly over time with increased levels during the administration of chemotherapy and radiotherapy, one and seven days post-infusion and decreased to near baseline levels 25 days following the bone marrow infusion in all symptoms except outlook. Outlook distress was high initially and gradually declined over the course of the treatment. Significant changes were shown in nausea existence, appetite, insomnia, bowel, and concentration distress. The levels and changes seemed to reflect the clinical course of the BMT procedure.

The participants showed moderate levels of emotional disturbance during the BMT with vigor and fatigue reaching high levels, tension and confusion reaching moderate levels, and depression and anger remaining fairly low. Emotional disturbance changed significantly over the course of the BMT for total emotional state and for all the emotional subscales except depression.
The findings indicate that during times of intensive treatment emotional disturbance is greater. Total symptom distress and emotions showed no correlation except one day following bone marrow infusion; however, all six specific emotion components were correlated with at least one of the following distressful symptoms: outlook, pain, appearance, concentration, or fatigue.

The findings suggest that symptom distress and emotions are closely linked to clinical events such as medications, blood transfusions, chemotherapy, radiotherapy, infections, nutritional deficits, but were tempered by coping abilities and lack of risk factors for emotional disturbance. Implications from the findings suggest specific times for the nurse to be particularly cognizant of specific symptom distress and emotional states and their patterns during the BMT. In addition, the nurse must be aware that there are complicated and uncomplicated courses for the BMT. The nurse must be adept at assessing the BMT patients for particular symptom distress and emotions when they are most likely to be problematic and to intervene appropriately.
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CHAPTER ONE

Background to the Problem

Bone Marrow Transplantation (BMT) first achieved marginal success as a method to treat certain types of cancer in the 1960's. Since then, it has become a treatment option for many types of cancer with over 10,000 patients having undergone this procedure to date in over 150 cancer centers around the world (Freedman, 1988; Corcoran-Buchsel, 1988). Although it is difficult to determine an overall survival rate because of differing statistics for each diagnosis, approximately 50-60% of patients will be alive one year following transplant (Wolcott, Wellisch, Fawzy, and Landsverk, 1986).

The patients are usually hospitalized for a period of six to eight weeks. During this time, they receive high doses of chemotherapy and radiotherapy which impact on all body systems causing a variety of side effects notably nausea, vomiting, mucositis, thrombocytopenia, leucopenia, alopecia, fatigue, and anorexia (Ford & Ballard, 1988). The physiological effects as well as the uncertainty related to the outcome of the procedure, may cause the BMT patient to experience anxiety, fear, depression or anger. These effects have been reported to change from the initial decision to have the BMT, throughout the administration of chemotherapy and radiotherapy as well as during the waiting for engraftment period and discharge from the hospital (Brown & Kelly, 1976; Gardner, August, & Githens, 1977; Gibson, 1987; Haberman, 1987, 1988; Wolcott et al, 1986). Despite the importance of the psychological impact of BMT on the patients, only an article and doctoral dissertation by Haberman (1987, 1988) and an article by Brown and Kelly (1976) were found describing the changes in emotions throughout the BMT. No research was found on the distress perceived by patients because of the symptoms they were having nor on the association between symptom distress and emotional states at the different stages of the BMT procedure.
Statement of the Problem

Ten thousand patients worldwide have undergone BMT since 1960 (Corcoran-Buchsel, 1988). Although some therapeutic effect has been achieved, approximately 50% of patients do not survive more than one year (Corcoran-Buchsel, 1988; Wolcott et al, 1986). The BMT procedure is known to produce many physical symptoms as well as much psychological stress. Although considerable information exists on the procedure itself, little was found on either the type and level of symptom distress or emotional state, or on the association between symptom distress and emotional state, and how these changed over time.

Purpose of this Study

The purpose of this study was to describe the type and degree of symptom distress and the emotional state experienced by BMT patients at the time of admission, through the administration of chemotherapy and radiotherapy, bone marrow infusion, waiting for engraftment to 25 days following the infusion of the bone marrow. In addition, this study investigated the relationship between the perceived symptom distress and the emotional state of BMT patients.

Theoretical Framework

Lazarus and Folkman's (1984) theory of stress, appraisal, and coping is the theoretical framework used in this study (see Figure I). Lazarus and Folkman (1984) maintain that people use cognitive appraisal to assess their situation and that this appraisal is always accompanied by emotions (Lazarus, 1982). In addition, person factors and situation factors influence the appraisal of the stressful event by the individual. Both cognitive appraisal and emotions continue to influence each other over time through the process of cognitive re-appraisal. Since the appraisal of a situation is instrumental in our coping, it is reasonable to assume that the appraisal of distress might be associated with varying emotional states.

Through primary cognitive appraisal, the situation is judged as irrelevant, positive/benign, or stressful. If the event is judged to be stressful, the process of cognitive appraisal further judges the situation to have potential for harm/loss, threat, or challenge. The individual then uses
the process of secondary appraisal to determine possible coping options. Coping can be either problem-focussed or emotion-focussed, but is usually a combination of both. The three major outcomes of coping are a person's social functioning, somatic illness, and morale. Social functioning refers to the individual's ability to live normally; somatic illness refers to the person's physical health and morale refers to the individual's overall emotional state. The cognitive appraisal process is circular because the individual will repeatedly re-appraise the event using
previous and newly learned information (Lazarus & Folkman, 1984). The framework will be described in more detail with emphasis on the appraisal process and how experience can change over time.

Cognitive Appraisal

An event is interpreted according to person and situation factors (Lazarus & Folkman, 1984). Person factors include the person's commitments and beliefs whereas the situation factors refer to the event's properties such as its novelty, predictability, event uncertainty, imminence, duration, temporal uncertainty, and ambiguity (Lazarus & Folkman, 1984). Novelty causes a stressful reaction only if the stimuli are associated with previous harmful events because situations are interpreted in light of previous experience or general knowledge of the situation. Predictable events are usually less stressful. When an individual is uncertain about what the outcome of the event will be, the event is usually highly stressful. The more imminent an event, the more likely it is to be stressful. A longer rather than shorter event may heighten the threat, but may also allow time for the person to manage the stressful event through the process of coping. Temporal uncertainty, when the individual does not know when the event will happen, is linked with a greater level of stress. A situation that is ambiguous is often associated with more stress. These characteristics of a situation are very important in determining the level of stress the event produces (Lazarus & Folkman, 1984).

Cognitive appraisal is the process that determines the meaning the event has to the individual. This cognitive appraisal intervenes between the event and the individual's emotional reaction (Lazarus & Folkman, 1984). Lazarus (1982) postulates that cognition and emotions occur simultaneously and affect each other throughout the stress and coping process. Cognitive appraisal further impacts on emotions by producing a specific emotional response rather than a generalized state of emotional arousal (Lazarus, 1982). It is through appraisal that judgements are also made in order to decide which coping strategies to use and it is through these coping strategies that outcomes evolve.
Emotional responses are very complex and not well understood (Lazarus, 1982). Emotions can be short-term or long-term and may change rapidly depending on the nature and the meaning of the information received about the situation (Folkman & Lazarus, 1985). A person may not know the appropriate response if the information received is not well understood or if the information is uncertain. Although it is not clear how emotions come about, they are valuable as diagnostic tools as they indicate how a person is interpreting his or her environment.

Re-appraisal

Re-appraisal is the process of re-assessing the event after the initial cognitive appraisal. Over time, an individual receives more information about an event and will re-appraise according to the same principles as cognitive appraisal. Re-appraisal is different from cognitive appraisal only in that it follows the initial appraisal. Similarly as in cognitive appraisal, person and situation factors also influence the re-appraisal of an event as well as the emotions generated during the event. Efforts to cope with a stressful event and outcomes will also influence the re-appraisal process (Lazarus & Folkman, 1984).

Theoretical Framework in Relation to the Study of Bone Marrow Transplant Patients

The theoretical framework will now be explained in relation to the concepts germane to the study of BMT patients (see Figure II). The framework provided a theoretical perspective to study BMT patients and if and how the appraisal of their stress generated from their symptoms (symptom distress) and their emotional states are linked together and how these changed over the course of the BMT procedure. The investigator would like to indicate, at this point, that this study was restricted to examination of the process of cognitive appraisal and re-appraisal. Throughout the BMT treatment process appraisal would likely change and the additional appraisals were considered as re-appraisals. Symptom distress with its associated emotions was considered as part of the cognitive appraisal process. The BMT patients' appraisal and re-appraisals were expected to be influenced by their beliefs and commitments and by factors in their situations. In this study the event was the BMT procedure with the accompanying protocols.
Properties of the situation included the side effects and symptoms the patients experienced, and the intensity, frequency, and duration of them. Person factors, situation factors, coping mechanisms and outcomes were not the focus of attention in this study.

![Diagram](image)

Figure II. Theoretical Framework in relation to Bone Marrow Transplant Study.
*Major concepts of study in bold print

Research Questions

1. What is the type and degree of symptom distress experienced by BMT patients on hospital admission, during the administration of chemotherapy and radiotherapy, one day, seven days, and 25 days following the bone marrow infusion?

2. What are the changes in symptom distress experienced by BMT patients from hospital admission, through administration of chemotherapy and radiotherapy, to one day, seven days, and 25 days following the bone marrow infusion?

3. What are the type and degree of emotions experienced by BMT patients on hospital admission, during the administration of chemotherapy and radiotherapy, one day, seven days, and 25 days following the bone marrow infusion?

4. What are the changes in emotional states experienced by BMT patients from hospital admission, through administration of chemotherapy and radiotherapy, to one day, seven days, and 25 days following the bone marrow infusion?
5. What is the relationship between symptom distress and emotional state of BMT patients on hospital admission, administration of chemotherapy and radiotherapy, one day, seven days, and 25 days following the bone marrow infusion?

Definitions of Terms

**Bone Marrow Transplantation** refers to a procedure that involves infusion of bone marrow following a major body onslaught of radiation and chemotherapy to eradicate all cancer cells. Bone marrow transplantation may be autologous where the person's own bone marrow is used; allogeneic where a donor's bone marrow is used; or syngeneic where genetically identical bone marrow, such as from a twin sibling, is used (Cogliano-Shutta, Broda & Gress, 1985; Champlin & Gale, 1984).

**Engraftment** refers to the time when the donor's stem cells have migrated to the recipient's marrow cavities and begin to proliferate and mature (Hutchinson & Itoh, 1982). Engraftment is signalled by white blood cells, red blood cells, and platelets beginning to develop normally in the marrow usually 10 to 30 days following transplantation (Nuscher et al, 1984).

**Bone Marrow Infusion** refers to a procedure similar to a blood transfusion where the bone marrow is intravenously infused into the recipient (Freedman, 1988).

**Cognitive Appraisal** refers to evaluative processes that intervene between an event and a reaction. The process allows the person to evaluate the importance of the event for his or her well-being (Lazarus & Folkman, 1984).

**Cognitive Re-appraisal** refers to a process that is the same as primary cognitive appraisal except that it follows the initial appraisal and may occur repeatedly. Re-appraisal is influenced by previous and newly obtained information about the situation and by the individual's coping mechanisms (Lazarus & Folkman, 1984).

**Symptom Distress** refers to the stress an individual feels as a result of the physical or emotional symptoms caused by the BMT procedure.
Emotional state refers to subjective feelings and physiological changes accompanied by behaviors such as facial expressions, gestures, vocal intonation, or instrumental acts (Folkman & Lazarus, 1988b; Geller, 1984; Izard, Kagan & Zajonc, 1984; Lazarus, 1982).

Operational Definitions

Symptom Distress refers to the subjective report of the degree of discomfort caused by the following factors: nausea, loss of appetite, insomnia, pain, fatigue, change in bowel pattern, difficulty with concentration, changes in appearance, difficulty with breathing, fear of future, and cough as measured by the Symptom Distress Scale (McCorkle & Young, 1978) (see Appendix A).

Emotional State refers to a subjective feeling of tension-anxiety, depression-dejection, anger-hostility, vigor-activity, fatigue-inertia, and confusion-bewilderment as measured by the Profile of Mood States (McNair et al, 1981).

Assumptions

1. The BMT procedure is stressful for patients.
2. There is no normal amount of distress that should be experienced.
3. Patients will be able to identify their emotional state and symptom distress.
4. Patients will complete the questionnaire accurately and honestly and will comprehend the elements of the questionnaire as they are intended.

Limitations

This study was descriptive in nature and aimed to identify the symptom distress and emotional states experienced by patients undergoing the BMT. Therefore no attempt was made to control factors such as age, gender, type of cancer, type of transplant, prognosis, time since diagnosis, or level of support systems. In addition, the number of patients included in the study as well as the convenience sampling method did not allow generalization beyond the sample.
Overview of the Thesis Content

The thesis is made up of five chapters. Chapter one reviews the background to the problem, explains the conceptual framework and outlines the purpose of the study. In chapter two, selected literature is reviewed and is divided into two sections: emotions and distress and the BMT procedure. Chapter three discusses the design, sampling procedures, instruments, data collection methods and statistical procedures. Chapter four includes a description of the sample, results of data analysis, and a discussion of the findings. The fifth chapter summarizes the study, contains a conclusion, and discusses implications for nursing and recommendations for future research.
CHAPTER TWO

Review of Selected Literature

Introduction

The review of literature is divided into two sections. The first section deals with emotions and distress and specifically discusses emotions, emotional responses to the stress of cancer, stress and coping, symptoms and emotions, and factors that influence the emotional response to stress. The second section is concerned with BMT and discusses the BMT process and physiological responses, emotions associated with BMT, emotional changes throughout the BMT procedure, and factors that influence the emotional response to BMT.

Emotions

Emotions are complex psychophysiological reactions defined as physiological changes in an individual's body accompanied by changes in behavior (facial expressions, gestures, vocal intonation, or instrumental acts) (Folkman & Lazarus, 1988b; Geller, 1984; Izard et al, 1984; Lazarus, 1982). Geller (1984) and McNair and colleagues (1981) view emotions as subjective feeling states. Although the relationship between emotions and coping responses is not clear, authors agree that an individual's coping impacts on the type and characteristics of his or her emotions which are constantly in flux and, because of their subjective nature, are difficult to specifically describe (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986; Folkman & Lazarus, 1988b).

Specific emotional states are caused by things perceived as stressful (Folkman & Lazarus, 1984). "Psychological stress is described as a particular relationship between the person and the environment that is appraised by the person as taxing his or her resources or exceeding his or her resources and endangering his or her well-being" (Lazarus and Folkman, 1984, p. 19). Cancer is a disease that is well-known to cause stress and subsequent emotions and coping responses (Wilson-Barnett, 1979; McMahon, 1987).
Emotional Response to a Cancer Diagnosis

The common stages of emotional response following diagnosis of cancer are described by several authors (Conti, 1989; Massie, 1989b; Priestman, 1986). Conti (1989) reports that common stages are fear, shock, doubt, confusion, depression, altruism, falling apart, acceptance and normalcy. Priestman (1986) cites the usual stages as shock, disbelief, anxiety, anger, guilt and depression followed by an adjustment period. If adjustment is not reached, severe emotional difficulties such as depression are usually experienced. Massie and Holland (1989) state that disbelief, denial, and numbness may be initially experienced by some while others feel intense despair and demoralization followed by a period of turmoil, distress, anxiety, fear of the future, and difficulty sleeping, eating and concentrating. These emotional responses may persist over a substantial period of time or be intermittent in nature (Conti, 1989).

Stress and Coping

Cancer represents a threat to physical and emotional integrity that challenges an individual’s coping ability. Coping is defined by Rowland (1989) as dealing with the difficult and unusual characteristics of a situation that require the development of new strategies and behaviors. Folkman and Lazarus (1980) see coping as having three functions: a) problem-focussed or instrumental coping that is concerned with changing a situation that is stressful, b) appraisal-focussed where a person perceptually controls the meaning of a situation, and c) emotion-focussed or palliative coping where the person attempts to reduce emotional distress. One or more methods of coping can be used in combination at any given time (Folkman & Lazarus, 1980). Rowland (1989) discusses two components of coping which are coping style and coping strategies. Coping style is a person’s characteristic method of dealing with stress, and coping strategy is more variable and represents how stress is handled during individual situations.

Denial, development of illusions, intellectualization, guilt, depression, fighting spirit and stoic acceptance are some examples of ways that patients cope with the impact of cancer (Hughes, 1987; Rafferty, 1985; Stoll, 1986; Taylor, 1983). Stoll (1986) reports that, in one study of 100 patients, 50% denied their diagnosis and/or the implications of their diagnosis after having it
discussed with them. Denial is not a solitary act, but a changing process that depends on the patient's situation (Hughes, 1987). Rafferty (1985) states the aim of denial is to maintain equilibrium and decrease psychological pain. Taylor (1983) states that individuals who adjust well use illusions to give meaning to their cancer, gain control over their cancer, and increase their self-esteem by comparing themselves favorably to others. Intellectualization occurs when patients dwell on what they need to know rather than how they feel and is used to decrease the overwhelming fear and anxiety of their illness (Rafferty, 1985). Guilt is used to give meaning as to why s/he developed cancer, for example, cancer may be interpreted as a punishment for personal inadequacy (Rafferty, 1985). Depression is another method that is frequently used to manage the consequences of having cancer (Hughes, 1987; Rafferty, 1985). Finally, Hughes (1987) reports that patients may cope with cancer by adopting a fighting spirit or stoically accepting their fate.

Caplan (1981) states that the goal of coping is to reduce physiological and psychological arousal to a tolerable level, and to adapt to the realities of the stressful situation. Rowland (1989) describes the goals of coping during a serious illness as keeping stress within manageable limits, maintaining self-esteem, keeping relationships with significant others, enhancing chances of physical functioning, and maximizing the ability to handle medical treatment and hospitalization.

Symptoms and Emotions Associated with Cancer Treatment

Chemotherapy and radiotherapy cause severe side effects that lead to emotional and coping responses (Coates, 1986; Knobf, 1986; Nerenz, Leventhaul & Love, 1982). Examples of symptoms caused by chemotherapy include nausea, emesis, shortness of breath, tiredness, weakness, sleep difficulties, alopecia, bone marrow suppression, stomatitis, cystitis, diarrhea, conjunctivitis, amennorrhea, and organ toxicities (Coates, 1986; Knobf, 1986; Nerenz et al, 1982). Examples of specific symptoms that impact on emotions are tiredness and weakness which may exacerbate depression, anxiety, and difficulty concentrating (Holland & Lesko, 1989; Hughes, 1987). Holland and Lesko (1989) reported that patients often experienced a paradoxical anxiety on completion of their chemotherapy because they no longer felt protected. Knobf's (1986) study
found that there was a higher degree of psychological distress than physical distress in 78 women who received adjuvant chemotherapy for breast cancer. Nerenz and associates (1982) did a study involving 61 patients with malignant lymphoma that indicated pain, chills, nausea and weakness contributed more to emotional distress, than any other symptoms, with pain and chills most problematic. In this study, hair loss was unrelated to distress; whereas Holland and Lesko (1989) reported that hair loss produced anxiety. Nerenz and colleagues (1982) study also showed that it was the number of side effects from chemotherapy, rather than the duration or severity, that was correlated with emotional distress.

Radiotherapy also produces many toxic side effects such as tiredness, nausea, burning skin, malaise, weakness, eye reactions, alopecia, damage to organs, anorexia, and diarrhea which may lead to emotional distress (Hughes, 1987; Peck & Boland, 1977; Whipp, 1986). Several studies have explored the emotional responses of patients undergoing radiotherapy. Studies show that patients often react to radiotherapy with anxiety, depression, guilt, suspicion, anger, or fear (Hughes, 1987; Peck, 1972; Peck & Boland, 1977; Whipp, 1986). Holland and associates (1979) did a study involving 20 mastectomy patients receiving radiotherapy that indicated a significant number felt worse at the end of the treatment because they suffered more anorexia, fatigue, and malaise and because they experienced separation anxiety on completion of the treatment. Peck and Boland (1977) did research involving 50 patients receiving radiotherapy with only mild to moderate emotional reactions recorded. In this study, 62% of patients showed a depressed mood with loss of feelings of well-being and a definite state of sadness and 66% showed signs of anxiety as evidenced by a preoccupation with spread of disease and doubts about treatment and survival. Irritability, suspicion, and euphoria were other emotional responses with some patients feeling disappointed, fearful, or angry that the treatment had made them feel worse (Peck & Boland, 1977).

Other Factors that Influence the Emotions

Other factors known to influence the emotional responses of individuals include gender, age, marital status, supportive relationships, person factors, philosophy of life, personality
characteristics, life satisfaction, previous experiences, socialization, education, and religiosity. Gender, age, and marital status show contradictory evidence as to their impact on emotional responses. Scott, Oberst, and Bookbinder (1984) and McNair and colleagues (1981) report that men are more likely to be stoic, angry, or hostile, whereas women tend to be anxious, depressed, fatigued, and indecisive. With respect to age, older individuals tend to show less anger and less indecisiveness because they are more philosophical about the stressful situation (Cassileth, Lusk, Brown, Cross, Walsh, & Hurwitz, 1986; McMahon, 1987; McNair et al, 1981; Wilson-Barnett, 1979). Cohen (1982) report that it is more important to look at the timing of the stressful event in the person's life rather than at age. When considering marital status, there is evidence to show that widowhood increases vulnerability (Goldberg & Cullen, 1985). All authors agree that supportive relationships with friends, relatives, and health care professionals are extremely important in combatting negative emotional responses (Cohen, 1982; Folkman & Lazarus, 1984; Goldberg & Cullen, 1985; Wilson-Barnett, 1979).

In addition, person factors, philosophy of life, and personality characteristics involving how an individual views his or her illness, sense of fulfillment or life satisfaction, previous experience with death, culture, temperament, and socialization were factors stated to be important in determining an individual's emotional response (Cohen, 1982; De Rivera, 1984; Goldberg & Cullen, 1985; Izard et al, 1984; Lipowski, 1971; Wilson-Barnett, 1979). Goldberg and Cullen (1985) reported some evidence that being religious decreased negative emotions. Finally, McNair and colleagues (1981) indicated that the less educated a person, the less severe were his or her negative emotions.

Emotional Responses to BMT

The common emotional responses of depression, anxiety, anger, confusion and fatigue will be discussed. The definition, prevalence, signs and symptoms, and influencing factors will be reviewed relative to each response.
Anxiety is a natural response to stress (Massie, 1989a). Anxiety is defined as a subjective experience of apprehension or tension imposed by the expectation of danger or distress, (Kelly, 1980) or as a disruptive and growing tension often associated with feelings of potential harm or distress (Welch-McCaffrey, 1985). Derogatis and associates (1983) estimate that one-third of patients experience anxiety in response to diagnosis, waiting for treatment, completion of lengthy treatment, or in advanced or terminal stages of cancer.

Anxiety is manifested through subjective and physical signs. A major subjective symptom of anxiety is experiencing fear (Kelly, 1980; Massie, 1989a; Rafferty, 1985) which may be vague and represent an ill-defined general emotion or it may represent or be caused by specific fears involving death, pain, social isolation, immobility, emotional abandonment, or fear of hospitalization which entails loss of autonomy, lack of control, and loss of privacy (Massie, 1989a). Other indicators of anxiety are poor concentration and memory, little interest in activities, irritability, weakness, exhaustion, insomnia, nightmares, flushed face, tense or worried expression, restlessness, nailbiting or smoking, sweaty palms, diaphoresis, diarrhea or constipation, heartburn, anorexia, air swallowing, respiratory or cardiovascular symptoms (Massie, 1989a).

Causes and contributing factors of anxiety are well-documented in the literature (Holland, Rowland, Lebovits, & Rusalem, 1979; Massie, 1989a; Rafferty, 1985). Massie (1989a) states that the most common causes of anxiety are related to experiencing pain, an abnormal metabolic state, a hormone-producing tumor, anxiety-producing drugs, or a pre-existing anxiety disorder. As described in relation to depression, the presence of anxiety is related to interpersonal, intrapersonal, and social factors (Holland et al, 1979). Two authors report that doctor-patient communication and information-giving is strongly related to a patient's level of anxiety (Massie, 1989a; Rafferty, 1985). Finally, anxiety often occurs at the same time as depression (Massie, 1989a; Rafferty, 1985).
Depression

Depression is a normal response to a stressful event (Hughes, 1986, 1987). Prevalence of reactive depression is estimated at approximately 10-15% (Hughes, 1986; Massie, 1989b), but the prevalence of depression in cancer patients is higher than the incidence in the general population and is estimated to be up to 70% for specific cancer patient populations (Hughes, 1986; Massie, 1989b).

Depression has both mental and physical signs and symptoms. Hughes (1986, 1987) states that sadness, irritability, pessimism, inability to enjoy pleasant activities, sense of worthlessness, anxiety, and hopelessness about the future are mental signals of depression. Physical signs are anorexia, decreased energy, constant tiredness, decreased libido, constipation, headaches, and pains (Greer & Silberfarb, 1982; Minot, 1986; Wilson-Barnett, 1979). McNair and colleagues (1981) describe the symptoms of depression as having a sense of emotional isolation, personal inadequacy and futility with feelings of sadness and guilt. Bukberg, Penman and Holland (1984) outline the following symptoms as criteria for diagnosis of depression: sustained lowered mood for two or more weeks, loss of interest, guilt or decreased self-esteem, suicidal ideation (uncommon among cancer patients), trouble concentrating, psychomotor changes and difficulty sleeping.

Unfortunately, many of the aforementioned signs and symptoms are manifestations of cancer and its treatment thereby making the diagnosis of depression difficult among cancer patients (Bukberg et al, 1984; Goldberg, 1981; Hughes, 1986, 1987). In addition, cancer may cause metabolic abnormalities or metastasis to the brain which may cause emotional changes that mimic depression (Hughes, 1986).

Patients have increased vulnerability to depression if they are male, older, experiencing pain, physically dependant, cognitively impaired, recently bereaved, or when poor communication exists between doctor and patient (Dunlop, 1985; Hughes, 1987). In addition, Hughes (1987) cites family history, support network, physical illness, satisfying work, adequate housing, and personalities that are prone to being pessimistic, inflexible, moody, or dependent on others as indicators of the likelihood of developing depression. Rafferty (1985) writes that a
feeling of personal weakness, feeling abnormal, or lacking control contribute to the onset of depression. A study conducted by Fobair, Hoppe, Bloom, Cox, Varghese, and Spiegel (1986), involving Hodgkins Disease survivors, found a strong correlation between prolonged energy loss and physical disability and the presence of depression.

Anger

Anger is a conflictive, interpersonal, emotional arousal that occurs when an actual or imagined wrong is committed (Averill, 1982; Strongman, 1987). The purpose of anger is described by Averill (1982) as malevolent when it is used to express dislike or break-off a relationship, constructive when it is used to strengthen a relationship or uphold social norms, and fractious when it is used to vent emotion. Anger is expressed by aggressive acts, violence, increased heart and respiratory rate, agitation, decreased control, shouts, snarls, laughs or silence (Averill, 1982; Kaufman, 1970). An individual's anger threshold is affected by metabolic changes, drugs, or illness (Averill, 1982).

Averill (1982) conducted a study about anger involving 160 college students and adults from the community and found most people became angry once per week with a fairly intense level of anger. The anger usually lasted for less than ten minutes or for more than one day. In 88% of the subjects the anger was targeted at another person who was usually someone close emotionally. The participants seldom became angry with someone of greater status.

No research studies were found that dealt directly with cancer and anger, but anger is briefly mentioned in many articles related to the emotional responses of cancer patients (Dunlop, 1985; Peck, 1972; Peck & Boland, 1977; Priestman, 1986). Anger is a common response in patients undergoing radiotherapy (Peck, 1972; Peck & Boland, 1977) and is a frequent response to the diagnosis of cancer, especially in young people because they feel their future has been threatened (Dunlop, 1985; Priestman, 1986). On the other hand, Hughes (1987) reported that people who develop cancer are more likely not to be able to express hostility or anger. Although the reason for this postulation is not clear, it may be that there is a relationship between personality type and vulnerability to cancer.
Confusion

Confusion is caused by either somatic malfunctioning or by emotional disturbances. Fleishman and Lesko (1989) report that confusion is caused by direct or indirect effects on the brain. The most common direct causes of confusion are primary brain tumors or metastatic spread of the cancer with the indirect causes being metabolic changes, organ failure, vascular complications or nutritional changes. Confusion also results from emotional changes brought on by learning of a diagnosis of cancer (Conti, 1989). The initial response to the diagnosis may be shock, lasting a few days to weeks, where the person is unable to process information, unable to concentrate, has poor judgement or is unable to carry out routine activities (Conti, 1989; Massie & Holland, 1989). In addition, the presence of both anxiety and depression contribute to decreased ability to concentrate (Hughes, 1987; Massie, 1989a, 1989b).

Fatigue

Fatigue is a vague, subjective feeling of tiredness, weariness, weakness, exhaustion, or lack of energy that varies in unpleasantness, duration, and intensity (Aistars, 1987; Piper, Lindsey, and Dodd, 1987). The prevalence of fatigue is indicated in a study done by Fobair and colleagues (1986) involving 403 patients with Hodgkin Disease. They reported that 80% of patient's energy levels are adversely affected by therapy and on average, the levels took eight months to return to normal.

Fatigue can be caused by emotional distress or by the effects of cancer and its treatment (Nerenz et al, 1982). Holland (1989) describes how emotional exhaustion is brought on by a prolonged illness where the patient requires intensive medical treatment and support and, after a period of time, shows signs of demoralization, withdrawal and apathy. Finally, emotional fatigue and decreased energy are commonly seen among depressed patients (Holland, 1989).
Bone Marrow Transplant Process and Associated Responses

The typical bone marrow transplant process will be described together with the common side effects and symptoms. Emotions associated with the procedure, how these change over time, and factors that influence emotional responses will also be described.

The first stage, which may begin prior to hospitalization, involves a comprehensive physical assessment and baseline studies to determine if a patient is physically able to undergo the intensive treatment (Freedman, 1988; Hutchinson & Itoh, 1982). After this determination is made, a Hickman line is inserted to insure long-term venous access for the infusion of total parenteral nutrition, intravenous fluids, medications, and blood products (Freedman, 1988; Hutchinson & Itoh, 1982; Salinger, 1984; Zimmerman, Cohen, Diekmen, Calvo, Hangsterfer, 1977). If the patient is having an autologous transplant, his or her own bone marrow is usually harvested at this time (Schryber, LaCasse, Barton-Burke, 1987).

On admission to the hospital the patient begins the treatment regimen. The administration of chemotherapy and radiotherapy takes approximately one week and involves the administration of high doses of chemotherapy and radiotherapy to destroy all cancer cells and obliterate the bone marrow (Barrett, 1987; Kamani & August, 1984). The major side effects during this time are nausea, vomiting, diarrhea, painful stomatitis, and skin reactions (Freedman, 1988; Hutchinson & Itoh, 1982). Medications such as anti-emetics and analgesics are often administered during this stage to control these side effects (Salinger, 1984; Zimmerman et al, 1977).

The actual infusion of the bone marrow takes approximately one hour. The bone marrow, either donated (allogeneic) or the person's own (autologous), is given in the same manner as a blood transfusion or pushed into the Hickman line using a syringe (Freedman, 1988; Zimmerman et al, 1977). Complications that may result from this procedure include volume overload and pulmonary abnormalities. Allergic reactions to the bone marrow preservative may also occur and be manifested by chills, fever, urticaria, or respiratory distress (Freedman, 1988).

The period of engraftment begins following infusion and ends when the patient's bone marrow engrafts and begins to produce blood components. Many of the side effects that occur at this time are a result of the chemotherapy and radiotherapy. Serious complications, side effects,
and symptoms seen at this time include infection, bleeding, acute graft versus host disease (allogeneic patients only), respiratory distress, veno-occlusive disease, cardiac toxicity, neurological complications and graft rejection (Cahan & Lyddane, 1978; Champlin & Gale, 1984; Freedman, 1988; Gale, 1979; Hutchinson & Itoh, 1982; Kamani & August, 1984; Salinger, 1984). Other common manageable symptoms often seen during this time are nausea, vomiting, diarrhea, anorexia, stomatitis, hemorrhagic cystitis, alopecia, and skin rashes (Cahan & Lyddane, 1978; Cogliano-Shutta et al, 1985; Ford & Ballard, 1988; Freedman, 1988; Nuscher et al, 1984; O'Quin & Moravec, 1988; Schryber et al, 1987).

When the bone marrow engrafts and the counts begin to rise, the period of engraftment is complete. This usually occurs between 20 and 50 days after the infusion. When the side effects of the treatment are resolved and the patient is producing blood components and has no residual problems that require hospitalization, the patient is discharged home (Hutchinson & Itoh, 1982; Zimmerman et al, 1977). Depending on the patient's diagnosis and type of transplant, average stay in hospital ranges from 25 to 75 days post bone marrow infusion (G. Phillips, personal communication; February 7, 1990).

Emotions associated with Bone Marrow Transplant

Although the emotions related to the stress of cancer have been well documented (Cassileth et al, 1986; Goldberg & Cullen, 1985; Greer & Silberfarb, 1982; McCorkle & Young, 1978; Scott et al, 1984; Welch-McCaffrey, 1985) little research was found on the emotional responses of patients undergoing BMT, with only three papers exploring the changes in emotions over time. The Popkin, Moldow, Hall, Branda, and Yarchoan (1977) article is a case study, the Haberman (1987, 1988) dissertation and related article describes a qualitative research study, and the Brown and Kelly (1976) article is an anecdotal description of the emotional responses during the stages of the BMT.

The literature repeatedly reports anxiety, depression, fear, emotional lability, despondency, guilt and hostility as typical responses to the BMT in an anecdotal manner (Cahan & Lyddane, 1978; Corcoran-Buchsel, 1986; Gardner et al, 1977; Kamani & August, 1984; Popkin

**Changes in Emotional State throughout the BMT**

Several authors discuss the emotional response of patients according to the stages of the BMT (Brown & Kelly, 1976; Haberman, 1987, 1988; Popkin et al, 1977). During the initial stage, when the patient makes the decision to undergo the treatment and when the preliminary tests are done, the patient may feel helpless, anxious (Brown & Kelly, 1976), angry, hopeful, frustrated, or critical of treatment (Haberman 1987, 1988). Haberman (1987, 1988) reports a patient may feel in "limbo" if a bed is not available.

During the second stage, when the chemotherapy and radiotherapy are administered, patients feel exposed, defenceless, fearful, and anxious (Brown & Kelly, 1976). Haberman (1987, 1988) and Ingram (1982) report that Total Body Irradiation is a frightening experience for patients. Haberman (1987, 1988) states that patients feel uncertain of how they will cope with the treatment. Symptoms such as nausea and vomiting during this time may elicit feelings of doubt about the treatment. Some patients may have rigid control over any emotional display during this period (Popkin et al, 1977).

The day of the bone marrow infusion is described as a highly emotional day (Haberman, 1987, 1988). Haberman's subjects described the experience as producing feelings of a new lease on life or a second birthday. Popkin and colleagues (1977) reported the patient felt relief, but also anger with the donor for being able to leave the hospital.

During the engraftment period patients may feel defenceless, have heightened concern over physical symptoms and worry about getting an infection (Haberman 1987, 1988). Popkin and colleagues (1977) stated that their single case study subject became irate intermittently with unexplained delays in treatment or medical procedures, but when there were signs of engraftment weeping occurred. Several emotions are reported at this stage of the BMT procedure where Brown and Kelly (1976) reported patients feeling both fear and joy at leaving the hospital. Patients experienced separation anxiety at the thought of leaving and anxiety and depression about
the prospect of marrow failure, graft versus host disease, relapse, or death (Haberman 1987, 1988).

Wolcott and colleagues (1986) surveyed the adaptation of BMT adult recipient survivors at an average of 42 months post-transplant. Data was collected on the patients' health status, social role function, relationships, mood state and self-esteem. The participants were mainly young employed adults who currently were in intimate relationships. Approximately 25% reported ongoing medical problems and 15-25% reported significant emotional distress, low self-esteem, and less-than-optimal life satisfaction.

Factors that influence the Emotional Response

Factors in the BMT situation have been observed to impact on the emotional response of the patients. Isolation, necessary to protect the patient from infection, has strong emotional implications that are associated with loneliness, withdrawing, concealing or disguising feelings (Collins, Upright, & Aleksich, 1989; Holt-Ashley, 1986; Holland, Plumb, Yates, Harris, Tuttolomondo, Holmes & Holland, 1977; Patenaude & Rappaport, 1982). Personality factors, such as being intellectual, passive, and less active were associated with fewer negative emotions during isolation (Brown & Kelly, 1976; Haberman 1987, 1988). Physical status seems to have little influence in mildly to moderately ill patients whereas in very ill patients it is related to more anxiety and depression. The well-being of other patients affected the subjects in two studies and if another patient died, the subject became upset (Patenaude & Rappaport; 1982; Holland et al, 1977). Holland and colleagues (1977) state that family anniversaries were stressful days.

Summary of the Literature Review

In summary, the literature describes developing cancer as a highly stressful event which requires patients to develop new coping strategies and behaviors. Cancer treatment, chemotherapy or radiotherapy, cause widespread side effects that give rise to may different emotional states. Depression, anxiety, anger, confusion, and fatigue are common responses to cancer and its treatment. BMT is an increasingly popular method of treating certain types of
cancer. It involves preparation, administration of chemotherapy and radiotherapy, bone marrow infusion, and bone marrow engraftment phases. The BMT procedure is frequently associated with anxiety, depression, fear, emotional lability, despondency, guilt and hostility. Emotional responses are influenced by the isolation room, personality factors, physical status, well-being of other patients, and family anniversaries.
CHAPTER THREE

Methods

Introduction

This chapter will describe the design, sample, settings for the study and data collection instruments. In addition, human rights and ethical considerations, data collection and data analysis procedures will be reviewed.

Design

This study used a repeated measures design with assessments done on admission to hospital, during the administration of chemotherapy and radiotherapy, and one day, seven days, and 25 days following infusion. These times correspond with critical periods of the BMT. The initial assessment gave data about the person's distress and emotional state before experiencing the BMT procedure. Administration of chemotherapy and radiotherapy was a critical period because the patient was receiving potentially lethal treatments which generate many side effects. The bone marrow infusion was the next critical period because it marked the end of chemotherapy and the beginning of the waiting period for engraftment of the bone marrow. Seven days following the bone marrow infusion was the third critical time, when many side effects were manifested and the patient's blood counts were extremely low leaving the patient highly dependent on medical and nursing intervention. Twenty-five days following the bone marrow infusion was a fourth critical period. The patient's blood counts were usually returning to a safe level and the patient was looking forward to being discharged from the hospital. Depending on the type of transplant, the length of hospital stay varied from 25 days to 75 days after infusion.

Sample

A convenience sample of ten subjects was obtained. All subjects met the following criteria:

1. hospitalized to receive a bone marrow transplant,
2. eighteen years of age or older,
3. able to speak, read and write English and
4. not confused nor have any known acute or chronic mental illness.

Setting

The BMT units at both the Vancouver General Hospital (VGH) and the British Columbia Cancer Agency (BCCA) were settings used for this study. The questionnaires were administered in the patient's hospital room.

Data Collection Procedures

The researcher contacted the Head Nurse/Nursing Unit Manager of the BMT units for notification of admission of patients who met the selection criteria and who agreed to have the investigator approach them. The researcher explained the project to the patients, answered any questions they had, and obtained their consent to participate in the study. Two copies of the information/consent form were signed and one was left with the patient (see Appendix B).

The patients were asked to complete the Symptom Distress Scale (SDS), Profile of Mood States (POMS), and Data Collection Guide questions, initially, during the administration of chemotherapy and radiotherapy, one day, seven days, and 25 days following infusion. Usually, the patients completed the questionnaire while the investigator was present, but occasionally it was an inconvenient time and the questionnaires were left with the patients. The questionnaires were usually self-administered, but occasionally the patient was too ill and the researcher read the questions. All the patients completed the questionnaire on the given day or within three days. Information for the Data Collection Guide was obtained by asking the patient questions or by collecting data from the hospital chart (see Appendix C).

Data Collection Instruments

The instruments used were McCorkle and Young's (1978) Symptom Distress Scale (SDS)(see Appendix A) to measure symptom distress and McNair and colleagues' (1981) Profile
of Mood States (POMS) to measure emotional states. In addition, the researcher obtained information using a Data Collection Guide (see Appendix C). Part A was used to collect information on socio-demographic characteristics from the patient and the chart and Part B consisted of questions about factors that changed between each data collection period such as physical state, side effects experienced, and other emotional responses of the patient.

**Symptom Distress Scale**

The SDS was used to measure the mental and physical distress the patient felt as a result of his/her symptoms (see Appendix A). McCorkle and Young (1978) developed the instrument to measure symptom distress of cancer patients. The items were generated by identifying concerns of cancer patients over a three month period. The instrument is composed of 13 items that measure degree of distress associated with nausea, loss of appetite, insomnia, pain, fatigue, change in bowel pattern, difficulty with concentration, changes in appearance, difficulty with breathing and coughing, and fear of the future, and cough on a 5 point Likert Scale from "1" (I do not feel sick at all) to "5" (I feel as sick as I possibly could). Scores can range from 13 (very little symptom distress) to 65 (severe symptom distress). Content validity of this instrument is supported because other researchers identified the same symptoms causing distress (McCorkle and Young, 1978; Schneider, 1978). Testing on 53 patients receiving chemotherapy and radiotherapy showed a reliability coefficient alpha of 0.82 and a standardized item alpha of 0.83 indicating that the scale has an acceptable level of internal consistency. Factor analysis was not done (McCorkle and Young, 1978). The internal consistency of the symptom distress scale, measured by Cronbach's reliability coefficient alpha, remained fairly high throughout all the data collection periods (0.54, 0.85, 0.8, 0.77, 0.71) for this current study giving credence to the findings, except for time one when the coefficient was fairly low.

The SDS was chosen for this study because BMT patients experience many of the same symptoms as those patients who have already used the scale. BMT patients may show symptoms different than those included in the SDS due to the particular nature of the procedures (graft versus host disease, excessive sedation due to anti-emetics or narcotic intake). To offset this
problem, an interview guide was developed to collect information about the additional symptoms experienced by patients.

Profile of Mood States

The POMS is a 65 item 5 point Likert scale that measures perception of affect. It was developed by McNair and colleagues (1981) to measure the emotions of psychiatric outpatients and college students. Six emotional states are measured which are tension-anxiety, depression-dejection, anger-hostility, vigor-activity, fatigue-inertia, confusion-bewilderment (McNair et al, 1981). A score of total mood states can be found by totalling all the scores together or each sub-component can be scored. Some moods are positive and some are negative (see Appendix D). The overall score ranges from -32 (low emotional disturbance) to +200 (high emotional disturbance).

Test-retest reliability for the six factors of the POMS ranged from 0.65 to 0.74 for the period between intake and commencement of treatment for psychiatric patients (McNair et al, 1981). McNair and associates (1981) report internal consistency reliability is highly satisfactory for the POMS with alpha coefficients of 0.90 and higher. The POMS also showed good internal consistency. For this current study, the Cronbach's reliability coefficient alpha for the first data collection period were tension-anxiety (0.95), depression-dejection (0.83), anger-hostility (0.64), vigor-activity (0.91), fatigue-inertia (0.78), and confusion-bewilderment (0.73).

Evidence of predictive validity was found when the factor scores proved sensitive to change associated with psychotherapy (Haskell, Pugatch, & McNair, 1969) and to short-term changes associated with mild tranquilizers (Lorr, McNair & Weinstein, 1964). Several studies have shown the POMS is sensitive to measuring changes in emotions predicted to occur at various times in emotion-inducing conditions (Pillard & Fisher, 1967).

Concurrent validity was examined using the Hopkins Symptom Distress Scale. It showed that similar factors such as tension-anxiety to anxiety-distress, and depression-dejection to depression-distress were highly correlated with emotional state. Nearly all the POMS factors were moderately to highly correlated with the three symptom measures. The majority of
correlations ranged from 0.77 for anxiety, to 0.86 for depression, and to 0.61 for fatigue (Parloff, Kelman, & Frank, 1954). The POMS was correlated with the Taylor Manifest Anxiety Scale for the tension-anxiety factor at 0.80 (McNair et al, 1981).

The POMS was chosen for use in this study because it appears to be the most applicable tool and has been used previously to measure the emotions of cancer patients (McCorkle & Quint-Benoliel, 1983) and BMT patients (Wolcott et al, 1986). The Data Collection Guide was used to collect subjective data about the patient's emotional state that might not have been identified using the POMS.

Data Collection Guide

The Data Collection Guide was formulated by the researcher to collect data that is relevant to patients undergoing the BMT procedure. Socio-demographic information was collected on Part A of the Data Collection Guide (see Appendix C). This data included information such as age, gender, marital status, occupation, education, place of residence, diagnosis, past treatments, and medical history. Part B was designed to gather information that might change over the data collection period such as symptoms, blood counts, medications, treatments, and emotional states.

Data Analysis

Data were analyzed using descriptive statistics and parametric statistics. Parametric tests are used because, although the sample size was small, it satisfies the assumptions of homogeneity of variance and symmetry of variance and covariance (W. Boldt, personal communication, October 10, 1990).

The subjects were described according to their socio-demographics (age, gender, marital status, support systems, educational level, occupation, place of residence) and their health history (diagnosis, type of transplant, and length of time since first diagnosed).

The first research question was answered by presenting descriptive data on the type and frequency of individual and total symptom distress experienced by the patient as well as the intensity for each data collection period. To address research question two, the presence and
significance of any changes was tested using Repeated measures analysis of variance. Research question three was answered using the POMS data and analyzed similarly to question one. Research question four was tested using repeated measures analysis of variance to find any significant change in emotional states. Finally, the fifth question was addressed by correlating the scores obtained from the SDS and the POMS instruments for each of the five time periods using Pearson's correlation coefficient. A two-tailed level of significance of 0.05 was used because the direction of the relationship between data was not predicted.

Human Rights and Ethical Considerations

To protect the human rights of the participants the thesis proposal was reviewed by the Behavioral Sciences Screening Committee at the University of British Columbia and the research committees at the British Columbia Cancer Agency and the Vancouver General Hospital. The subjects were provided with a description of the study and an information/consent sheet (see Appendix B). The subjects were told that the study involved approximately 20 minutes of their time to answer questions from two questionnaires and a Data Collection Guide at five different times during the BMT procedure. Subjects were given several opportunities to ask questions before signing the consent sheet. Subjects were free to withdraw at any time from the study. Patient's names were not on the questionnaire or on the Data Collection Guides. Code numbers were used on all documentation to insure confidentiality of the subjects.
CHAPTER FOUR

Presentation and Discussion of Results

Introduction

This chapter is divided into three sections. Demographic and health-related characteristics of the sample are presented in the first section. The research results pertaining to each of the five research questions are presented in section two. The third section consists of a discussion of the findings.

Characteristics of the Sample

A total of 17 subjects were approached to participate in the study and 13 agreed to participate in the study. Of these 13, one was unable to complete the baseline questionnaire and two other subjects became too ill to finish the last two questionnaires leaving a total of 10 subjects who completed the questionnaires at all five data collection periods. Socio-demographic data are reported on all 12 subjects who initially became involved in the study. When answering questions one and three, all available frequencies are presented. When answering the remaining questions, nine subjects were included in the statistical analysis, on the recommendation of Dr. W. Boldt, because one subject had widely differing responses from the other nine. Two subjects did not have complete data. This subject suffered severe organ toxicities and poor engraftment likely leading to results on the SDS and the POMS that were very different from the other nine subjects.

Demographic Characteristics of the Sample

Demographic characteristics of the sample are discussed in terms of age, sex, marital status, number of children, educational level, occupation, and place of residence. Age ranged from 25 to 59 years with a mean of 41.8 years (see Table I). The sample consisted of ten male subjects (83.3%) and two female subjects (16.7%). Of the twelve subjects, six were married (50%), two lived common-law (16.7%), two were divorced (16.7%), and two were single.
The number of children the subjects had ranged from zero to eight. Educational level was broken down into those having completed elementary school (25%), high school (16.7%) and college (58.3%). Occupational status was categorized into professional/manager (25%), sales (25%), laborer (25%), and unemployed (25%). The subjects lived in the lower mainland of British Columbia (B. C.) (50%), other places in B. C. (33%), and in Alberta (17%).

Table I

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percent</th>
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<tr>
<td>25-29</td>
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<tr>
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<td>8.3</td>
</tr>
<tr>
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<td>2</td>
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<tr>
<td>45-49</td>
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<td>33.3</td>
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<tr>
<td>50-54</td>
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<td>-</td>
</tr>
<tr>
<td>55-59</td>
<td>2</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Health-Related Characteristics of the Sample

Health-related characteristics of the sample are discussed in terms of information collected prior to starting the BMT procedure and data that changed during the transplantation period. Static characteristics collected on the initial visit included diagnosis, time since diagnosis, type of transplant, and place of transplant. The diagnoses were leukemia (4), lymphoma (3), ovarian cancer (1), Hodgkin's disease (1), neuroectodermal sarcoma (1), myeloma (1), and testicular cancer (1). Time since diagnosis ranged from three months to five years (M=13.3 months)(see Table II). There were eight autologous transplants, three allogeneic, and one repeat allogeneic transplant. Six transplants were started at VGH and six started at BCCA with one subject transferred to VGH during the study.

Characteristics that tended to change between the data collection periods were blood counts, medications, treatments, visitors, and the environment of the room. As one might expect platelets, white blood cell count (WBC), and hemoglobin changed throughout the BMT procedure.
In general, the platelet count at the first data collection period was fairly high and gradually dropped until all subjects required platelet transfusions during the engraftment period. At the last data collection period, three patients still had very low platelet counts while the remaining subjects' platelet counts had started to increase. At the first data collection period, all subjects had adequate WBC counts with three leukemic patients having abnormally high counts. During the administration of chemotherapy and radiotherapy, two subjects experienced a rapid drop in their WBC counts, while others maintained adequate counts until the third data collection period. At that time, five subjects had very low WBC counts with all subjects having very low counts at the fourth data collection period. Some variability existed at the last data collection period where seven patients had recovered their WBC counts and three still had low counts. Hemoglobin gradually decreased over time, but remained at a satisfactory level throughout the BMT procedure for all patients due to transfusion therapy.

Table II

<table>
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<th>Time Since Diagnosis (n=12)</th>
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</thead>
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<tr>
<td>7-12 months</td>
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BMT patients received similar medications throughout the procedure (see Appendix F). All patients required anti-emetic therapy during the administration of chemotherapy and radiotherapy. This time is also termed the conditioning regime. Nine patients required total parenteral nutrition as they were unable to eat due to anorexia and mucositis. For four patients, the mucositis was severe enough to warrant continuous intravenous morphine. All patients required pre-medications for blood products and for amphotericin B to prevent reactions. All patients required antibiotic coverage while their WBC counts were low. In addition, four patients
Table III

Range of Blood Counts through the BMT Procedure

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<th></th>
<th>Admission to Hospital n=12</th>
<th>Chemotherapy and Radiotherapy n=12</th>
<th>Bone Marrow Infusion n=12</th>
<th>7 days post-infusion n=10</th>
<th>25 days post-infusion n=10</th>
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<tbody>
<tr>
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<td>44-94</td>
<td>29-726</td>
<td>13-170</td>
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<tr>
<td>White Blood* Cell Count</td>
<td>3.2-104.0</td>
<td>1.0-18.6</td>
<td>0.1-8.5</td>
<td>0.1-0.6</td>
<td>0.4-13.2</td>
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<tr>
<td>Hemoglobin*</td>
<td>78-134</td>
<td>97-115</td>
<td>82-131</td>
<td>85-115</td>
<td>70-116</td>
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</table>

*Note. Normal Values=
Platelets 125-400 X 10(9)/L
WBC 4.0-11.0 X 10(9)/L
Hemoglobin Men: 140-180 g/L, Women 120-160 g/L

were involved in a study where they received a bone marrow enhancer. Finally, the allogeneic patients received anti-rejection medications.

The majority of treatments took place as part of the pre-BMT protocol. During the BMT, all patients had chest X-rays and one had a spinal tap. Routine procedures such as Hickman line care and blood work were done every day for each of the patients along with medical and nursing assessments and monitoring.

The number of visitors varied for each of the twelve subjects from those having no visitors to those who had a friend or relative at their bedside almost continuously. Six patients were from out of town. Two had family who stayed with them continually while the remaining four had visitors only occasionally. Of the six who were from the lower mainland, one subject asked that no one come and visit him, four had visitors that came in the evenings and on the weekends, and one subject had relatives attending most of each day.

The environment of the isolation room ranged from no personal articles to having many get-well cards, decorations, balloons or stuffed animals. All the rooms had a television and video-player. Some had a stereo. In addition, all the rooms had a large whiteboard where
calendars, blood counts, pictures, or messages were written. Finally, all the rooms had a private bathroom and a large window.

Findings

The findings of the study will be presented in relation to the five research questions.

Type and Degree of Symptom Distress Throughout the BMT

To address question one: the type and degree of symptom distress that subjects expressed throughout the BMT process, both the individual and the total scores for the SDS scale at hospital admission, during administration of chemotherapy and radiotherapy, one day, seven days, and 25 days post bone marrow infusion will be presented (see Table IV).

Individual Scores

The individual scores for distress from problems regarding nausea, appetite, insomnia, pain, fatigue, bowel, concentration, appearance, breathing, outlook, and cough are presented in Table IV in relation to frequency. Table V shows the means for each symptom distress at each data collection period. These means were calculated in order to compare symptom distress levels.

Symptoms that caused the most distress were related to problems with appetite, insomnia, and fatigue. Appetite related distress means were 1.5 at the initial data collection period rose to a maximum of 3.7 one week following infusion and dropped to a mean of 2.9 at 25 days post bone marrow infusion. The scores ranged from one to four at the initial visit and thereafter ranged from one to five. Insomnia was the other symptom that caused considerable distress with a starting mean of 2.0 which increased to a maximum of 3.5 seven days post infusion and dropped to 2.5 at 25 days post transplant with a range of one to four initially and one to five for the remaining four data collection periods. Distress from fatigue showed consistently high means (M=2.1, M=2.8, M=2.6, M=2.7, M=2.4) and a wide range of scores at all points.

Nausea existence and intensity, pain existence and intensity, bowel, and concentration symptoms showed moderate distress. Distress from the existence of nausea began with a mean
Table IV

Individual Symptom Distress Frequencies

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<th></th>
<th>Admission to Hospital n=12</th>
<th>Chemotherapy and Radiotherapy n=12</th>
<th>Bone Marrow Infusion n=12</th>
<th>7 days post-infusion n=10</th>
<th>25 days post-infusion n=10</th>
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</table>

Note. 1=not distressing 5=extremely distressing.

*indicates where the outlier response falls

**indicates where the withdrawers' response falls
of 1.3, increased to 2.3, and then decreased to 1.5 with a range of one to three initially, one to four during administration of chemotherapy and radiotherapy, one to five one day post infusion, one to three one week following infusion, and one to five 25 days post infusion. At 25 days post infusion, only one subject's score was at five with the remainder ranging from one to two. Nausea intensity distress began with a mean of 1.7, increased to 2.3 during the administration of chemotherapy and radiotherapy, and continued to decrease to a low of 1.6 at the final data collection period. Nausea intensity had a fairly wide range at all data collection periods (1 to 3, 1 to 4, 1 to 4, 1 to 3, 1 to 5).

Table V

Mean Distress Levels Resulting from Individual Symptoms

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<th>Admission to Hospital n=12</th>
<th>Chemotherapy and Radiotherapy n=12</th>
<th>Bone Marrow Infusion n=12</th>
<th>7 days post-infusion n=10</th>
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Note. Each symptom was measured on a 5 point scale.

Distress related to pain existence began with a mean of 2.1, dropped to 2.0 at the second measurement time, rose marginally to 2.7 and then decreased to 1.9 25 days post infusion. Pain existence had a wide range through the BMT (1 to 5, 1 to 4, 1 to 5, 1 to 5, 1 to 5). Pain intensity distress had a mean of 1.6 initially and rose to 2.2 one day following infusion and then decreased
to 1.4 at the final data collection time. It had a fairly wide range (1 to 3, 1 to 4, 1 to 4, 1 to 3, 1 to 5) at the different data collection times.

Bowel distress began with a mean of 1.8, increased to 2.4 one day following bone marrow infusion, and dropped to 1.8 at the end. The range was one to five for the first, second, and fifth data collection periods and one to four and two to four at the third and fourth periods. Concentration distress began at a mean of 1.5, reached a maximum of 2.3 during the administration of chemotherapy and radiotherapy, and dropped to a final mean of 1.6 at the last data collection period. Initially, the range was from one to two and then increased to a maximum of one to five.

The four symptoms that were the least distressing were appearance, breathing, outlook, and cough. The means for distress related to appearance remained relatively stable throughout the procedure with a slight increase during the conditioning regime and a slight drop at the end of the procedure (M=1.6, M=1.8, M=1.6, M=1.5, M=1.3). The range was from one to three for the first three visits and for most subjects decreased to a range of one to two at the end of the BMT procedure. Distress related to breathing ranged from a mean of 1.0 to a mean of 1.5 at the last measurement time. The range was very low for breathing except at the last data collection period where the range was from one to five. The higher mean and range at 25 days post infusion was due to one subject who had very high scores compared to the other subjects. Distress related to outlook was the only symptom that started by having the highest mean (M=2.2) and then gradually decreased to the lowest mean (M=1.6) at the end of the BMT period. Outlook started with the greatest range (one to four) and gradually decreased during the BMT procedure with the lowest range at the end (one to two). Distress related to cough had means that remained fairly stable throughout the procedure (M=1.5, M=1.7, M=1.5, M=1.5, M=1.3) with a range of one to three for baseline, administration of chemotherapy and radiotherapy, and infusion and then one to two at 7 and 25 days following bone marrow infusion.
Total SDS Scores.

The possible range for total SDS was 13 (low distress) to 65 (high distress). The mean total symptom distress score at hospital admission had the lowest distress ($M=21.8$). It was highest one day following infusion ($M=29.4$), and decreased to a low at the end of treatment ($M=23.3$) (see Table VI). The ranges (13-42) remained fairly constant until twenty-five days following the bone marrow infusion when the range decreased to 15 to 27 (excluding an outlier who had a score of 54).

Table VI

<table>
<thead>
<tr>
<th>Total Symptom Distress Score</th>
<th>Admission to Hospital n=12</th>
<th>Chemotherapy and Radiotherapy n=12</th>
<th>Bone Marrow Infusion n=12</th>
<th>7 days post-infusion n=10</th>
<th>25 days post-infusion n=10</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-17</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>18-22</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>23-27</td>
<td>2</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>28-32</td>
<td>1*</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>33-37</td>
<td>-</td>
<td>4*</td>
<td>2</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>38-42</td>
<td>1</td>
<td>1</td>
<td>3*</td>
<td>1*</td>
<td>-</td>
</tr>
<tr>
<td>43-47</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>48-52</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>53-57</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1*</td>
</tr>
<tr>
<td>mean</td>
<td>21.8</td>
<td>28.5</td>
<td>29.4</td>
<td>28.6</td>
<td>23.3</td>
</tr>
<tr>
<td>mode</td>
<td>15.0</td>
<td>35.0</td>
<td>22.0</td>
<td>34.0</td>
<td>15.0</td>
</tr>
<tr>
<td>SD=</td>
<td>5.2</td>
<td>9.2</td>
<td>8.1</td>
<td>5.9</td>
<td>4.3</td>
</tr>
<tr>
<td>mean (n=9)</td>
<td>19.2</td>
<td>28.6</td>
<td>28.8</td>
<td>27.4</td>
<td>19.9</td>
</tr>
</tbody>
</table>

Note: Minimum possible is 13 (low distress). Maximum possible is 65 (high distress). *Indicates outlier's response

Verbal Reports of Symptom Distress.

A summary of the responses to the question "What symptoms are bothering you today?" are described below. On admission to hospital, most patients did not have any symptoms, but a few reported back pain (from bone marrow harvest), abdominal pain, and headache with one subject reporting "trouble with bowels" and nosebleeds. During the administration of
chemotherapy and radiotherapy, most subjects reported nausea, vomiting, mucositis, and fatigue while one person reported he felt agitation from receiving the anti-emetic Maxeran. Following the bone marrow infusion, a wide range of symptoms were reported such as nausea, interrupted sleep, cramps, diarrhea, and mucositis. One week following the bone marrow infusion, mucositis, diarrhea, rigors, pruritis, and generalized aches were reported by most subjects. At the last data collection period, different subjects reported that fever, blocked salivary glands, headache, and a painful eye were problematic.

Changes in Symptom Distress throughout the BMT Procedure

In order to address research question two regarding how symptom distress changed over time, repeated measures analysis of variance was used to determine if the changes in symptom distress over the course of the BMT were significant for each symptom (see Figure III and IV) and for total symptom distress (see Table VII). Only nine subjects were used in the analysis because one subject's responses were very different from the others and considered an outlier. Each of the symptom scores were statistically tested to determine if significant change existed between each of the five data collection periods and if change did exist, post-hoc analysis was done using the Student Newman-Keuls test.

Symptom distress changed significantly over time for nausea existence, appetite, insomnia, bowel problems, and concentration. Distress from nausea existence ($F=6.0, p=0.001$) initially and at the end the procedure was significantly different than the distress felt during the administration of chemotherapy and radiotherapy. Distress from appetite problems at the initial data collection was significantly different from all subsequent data collections ($F=7.53, p=0.002$). Insomnia induced distress was significantly different initially from that experienced during the administration of chemotherapy and radiotherapy, one day and seven days following the infusion of bone marrow ($F=4.2, p=0.007$). Distress experienced from changes in bowel pattern was significantly different initially and at the end of treatment than at one day and seven days following the bone marrow infusion ($F=5.9, p=0.001$). Distress caused from changes in
Means of Each Symptom Distress at each Measurement Time during the BMT Procedure (n=9)

1=nausea existence, 2=nausea intensity, 3=appetite problems, 4=insomnia, 5=pain existence, 6=pain intensity, 7=fatigue, 8=bowel problems, 9=concentration, 10=appearance, 11=breathing, 12=outlook, 13=cough
concentration was significantly different one day following the infusion of the bone marrow and at 25 days post infusion (F=3.7, p=0.01).

Analysis showed there was a significant change in the total symptom distress (F=7.8, p=0.0002). Further analysis, using Student-Newman-Keuls test for variable, showed that subjects experienced significantly more symptom distress at the second, third, and fourth data collection periods than at the first or last. That is, the total distress at the first and last time period were not significantly different, but they did differ significantly from the total symptom distress at the other three times. Figure V shows that the total symptom distress for each of the five data collection periods forms a curve that is quadratic (p=0.0001) where the symptom distress is at first relatively low, sharply increases on administration of chemotherapy and radiotherapy,

Figure IV
Means of Total Symptom Distress Scores Throughout the BMT Procedure(n=9)

Note p=0.0001 that curve is quadratic
remains high one day following bone marrow infusion, starts a gradual decline at one week following bone marrow infusion, and decreases close to baseline levels at 25 days following the bone marrow infusion.

Table VII

Change in Symptom Distress Throughout the BMT Procedure (n=9)

<table>
<thead>
<tr>
<th></th>
<th>Admission to Hospital n=12</th>
<th>Chemotherapy and Radiotherapy n=12</th>
<th>Bone Marrow Infusion n=12</th>
<th>7 days post-infusion n=10</th>
<th>25 days post-infusion n=10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>19.2</td>
<td>28.6</td>
<td>28.8</td>
<td>27.4</td>
<td>19.9</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>4.4</td>
<td>8.2</td>
<td>7.6</td>
<td>6.4</td>
<td>4.3</td>
</tr>
</tbody>
</table>

Type and Degree of Emotions throughout the BMT Procedure

In order to address research question three: the type and degree of emotions that subjects experienced throughout the BMT procedure, results from the POMS are presented. The means (see Table VIII) and frequencies (see Table IX) for each subscale are recorded along with the mean and frequencies for the total emotional scores (see Table X).

The maximum possible score for tension-anxiety was 36 (high tension-anxiety) and the minimum possible score was zero (low tension-anxiety). Tension-anxiety began at a moderate degree (\(M=11.9\)), increased to a maximum point one day following the bone marrow infusion (\(M=12.8\)), and then steadily decreased to a low point at twenty-five days post transplant (\(M=7.8\)). A wide range of scores was present at the beginning of the treatment (0-29) and steadily decreased throughout the BMT. The range was the lowest at the end of treatment (0 to 20).

The lowest possible score for depression-dejection was zero (low depression-dejection) and the highest possible score was 60 (high depression-dejection). Depression-dejection started
out moderately (M=10.3), rose to a high one day following infusion (M=11.4), sharply declined one week after the infusion (M=7.0) and continued to decrease to the end of the procedure (M=5.4). A wide range was seen in depression-dejection (1 to 35, 0 to 50, 0 to 41) until after bone marrow infusion where, at one week (0 to 27) and 25 days (0 to 19) following the infusion, the range was much less.

Scores could range from zero (low) to 44 (high) for anger-hostility. Anger-hostility started at a moderate point (M=7.3), decreased slightly during the administration of chemotherapy and radiotherapy (M=6.8), rose again to a high one day following the bone marrow infusion (M=8.0), and then gradually decreased to the lowest point at the end of the BMT (M=4.2). The range was low at the beginning of the procedure (0-16), increased one day following the bone marrow infusion (0-26), and then decreased to a small range at the end of the treatment (0-12).

Table VIII

Means for Emotional Subscales throughout the BMT Procedure

<table>
<thead>
<tr>
<th></th>
<th>Admission to Hospital n=12</th>
<th>Chemotherapy and Radiotherapy n=12</th>
<th>Bone Marrow Infusion n=12</th>
<th>7 days post-infusion n=10</th>
<th>25 days post-infusion n=10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tension-Anxiety</td>
<td>11.9</td>
<td>12.3</td>
<td>12.8</td>
<td>8.5</td>
<td>7.8</td>
</tr>
<tr>
<td>Depression-Dejection</td>
<td>10.3</td>
<td>10.3</td>
<td>11.4</td>
<td>7.0</td>
<td>5.4</td>
</tr>
<tr>
<td>Anger-Hostility</td>
<td>7.3</td>
<td>6.8</td>
<td>8.0</td>
<td>6.5</td>
<td>4.2</td>
</tr>
<tr>
<td>Vigor-Activity</td>
<td>18.4</td>
<td>12.3</td>
<td>13.7</td>
<td>12.8</td>
<td>15.9</td>
</tr>
<tr>
<td>Fatigue-Inertia</td>
<td>6.7</td>
<td>10.9</td>
<td>10.8</td>
<td>8.9</td>
<td>6.8</td>
</tr>
<tr>
<td>Confusion-Bewilderment</td>
<td>5.9</td>
<td>8.1</td>
<td>8.6</td>
<td>5.9</td>
<td>4.0</td>
</tr>
</tbody>
</table>
Table IX

Levels of Emotions throughout the BMT Procedure

<table>
<thead>
<tr>
<th>Scores</th>
<th>Admission to Hospital n=12</th>
<th>Chemotherapy and Radiotherapy n=12</th>
<th>Bone Marrow Infusion n=12</th>
<th>7 days post-infusion n=10</th>
<th>25 days post-infusion n=10</th>
</tr>
</thead>
<tbody>
<tr>
<td>TENSION-ANXIETY</td>
<td>0-4</td>
<td>3</td>
<td>1**</td>
<td>2**</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>5-8</td>
<td>3*</td>
<td>3**</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>9-12</td>
<td>1**</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>13-16</td>
<td>2</td>
<td>2</td>
<td>2*</td>
<td>1*</td>
</tr>
<tr>
<td></td>
<td>17-20</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>21-24</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>25-28</td>
<td>1</td>
<td>2**</td>
<td>2**</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>29-32</td>
<td>1**</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Note.* Minimum possible is 0 (low tension-anxiety). Maximum possible is 36 (high tension-anxiety).

DEPRESSION-DEJECTION

<table>
<thead>
<tr>
<th>Scores</th>
<th>0-5</th>
<th>5*</th>
<th>7* **</th>
<th>6**</th>
<th>6*</th>
<th>6</th>
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</thead>
<tbody>
<tr>
<td>6-10</td>
<td>2**</td>
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<td>2*</td>
<td>-</td>
<td>-</td>
<td>1*</td>
</tr>
<tr>
<td>11-15</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>16-20</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>21-25</td>
<td>1**</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>26-30</td>
<td>-</td>
<td>1**</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>31-35</td>
<td>1</td>
<td>-</td>
<td>1**</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>36-40</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>41-45</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>46-50</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Note.* Minimum possible is 0 (low depression-dejection). Maximum possible is 60 (high depression-dejection).

ANGER-HOSTILITY

<table>
<thead>
<tr>
<th>Scores</th>
<th>0-4</th>
<th>4</th>
<th>6** **</th>
<th>5*</th>
<th>5</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-8</td>
<td>4*</td>
<td>3</td>
<td>2**</td>
<td>2*</td>
<td>2*</td>
<td>-</td>
</tr>
<tr>
<td>9-12</td>
<td>2**</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>13-16</td>
<td>2**</td>
<td>-</td>
<td>1**</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>17-20</td>
<td>-</td>
<td>1**</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>21-24</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>25-28</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Note.* Minimum possible is 0 (low anger-hostility). Maximum possible is 44 (high anger-hostility).

VIGOR-ACTIVITY

<table>
<thead>
<tr>
<th>Scores</th>
<th>0-4</th>
<th>-</th>
<th>1**</th>
<th>-</th>
<th>1</th>
<th>-</th>
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</thead>
<tbody>
<tr>
<td>5-8</td>
<td>-</td>
<td>1*</td>
<td>3**</td>
<td>2</td>
<td>1*</td>
<td>-</td>
</tr>
<tr>
<td>9-12</td>
<td>4** **</td>
<td>6**</td>
<td>3*</td>
<td>1</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>13-16</td>
<td>-</td>
<td>2</td>
<td>3</td>
<td>3*</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>17-20</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>21-24</td>
<td>3</td>
<td>1</td>
<td>2**</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>25-28</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>29-32</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

*Note.* Minimum possible is 0 (low vigor-activity). Maximum possible is 32 (high vigor-activity).
Possible scores for vigor ranged from zero (high vigor-activity) to 32 (low vigor-activity). Subjects were the most vigorous at the beginning of the treatment ($M=18.4$), quickly dropped during the conditioning regime ($M=12.3$), rose slightly one day post infusion ($M=13.7$), dropped one week later ($M=12.8$) and then began to recover at the end of the treatment ($M=15.9$). The range for vigor remained fairly wide throughout the BMT procedure (9 to 28, 0 to 24, 5 to 24, 0 to 28, 5 to 32).

The lowest score possible for fatigue-inertia is zero (low) and the highest score possible is 28 (high). Fatigue-inertia started off low ($M=6.7$), increased to a maximum during the administration of chemotherapy ($M=10.9$) and then gradually decreased to the end of treatment ($M=6.8$). The ranges were the least at the first (0 to 16) and last interview (0 to 16) and increased slightly for the middle three interviews (2 to 21, 0 to 18, 0 to 22).

Confusion-bewilderment scores ranged from zero (low) to 28 (high). Confusion was low initially ($M=5.8$), rose to a peak one day following the infusion ($M=8.6$), and then reached the lowest point at 25 days post infusion ($M=4.0$). Confusion had a wide range throughout the BMT
procedure (0 to 16), but was the highest during the administration of chemotherapy (2 to 17) and one day following the bone marrow infusion (0 to 17) and decreased to the lowest one week (0 to 12) and 25 days (0 to 16) following the infusion.

**Total POMS Score.**

Total POMS scores were obtained by adding the total scores from each of the subscales, weighing vigor negatively, giving a possible range of scores from -32 (low mood disturbance) to 200 (high mood disturbance)(see Table X). The baseline measurement ($M=23.6$) showed a moderate level of emotional disturbance which gradually increased to a maximum one day ($M=37.8$) following the bone marrow infusion and continued to drop one week ($M=24.0$) and 25 days ($M=12.3$) following the infusion. A wide range existed for total POMS scores throughout the BMT (-19 to 94, -10 to 124, -13 to 115, -23 to 86, -32 to 60).

Table X

Scores for Total Profile of Mood States

<table>
<thead>
<tr>
<th>Scores</th>
<th>Admission to Hospital n=12</th>
<th>Chemotherapy and Radiotherapy n=12</th>
<th>Bone Marrow Infusion n=12</th>
<th>7 days post-infusion n=10</th>
<th>25 days post-infusion n=10</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-32)-(-12)</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>(-11)-10</td>
<td>2</td>
<td>3**</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11-30</td>
<td>3</td>
<td>4</td>
<td>2**</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>31-50</td>
<td>4**</td>
<td>2</td>
<td>2*</td>
<td>3*</td>
<td>-</td>
</tr>
<tr>
<td>51-70</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>2*</td>
</tr>
<tr>
<td>71-90</td>
<td>-</td>
<td>1*</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>91-110</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>111-130</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mean</td>
<td>23.6</td>
<td>36.2</td>
<td>37.8</td>
<td>24.0</td>
<td>12.3</td>
</tr>
</tbody>
</table>

*Note. Minimum possible is -32 (low mood disturbance). Maximum possible is 200 (high mood disturbance). Total Mood Score is obtained by adding the scores for tension-anxiety, depression-dejection, anger-hostility, fatigue-inertia, and confusion-bewilderment, and then subtracting the score for vigor-activity.

*indicates where the outlier response falls

**indicates where the withdrawers' response falls
**Verbal Reports of Emotional State.**

Subjective responses to the question "How are you feeling today?" tended to differ for each data collection period. At the first data collection period, most patients responded by saying they felt good, positive, or optimistic; however, one person responded by saying he felt anxious. During the administration of chemotherapy and radiotherapy, most still stated they felt good with one saying he felt anxious and two saying they wanted to leave the isolation room. Following the bone marrow infusion, most of the subjects responded by saying they felt good with three stating they felt anxiety or concern and one patient reported feeling miserable. One week after the bone marrow infusion, subjects responded by saying they felt fine, good, or relaxed with two stating they were bored and one stating she felt confused. At the last data collection period, most subjects responded by saying they felt good and/or they wanted to go home. Two subjects stated they were disappointed because their counts were not higher.

**Changes in Emotional State Throughout the BMT Procedure**

To address research question four regarding how emotional states changed over time, repeated measures analysis of variance was used to determine if the changes in emotional distress over the course of the BMT were significant for each emotional subscale and for the total emotional state. Data is presented using the results obtained from the subscales and total POMS score at each of the five data collection periods. The outlier mentioned previously, is not included leaving nine subjects for analysis.

Each of POMS emotional subscales were statistically tested using the repeated measures analysis of variance to determine if change existed between each of the five data collection periods and if significant change did exist, post-hoc analysis was done using Student-Newman-Keuls test (see Figure V). Tension-anxiety subscale showed a significant change ($F=3.2$, $p=0.03$) and formed a curve that was linear ($p=0.01$) (see Figure VI). Post-hoc analysis of this subscale showed that the results at the time of bone marrow infusion were significantly different from the results found just prior to discharge. Anger-hostility subscale significantly changed ($F=4.0$, $p=0.01$) and formed a curve which was quadratic ($p=0.02$). Post-hoc analysis showed that
Figure VI

Item Means for Individual Emotions throughout the BMT (n=9)

emotional subscales

1=anxiety, 2=depression, 3=anger, 4=vigor-, 5=fatigue, 6-confusion
during the administration of chemotherapy and radiotherapy anger-hostility were significantly
different from all other times. Both vigor-activity (F=4.4, p=0.01) and fatigue-inertia (F=4.1,
p=0.01) showed significant changes throughout the BMT procedure and both formed a curve
which was quadratic (p=0.0009, p=0.0005). Further analysis of vigor-activity showed that the
baseline and the final reading were significantly different than during administration of
chemotherapy and radiotherapy and one day following bone marrow infusion. Fatigue had
significant differences between admission and discharge and one and seven days post-infusion.
Seven days post-infusion was not different for both vigor-activity and fatigue-inertia. Confusion-
bewilderment had statistically significant changes (F=3.5, p=0.02) over time and formed a curve
which was linear (p=0.006). Significant differences in confusion existed between
administration of chemotherapy and radiotherapy and discharge from hospital. The changes in
total POMS scores were analyzed using repeated measures analysis of variance which indicated
that the changes in mood over time were significant (F=4.68, p=0.004)(see Table XI). Further
analysis, using Student-Newman-Keuls test, showed that subjects had significantly different
emotional states at 25 days post infusion than during administration of chemotherapy and
radiotherapy and one day post infusion. Figure VI showed that the total emotional state for each
of the five data collection periods formed a quadratic curve (p=0.0004) where the emotional state
was at first undisturbed, sharply increased on administration of chemotherapy and radiotherapy,
remained high one day following bone marrow infusion, started a gradual decline at one week
following bone marrow infusion, and decreased below baseline levels at 25 days following the
bone marrow infusion.

Table XI

| Change of Total Emotional State Throughout the BMT Procedure (n=9) |
|-------------------|-------------------|-------------------|-------------------|-------------------|
|                   | Admission to Hospital | Chemotherapy and Radiotherapy | Bone Marrow Infusion | 7 days post-infusion | 25 days post-infusion |
| Mean              | 16.8               | 37.1               | 38.1               | 24.1               | 8.1                 |
| Standard Deviation | 23.7               | 37.4               | 38.1               | 31.6               | 22.7                |
Relationship between Symptom Distress and Emotional State Throughout the BMT Procedure

Research question five, the relationship between symptom distress and emotional state throughout the BMT procedure was answered using Pearson's Correlation Coefficients which compared total symptom distress to total emotional distress for each of the five data collection periods. The relationships between distress for individual symptoms and each emotion were also correlated (Table XII). The results showed that total symptom distress and overall emotional state was significantly positively correlated one day following the bone marrow infusion \( (r=0.8, \ p=0.01) \), but at no other time.
Table XII

Correlation of Symptom Distress and Emotional State (n=9)

<table>
<thead>
<tr>
<th></th>
<th>POMS</th>
<th>tension</th>
<th>depression</th>
<th>anger</th>
<th>vigor</th>
<th>fatigue</th>
<th>confusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>outlook</td>
<td>0.7*</td>
<td>0.7*</td>
<td>0.6*</td>
<td>0.6*</td>
<td></td>
<td></td>
<td>0.7**</td>
</tr>
<tr>
<td>appearance</td>
<td>0.9***</td>
<td>0.9***</td>
<td>0.9***</td>
<td>0.9***</td>
<td>0.8**</td>
<td>0.8**</td>
<td></td>
</tr>
<tr>
<td>concentration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.7*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pain existence</td>
<td>0.6*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.8**</td>
<td>0.7*</td>
</tr>
<tr>
<td>pain intensity</td>
<td>0.7*</td>
<td>0.6*</td>
<td></td>
<td>0.6*</td>
<td>-0.6*</td>
<td>0.8**</td>
<td>0.8**</td>
</tr>
<tr>
<td>SDS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.7*</td>
<td>0.7*</td>
</tr>
</tbody>
</table>

Note: SDS=total symptom distress
POMS=total emotional state
*p<.05, **p<.01, ***p<.001

When each emotion was correlated with distress for individual symptoms, significant correlations were found. Tension-anxiety and anger-hostility were significantly positively correlated with distress related to outlook, appearance, and pain intensity with depression-dejection significantly correlated with distress due to outlook and appearance. Vigor-activity was significantly negatively correlated to both the distress caused by pain existence and intensity. Appearance, pain existence and intensity distress were significantly positively correlated with fatigue-inertia while confusion significantly positively correlated with these three and with distress caused from nausea intensity and concentration. Symptom distress correlated positively with confusion-bewilderment and fatigue-inertia.

Discussion

This section includes a discussion of the characteristics of the sample, and a discussion of findings under symptom distress, emotional states, and relationships between symptom distress and emotional states. The results will be discussed in relation to clinical observations, verbal reports, literature findings, theoretical framework and methodological concerns.
Representativeness of the Sample

The characteristics of the study sample were similar to the Vancouver population of adult BMT patients. Between January, 1989 and October, 1990, 289 patients underwent BMT. The Vancouver population had an age range of 18 to 61 years with a mean of 41.8 years while the study sample age range was 25 to 59 years with a mean of 36. In relation to gender, the Vancouver population was 56.6% male and 43.3% female while the sample was 83.3% male and 17.7% female. However because both female subjects withdrew, the data analysis was based on an all male sample. The majority of subjects in the study (83.3%) came from B. C. whereas in the Vancouver population 64% came from B. C..

The sample was fairly representative in that most of the types of cancer occurred, albeit in a different ratio from the population. Diagnoses of the population included leukemia (57%), Hodgkins disease (14.8%), lymphoma (9%), myeloma (7%), ovarian cancer (3.7%), testicular cancer (3.7%), and other (4.8%). The sample had eight autologous, three allogeneic, and one repeat allogeneic treatments. This reflected more autologous transplants than the population which had fairly even distribution between the types of transplants: autologous (48.3%), allogeneic (57.4%), and repeat allogeneic (0.6%).

Discussion of Findings

Symptom Distress.

The findings related to total and individual type and degree of symptom distress will be discussed. This will be followed by the pattern of symptom distress over the course of the BMT.

Total and Individual Symptom Distress.

Overall, the bone marrow transplant experience caused moderate degrees of symptom distress. This finding seemed reasonable considering that patients responded differently to the procedure, some patients had few complications whereas others had a difficult transplant. Furthermore, it seemed reasonable that an overall moderate level of distress was reported because
some symptoms caused more distress than other symptoms. Most literature sources give the impression that overall symptom distress is fairly severe for most patients, but this was not supported in this study (Freedman, 1988; Nuscher et al, 1984).

In terms of individual symptoms, appetite problems and insomnia were the most distressing symptoms. Other symptoms caused moderate distress at one point or another during the procedure whereas changes in appearance and distress related to coughing and breathing caused low levels of distress. Each of these intensity groupings will be discussed.

Symptoms Causing High Levels of Distress

Appetite Problems

Problems with appetite caused high levels of distress probably because there were many forces impacting negatively on appetite. Anorexia is a common side effect of chemotherapy and a major problem during BMT and was therefore expected in this sample (Nuscher et al, 1984). Factors which the patients mentioned as influencing their appetites adversely were nausea, blocked salivary glands, rigors, mucositis and abdominal cramps. All the patients had some degree of stomatitis which usually started one day post-infusion and made it painful to swallow. The odor of the bone marrow preservative could have contributed to a poorer appetite for the autologous patients, but none commented on this as a factor. In addition, the low microbial diet required for all patients because of their low white blood counts, was reported by most subjects to be unappetizing. Eight of the patients required total parenteral nutrition which may have decreased their appetite for food. No studies were found that stated appetite was a problem during the BMT, but in McCorkle's and Quint-Benoliel's (1983) study of lung cancer patients who were receiving radiotherapy, appetite was reported as a moderate problem at one and two months post-diagnosis. Their study involved 56 lung cancer patients and 65 heart attack patients who completed interviews about symptom distress and mood states one and two months post diagnosis.
Insomnia

High levels of distress associated with insomnia may have occurred during the BMT because of the influences of treatment and hospitalization. Patients reported that nightly monitoring of vital signs, fluid balance, and early morning blood drawing interrupted their sleep. In addition, all the patients were confined to an isolation room where there was limited stimulation and potential for exercise. This may have served to decrease their need for sleep or make them feel restless. Other influences may have been adjusting to the hospital routines and/or worrying about various side effects or treatments. Each patient received frequent doses of sleep-altering medications such as anti-histamines, anti-emetics, anxiolytics, or analgesics which may have caused somnolence. Some anti-emetics, such as Maxeran, may have caused insomnolence by increasing levels of anxiety (Swonger, 1991). Several authors report that insomnia causes distress during chemotherapy treatment (Coates, 1986; Knobf, 1986; McCorkle & Quint-Benoliel 1983; Nerenz et al, 1982). McCorkle and Quint-Benoliel (1983) reported moderate levels of distress from sleep disturbance with lung cancer patients who were one and two months post-diagnosis. The BMT patients reported higher levels than this group of lung cancer patients probably because the lung cancer patients were not exposed to the impact of hospitalization. Haberman (1987) in a study of BMT patients, reported that night sweats were a frequent cause of sleep disturbance; however, no subjects from the present study reported this symptom.

Symptoms Causing Moderate Levels of Distress

Fatigue

Closely associated with insomnia is fatigue which caused moderate levels of distress during the BMT. This level of fatigue was lower than expected since many fatigue-inducing factors were present such as medical treatments, blood counts, responses to medications, and lack of exercise. All patients endured intensive medical treatments such as Hickman line insertions, bone marrow biopsies or bone marrow harvests (autologous patients only). All patients had below normal hemoglobin levels, which can cause fatigue. When the patients required blood transfusions, many experienced severe rigors and chills that may have further decreased energy
levels. Drug therapy to treat nausea, blood reactions, or pain is also known to cause somnolence that may lead to feelings of fatigue (Swonger, 1991). All the patients received anti-emetics during the administration of chemotherapy and radiotherapy and for at least one week following the transplantation. Blood reactions were experienced by all the subjects at one time or another before engraftment occurred and four of the patients received morphine intravenously. In addition, the fact that most patients were in bed for most of the day and were unable to leave their rooms may have increased their fatigue.

Moderate levels of fatigue are strongly supported by researchers such as Fobair and colleagues (1986) who reported that Hodgkins Disease patients who received chemotherapy took an average of eight months before their fatigue resolved. A study done by McCorkle and Quint-Benoliel (1983), using the Symptom Distress Scale, reported similar levels of distress related to fatigue in lung cancer patients one and two months post-diagnosis as in this study. Haberman's (1987) study of BMT patients reported that profound fatigue was frequent throughout the BMT procedure.

Pain

Pain caused a moderate degree of distress. The pre-BMT work-up tests and procedures probably caused some degree of pain. In addition, several patients reported experiencing pain such as muscle aches, sore eyes, rash, headache, abdominal cramps, or stomatitis. In fact, four patients received intravenous morphine for their severe stomatitis. Because the health care providers were aggressive in treating pain, the frequency and intensity of pain may have been reduced. McCorkle and Quint-Benoliel's (1983) study of lung cancer patients reported similar levels of pain as the BMT patients using the Symptom Distress Scale. However, the etiology of the pain may have been different in that the BMT patients seemed to have pain due to procedures and side effects of treatment whereas McCorkle and Quint-Benoliel's patients may have had pain related to the progression of cancer.
Concentration

Distress related to difficulty concentrating reached moderate levels probably due to the influence of drug therapy, blood transfusions, fever, lack of stimuli, and fatigue. Drug therapy such as analgesics, anti-histamines, and anti-emetics have mind-altering properties which probably decrease the ability to concentrate (Swonger, 1991). Side effects to blood transfusions such as elevated temperature, chills, and rigors may have impacted on concentration (Freedman, 1988). All the patients experienced infections and fevers which may have altered their ability to concentrate. Finally, the isolation rooms with their lack of stimulation may have had some impact on concentration levels. Patients were confined to a small hospital room for approximately one month without any excursions except to have X-rays. Only health personnel, visitors, television, radio, telephone and a window provided links to the outside world. The moderate levels of fatigue may also have contributed to complaints of decreased ability to concentrate (Hughes, 1987). Difficulty concentrating is a problem frequently associated with the administration of chemotherapy so this is a reasonable finding for this sample at this measurement time (Holland & Lesko, 1989; Hughes, 1987).

Nausea

This study's results showed that nausea was moderately distressing. This finding was reasonable considering the chemotherapy and radiotherapy administered during the BMT procedure. Nausea is a well-known distressing side effect of treatment (Nuscher et al, 1984; Swonger, 1991). In addition, the autologous patients may have felt nauseated from the bone marrow preservative. Nausea levels could have been much higher, but were probably less due to the regular, high dose administration of anti-emetics during the actual administration of chemotherapy and radiotherapy. McCorkle and Quint-Benoliel's (1983) lung cancer subjects showed slightly lower levels of nausea, but this may have been due to their receiving lower doses of chemotherapy than what the BMT patients received.
**Bowel Changes**

Distress related to bowel changes was moderate and expected considering that most of the BMT patients received chemotherapy, radiotherapy, antibiotics, Total Parenteral Nutrition, and took no food by mouth during most of the procedure. McCorkle and Quint-Benoliel's (1983) study of lung cancer patients showed similar levels of distress in relation to bowel changes from receiving chemotherapy and radiotherapy. Swonger (1991) reported that both antibiotics and Total Parenteral Nutrition may cause diarrhea. Eight of the nine patients were unable to eat anything during the intensive phase of treatment; hence, it seems reasonable that they would experience some bowel changes that were distressing.

**Symptoms Causing Low Levels of Distress**

**Changes in Appearance**

Somewhat surprising was the low level of distress associated with changes in appearance because all patients experienced some change in appearance such as in skin color and texture, complete alopecia, and weight loss. Perhaps the low level is due to the fact that the sample was all male and may have been less upset at the prospect of hair loss or perhaps they were comforted by the fact that their hair would grow back. The findings are supported by the literature which states that alopecia may or may not be associated with increased distress (Holland & Lesko, 1989; Nerenz et al, 1982).

**Breathing and Coughing**

Breathing and coughing were not reported as distressing for any of the subjects except the outlier who was not included in the analysis. The low level of distress was supported by Freedman (1988) who reported that breathing was a problem only when complications arose during the BMT. This was found in the responses of the outlier who reported extreme distress breathing, but no distress related to coughing. McCorkle and Quint-Benoliel's (1983) study
showed that lung cancer patients had somewhat higher levels of distress from coughing which could be due to the location of their cancer.

**Pattern of Symptom Distress**

This section presents a discussion on the total pattern of symptom distress and then a review of factors that influence symptom distress at each time period. Distress related to overall symptoms changed significantly over time in that distress was moderate on admission to hospital, increased to a high level during the treatment phases of chemotherapy, radiation and bone marrow infusion and for one week after bone marrow infusion and then dropped to moderate levels prior to hospital discharge. Similar patterns of change occurred for all symptoms except problems with outlook which started at a moderately high level and then declined.

The general pattern of symptom distress seems logical when compared with the clinical events at each time period of the BMT procedure. The pattern showed that levels were fairly low during the initial phase when the patients were preparing to have the BMT, and then sharply increased at the start of the intensive phase of treatment when the chemotherapy and radiotherapy was administered. Symptom distress remained high through the intensive phase where the bone marrow was infused through to seven days post-infusion. Near the end of the procedure, when engraftment was occurring and most patients had been or were soon to be discharged, symptom distress returned to near baseline levels. These findings can be further explained by considering the events at each stage of the transplant. Initially, however, the difference in the outlook pattern will be explored.

**Outlook**

The differing pattern of outlook distress may be explained by Lazarus and Folkman's (1984) situation factors of novelty, event uncertainty, and duration. Transplantation was a novel or new experience for eight of the nine patients and as such was anxiety producing. Uncertainty is reported to make an event highly stressful which is the case with the BMT procedure because the outcome is unknown. Uncertainty may have decreased as it became clear to most subjects that
they were going to survive. Haberman (1987) reported that when a situation is ambiguous, external clues may be utilized to define and give meaning to the situation. Another reason that overall distress related to outlook decreased as time passed may have been the duration of the treatment which gave subjects time to develop coping techniques. For the outlier, her outlook distress was low initially, high seven days following the transplant and low at the end because by seven days post-infusion it was clear that the transplant was going badly and she may have been too ill to comprehend the seriousness of the situation.

**Initial phase.**

Initially, subjects had moderate degrees of symptom distress. Many of the subjects were still recovering from the effects of the pre-BMT work-up such as Hickman line insertion, bone marrow harvest, spinal tap, or lumbar puncture. Most were newly admitted to the hospital and may have experienced problems getting accustomed to hospital routines. In addition, they may had been experiencing effects from their disease, recent surgery, previous chemotherapy or radiotherapy. For example, one subject had recently had major abdominal surgery, three others had just finished receiving intensive chemotherapy, and two were experiencing sinus problems related to tumor growth.

**Chemotherapy and Radiotherapy Administration Phase.**

During the administration of chemotherapy and radiotherapy many forces acted on the subjects to increase their symptom distress. The severe side effects of chemotherapy and radiotherapy are well-documented and begin during this phase of treatment (Freedman, 1988; Nuscher et al, 1984). Furthermore, the medications given to counteract the effects of treatment have associated side effects. All subjects received extremely high doses of anti-emetics which had varying effects ranging from somnolence to anxiety (Swonger, 1991). Both effects were likely to influence the subjects' sleep pattern, concentration, appearance, outlook, and fatigue which was illustrated in the increase in the distress caused by these symptoms. Although outlook improved, it may have been influenced by medications given to decrease nausea and anxiety
rather than the patients actually being optimistic about the future. A factor that likely impacted on sleep disruption, concentration, and fatigue distress was the frequent monitoring necessary during this time. Nurses were frequently at the bedside administering medications, monitoring vital signs, changing intravenous lines, and drawing blood.

One Day Post-infusion Phase.

Results showed that symptom distress remained moderate to high one day following the infusion. This level of distress could be explained by the events that happened during that time. The bone marrow preservative used in autologous patients may have caused nausea or decreased appetite because the preservative is eliminated from the lungs and is associated with a strong odor that persists for at least twenty-four hours. Usually the infusion does not cause any life-threatening side effects (Freedman, 1988), but it is said to cause nausea, chills, and rigors for all types of transplants. Although the chemotherapy and radiotherapy administration was completed by this time, the effects were still present and other effects were just developing. Five of the ten patients had white blood cell counts that had dropped below safe levels which meant that they were confined to the isolation room, on a low microbial diet, at risk for infection and fever, and dependent on platelet and red blood cell transfusions. Other effects of the chemotherapy and radiotherapy were stomatitis and alopecia that started at this time. In addition, the patients needed to be closely monitored.

Seven days Post-Infusion.

Many of the above influences continued to seven days post-infusion and symptom distress remained high for most subjects. Blood counts had all dropped and all the subjects required blood and blood product transfusions with the accompanying side effects and medications. In addition, all the subjects had started on intensive antibiotic therapy for infections. The fevers could be a reason for fatigue, decreased concentration, poor appetite and bowel changes. Antibiotics are reported to cause diarrhea (Swonger, 1991). Nausea and stomatitis necessitated the administration of anti-emetics and continuous intravenous morphine. All subjects
had lost their hair so it was unusual that distress related to appearance had decreased at this time. The reason for this finding may have been that other symptoms were more distressing and that loss of their hair was not as important. Other influences that continued from previous times were the close monitoring and frequent medication administration by the nursing staff. Eight of the ten patients were receiving TPN that may have been a factor that influenced their appetite.

**Twenty-Five Days Post-infusion.**

Symptom distress logically decreased at twenty-five days post-infusion because many of the medications and problems seen during the intensive treatment phase were no longer present. Four patients who had been discharged from the hospital had safe blood count levels, were eating satisfactorily, no longer had a fever, and did not require intravenous therapy with its accompanying interruptions, and did not require anti-emetics, analgesics, TPN, or antibiotics. They were probably not as likely to have difficulty sleeping once they were at home and they were able to choose their own food. Of the hospitalized patients, only two did not have engraftment of white blood cells and three did not have engraftment of platelets; hence, many of the side effects associated with antibiotics and blood transfusions were not present. All patients were free of stomatitis. Some side effects of treatment however still persisted such as fever, blocked salivary glands, headache and painful eyes showing that some symptom distress continued to exist. Unlike the rest of the sample, the outlier showed high levels of distress at this time probably because the side effects of treatment were not resolved. She continued to receive intensive supportive therapy. Her platelet count also remained very low and her pulmonary, renal and liver function were still compromised.

**Homogeneity of Symptom Distress Responses.**

The subjects were fairly homogeneous in their distress on admission to hospital. Wide variation was seen during the treatment phase through to one day post infusion when considerable variability existed in distress related to nausea, appetite, insomnia, and pain. At one week post infusion, distress was fairly similar across subjects except for insomnia, pain and fatigue. Prior
to discharge, appetite problems and insomnia again showed considerable variability across subjects.

The variability of the subjects' responses seemed reasonable because there were many differences between each of the patients such as treatment protocol, type of transplant, diagnosis, and physical condition. The treatment protocol that the outlier received was very aggressive and had only been used with three other patients. This may have accounted for her symptom distress being very high compared to the other subjects. It would have been reasonable if the patients who had allogeneic transplants had had more symptom distress than the autologous recipients, but this was not generally the case. Four of the six patients who underwent an autologous transplant reported fewer symptoms as did two of the four allogeneic patients indicating that prior to 25 days post-transplant both types of patients had fairly similar levels of distress. Diagnoses may have changed the symptom distress of the patients. Patients with Chronic Myelogenous Leukemia may have reported different symptom distress and at different times because they had not had previous intensive treatment. They also had differing treatment protocols that caused their blood counts to take longer to drop and longer to recover. The starting physical condition of all the patients was variable as three had surgery or an acute medical crisis immediately prior to starting the BMT procedure. This may or may not have impacted on symptom distress because two of these patients had a difficult transplant whereas the other did not experience high levels of symptom distress.

Emotional States

The findings related to type and degree of emotional states and changes in emotional states throughout the BMT will be discussed. First, total emotional disturbance will be reviewed and then, specific emotions will be considered followed by a discussion of total emotional disturbance at each time period.
Total Emotional Disturbance.

Subjects felt moderate levels of emotional disturbance throughout the bone marrow transplant which was explainable considering that they all had a diagnosis of cancer. A common reaction to a diagnosis of cancer is emotional turmoil accompanied by physical difficulties such as problems eating, sleeping or concentrating followed by, for most patients, a period of normalcy or equilibrium (Conti, 1989; Massie, 1989b; Priestman, 1986). The patients in this study may have reached a point of equilibrium before the transplant began by developing coping strategies to deal with their diagnosis of cancer as they had all been diagnosed for at least three months. Because severe emotional disturbance only occurred in the one female outlier subject, it is meaningful to look at forces that may have kept the sample's emotions in check such as coping and reduction of susceptible risk factors.

The low level of emotional disturbance in this sample showed patients may have been coping by denying, developing illusions, or by adopting a fighting spirit. The patients did not experience severe emotional distress before or during the life-threatening BMT. Perhaps this was because some may have denied the impact of their situation. In addition, some subjects may have developed illusions such as believing they were in the percentage who would be cured of their cancer. Some patients made statements such as 'I am going to beat this thing' or 'I am going to make it through' leading to the impression that they had adopted a fighting spirit. Denial, illusion, and fighting spirit are some examples of coping strategies that may have been used by the patients to keep their physiological and psychological arousal to a tolerable level. For those patients who had difficulty with their treatment they may have had poor coping strategies and more risk factors.

McCorkle and Quint-Benoliel (1983) measured total emotional state of lung cancer and myocardial infarction (MI) patients using the POMS. It is reasonable to assume this group of patients would have similar results to the BMT patients as both have a life-threatening disease. The results from their study are comparable to the findings in this study where the MI patients had emotional states, one and two months following discharge similar to those of the BMT subjects.
The cancer patients had similar results as the BMT subjects during administration of chemotherapy and radiotherapy and one day post-transplant.

Particular Emotions.

Particular emotions showed varying levels during the BMT procedure. High levels of vigor and fatigue were reported; moderate levels of anxiety and confusion; and low levels of depression and anger were found.

Emotions Causing High Levels of Disturbance

Vigor-Activity and Fatigue-Inertia

Fatigue and vigor indicated very similar levels, albeit at opposite times. Fatigue ranged from small to moderate amounts over the span of the procedure and vigor ranged from "little" to "quite a bit" according to the scale. The effects of treatment seemed to play a major role in relation to energy levels. Before treatment began, vigor levels were fairly high and fatigue levels low. When subjects were given treatment during the conditioning regime, these levels reversed and vigor decreased and fatigue increased. The physical effects of treatment continued one day post-infusion and there was no change in vigor and fatigue levels. Not until seven days post-infusion, did the physical symptoms begin to decrease causing a decrease in fatigue levels. Physical effects of treatment were substantially decreased by 25 days post-infusion and the degree of fatigue and vigor showed significant signs of reversal where there was a higher degree of vigor and a lower degree of fatigue. This study's findings support Fobair and colleagues' (1986) and Haberman's (1987) findings where subjects were reported to experience prolonged fatigue. In addition, the levels and patterns of symptom distress fatigue were closely associated with the levels of emotional fatigue; hence physical fatigue may be closely associated with emotional fatigue.
Emotions Causing Moderate Levels of Disturbance

Anxiety-Tension

Subjects experienced moderate levels of anxiety initially, during the administration of chemotherapy and radiotherapy, and one day post-infusion followed by low levels of anxiety at day seven and twenty-five. Literature reports are congruent with these findings, except at discharge, as the BMT is frequently associated with anxiety initially, through the administration of chemotherapy, around the time of the bone marrow infusion, during the engraftment phase, and discharge (Brown & Kelly, 1976; Haberman 1987, 1988; Popkin et al, 1977).

The initial level of anxiety did not change significantly over the course of the BMT and had a pattern similar to outlook. These levels of anxiety may have occurred because of forces that were increasing anxiety and forces that were counteracting this increase. Forces that served to increase anxiety can be explained using Lazarus and Folkman's (1984) situation factors of novelty and uncertainty. Novel experiences were interpreted in light of previous experiences that had similar attributes such as previous experience with chemotherapy and radiotherapy which may have increased anxiety. In addition, uncertainty of the treatment outcome of the BMT was likely to produce anxiety. In fact, one subject verbally reported feeling anxious before the transplantation began. Experiencing anxiety at this stage was congruent with Brown and Kelly's (1976) anecdotal description reporting that BMT patients do experience anxiety while they are waiting for the procedure to begin.

Forces that served to decrease anxiety could be explained by Lazarus and Folkman's (1984) situational factor of predictability. The BMT was predictable, to some degree, because the patients knew what to expect of the environment and the treatment. For example, they were familiar with the environment of the BMT rooms, had met the doctors and nurses, and had experience with hospital routines. The BMT was further predictable because both the doctors and the nurses had fully explained the procedure and answered any questions and many subjects had spoken with other BMT patients. The idea that predictability decreases anxiety is reiterated by Massie (1989a) and Rafferty (1985) who wrote that anxiety is linked with receiving information
and with the communication between doctor and patient. Other forces, besides predictability, are
reported to decrease anxiety such as the use of coping mechanisms (Hughes, 1987; Stoll, 1986;
Taylor, 1983) and the lack of risk factors that would pre-determine them to experience anxiety.
For example, men are reported to be less likely to experience anxiety and because this sample is
all male they may not have shown high levels of anxiety (Scott et al, 1984; McNair et al, 1981).

Anxiety levels showed a slight increase during the administration of chemotherapy and
radiotherapy. Literature sources report that chemotherapy and radiotherapy are frequently
accompanied by anxiety and that some medications produce anxiety (Massie, 1989a). These
patients were given the anti-emetic Maxeran, that can cause anxiety (Swonger, 1991), in fact, one
subject reported feeling anxious during administration of chemotherapy and radiotherapy because
of maxeran. Lack of significant change may be due to the subjects using coping strategies and
they lacked situation and risk factors that would have made them vulnerable to a high degree of
distress at this stage.

One day following the bone marrow infusion, anxiety levels were significantly higher
than at the end of treatment, but the level was similar to that at other stages of treatment. Reasons
for this heightened level of anxiety may be explained by the fact that the patients were still
receiving anti-emetics and the side effects of chemotherapy and radiotherapy were present and
may have been getting quite severe. For example, the blood counts were dropping at this time,
alopecia was occurring, and stomatitis was often becoming quite severe. This was a critical time
in the transplant where there was no turning back and the patient had to wait to see the extent of
the side effects and whether engraftment would occur. In addition, the situational factors of
predictability, event outcome, and temporal uncertainty came into play. The bone marrow
infusion was a new experience for eight of the subjects so it was unpredictable and engraftment
was uncertain. All these factors contributed to anxiety at this stage. The subjects who were
withdrawn from the study after this stage, showed higher levels of anxiety probably because the
transplant was not going well.

Anxiety levels decreased one week following the infusion. Although not significant, this
drop can be partly explained through Lazarus and Folkman's (1984) situational factors of
uncertainty and duration. At one week following the infusion, patients may have felt less uncertain about the treatment because, although they were experiencing side effects and still needed close monitoring, they had been through the critical parts of the treatment and had experienced the worst of the side effects of the chemotherapy. The long duration of the treatment may have given the subjects time to develop coping strategies. After all, the subjects had been in their hospital room for at least two weeks by this stage.

Anxiety levels were low at the final interview which seems reasonable because half of the subjects had been or were about to be discharged from hospital. Many of the situational factors had changed at this stage in that hospitalization was nearly over and the outcome of the side effects and the engraftment were more clearly known, although three patients did not have these certainties because they had not engrafted. The subjects who felt anxious at day 25 may have done so because they felt uncertain about the future; even though some were engrafting. The low levels of anxiety at day 25 for the majority are comparable to a study conducted by McCorkle and Quint-Benoliel (1983) where both cancer and MI patients had low anxiety levels one and two months following diagnosis probably due to their ability to cope.

Confusion-Bewilderment

The study's findings were supported by literature sources in that confusion was not a substantial problem during the BMT, but following the administration of chemotherapy there was an increase in the average degree of confusion (Holland & Lesko, 1989; Hughes, 1987). The degree of confusion during the administration of chemotherapy was significantly different than the degree indicated at the final interview. Forces existed at all times throughout the BMT that may have led to confusion such as medications, nutritional deficits, anxiety and the pre-BMT work-up and surgery. Fleishman and Lesko (1989) reported that somatic changes, such as side effects of medications or nutritional changes may produce some confusional states and Hughes (1987) and Massie (1989a & 1989b) wrote that depression and anxiety often contribute to some degree of confusion. The arguments that medications, nutritional changes, medical procedures
and emotional disturbance contributed to confusion were validated in this study by confusional levels being lower at the final interview, where many of these influences had decreased or were absent. However, significant differences were seen only during chemotherapy and radiotherapy administration where the factors, such as medications, were strongest and put the subjects over the threshold of significant change in degree of confusion.

Emotions Causing Low Levels of Disturbance

Anger-Hostility

Overall, levels of anger were fairly low except during the administration of chemotherapy. High doses of medications may have explained the increased level of anger because anger thresholds can be decreased by medications (Averill, 1982). Overall low levels of anger may have been related to the overall lack of high emotional disturbance seen in this sample as Averill (1982) and Hughes (1987) indicated that anger is related to anxiety, stress, or depression. Hughes (1987) reported that people who get cancer are less able to express anger than other people. Low levels of anger are surprising, however, because hostile responses are common during the BMT (Cahan & Lyddane, 1978; Corcoran-Buchsel, 1986; Popkin & Moldow, 1977).

Depression-Dejection

Depression was not found to be a problem with most patients in this study with average depression ranging from none to only a little at all stages of the BMT procedure. These results were surprising because depression is a common response to the stress of cancer and its treatment and its sequelae often mimic depression (Bukberg et al, 1984; Goldberg, 1981; Hughes, 1987). Reasons for this discrepancy may be that the subjects were able to cope with their situation or they were not as much at risk in developing depression because they were male. Several authors stated that males were not as susceptible to depression as females (Dunlop, 1985; Hughes, 1987; McNair et al, 1981; Scott et al, 1984).
The overall pattern of emotions showed that emotional disturbance initially was low, then increased during the administration of chemotherapy and radiotherapy and one day post-infusion, and subsequently continued to decrease seven and 25 days post-infusion. This pattern of emotional disturbance seems very reasonable because emotional disturbance was greatest during the intensive phase the BMT. The reasons for these changes will be discussed in more detail under each time period.

**Initial Phase.**

Initially, all subjects had low levels of emotional disturbance. The subjects were experiencing many stresses at the beginning of the BMT procedure such as uncertainty, inexperience with hospital routines, lack of coping skills, and some were probably experiencing symptom distress from their BMT work-up. Uncertainty about what to expect may have accounted for emotional disturbance because the patients did not know if they would survive the treatment, what side effects they would experience, or if they would engraft. This uncertainty was probably tempered with their previous experience with chemotherapy and radiotherapy which may have involved high or low levels of symptom distress. Haberman (1987) noted that uncertainty is often a life theme in BMT patients, but is offset by feelings of hope that the BMT experience would yield long term survival. Closely linked with uncertainty is lack of knowledge. Some subjects lacked knowledge of hospital routines and health care personnel as they were previously treated as outpatients. Lastly, most patients were recovering from pre-BMT work-ups such as surgery, bone marrow harvests, biopsies, or Hickman line insertion that still caused side effects.

**Chemotherapy and Radiotherapy Administration Phase.**

The administration of chemotherapy and radiotherapy caused many side effects and may have been the reason emotional disturbance levels increased. Other medications such as antiemetics and analgesics were given to offset these side effects; however, most of these may have
caused emotional changes or lowered emotional thresholds. Higher levels of sleep disturbance were reported at this time perhaps altering emotional levels. Increased levels of symptom distress may have impacted on emotional levels. In addition, patients were sent for Total Body Irradiation which is commonly reported as a frightening experience (Haberman, 1988; Ingram, 1982). Nursing personnel were frequently at the bedside during this time to monitor and administer medications and their actions may have increased or decreased emotional disturbance.

**One Day Post-Infusion Phase.**

Emotional disturbance remained fairly high one day post-infusion probably because the subjects were experiencing high levels of symptom distress. Side effects from the chemotherapy and radiotherapy occurred at this time: blood counts dropped for five of the ten patients, stomatitis had started, alopecia was in the initial stages, and all patients were nauseated. Autologous patients may have been disturbed due to the odor of the bone marrow preservative. Haberman's (1987) study reported that blood counts, loss of appetite, signs of Graft-Versus-Host-Disease, nausea, pain, and lack of ability to exercise were factors that patients were most concerned about at this time which is fairly congruent to this study.

**Seven Days Post-Infusion.**

Many of the influences that were present during the last two phases were still present at this time; however, emotional disturbance did decrease to near baseline levels. Although many of the side effects were still occurring and the patients had not yet engrafted, they may have felt they were over the worst part of treatment and the situation could only get better. In addition, patients may have started to develop coping skills and were more used to the hospital environment since they had been in their rooms for at least two weeks. Some patients may even have been bored by this time and was stated as such by a few.
Twenty-Five Days Post-Infusion.

Emotional disturbance was decreased to its lowest level at the final stage of the procedure. It was clear to most patients that they were not going to suffer severe, long-lasting side effects and probably felt very encouraged that they had survived the treatment. Medications, intensive monitoring, and intravenous lines had been discontinued for more than half of the subjects: a positive sign that may have improved the subjects' emotional states.

Homogeneity of Emotional Responses

Although the majority of patients had low emotional disturbance, four to five patients had moderate disturbance at some time during the BMT, and one experienced high levels. The patient who experienced high levels of emotional disturbance was the youngest subject who had a very poor prognosis. He was facing death at an early age which is commonly associated with emotional disturbance (Hughes, 1987). The outlier and the withdrawers showed moderate levels of disturbance which also seemed reasonable considering that they had more difficulty with the transplant than the other subjects. Responses tended to group together for all of the time periods with the bulk reporting low levels except during the administration of chemotherapy and radiotherapy and one day post-infusion where the majority of the respondents reported higher levels of emotional disturbance.

Relationship between Symptom Distress and Emotional States

In this study, overall symptom distress and emotional states were not significantly correlated except at one day following the bone marrow infusion where the correlation was $r=0.8$. These findings are congruent with Nerenz and colleagues (1982) who reported that side effects lead to emotional distress. Patenaude and Rappaport (1982) reported that physical status in low to moderately ill patients had little impact on emotional state, but severely ill people were more likely to experience emotional disturbance. One day following the infusion, the number and severity of symptom causing distress were at a maximum for most patients. Perhaps a threshold was reached where symptom distress was high and did impact on emotions. At other times, the
patients were in the mild to moderately ill range at which time symptom distress did not correlate with their emotional state.

Distress from specific symptoms and individual emotions were often correlated at each measurement time. Tension-anxiety was significantly correlated with outlook, appearance, and pain intensity. Nerenz and associates (1982) reported hair loss to be unrelated to distress; whereas, Holland and Lesko (1989) stated that it was related to distress. The current study showed there was a very high correlation between distress related to appearance changes and anxiety, but the actual levels of anxiety were low. Peck & Boland (1977) reported that patients were anxious during treatment with radiotherapy as evidenced by a pre-occupation with the spread of disease and doubts about survival. This anxiety could have been likened to outlook because anxiety and outlook were highly correlated throughout the BMT (r=.7). Anxiety and outlook were both experienced at low levels. As for the moderate correlation between anxiety and pain intensity, Massie (1989a) stated that pain is a common cause of anxiety. According to Holland and Lesko (1989) and Hughes (1987) tiredness and weakness exacerbate anxiety, but this association was not seen in the current study. Perhaps the reason for this finding was that fatigue distress occurred at slightly different times than anxiety and did not decrease at the end of treatment in the same way that anxiety did or the two often occurred together, but did not have causal links and therefore an association was not seen throughout the BMT.

In this study, depression was moderately correlated with distress related to outlook and highly correlated with problems with appearance. The link between depression and problems with outlook was supported by the works of Hughes (1986, 1987) and McNair and colleagues (1981). No reports correlated distress from change in appearance with depression although this is a reasonable expectation. This study did not indicate that fatigue was associated with depression; however, several authors reported that tiredness, weakness, prolonged energy loss, and physical distress are associated with depression (Fobair et al, 1986; Holland & Lesko, 1989). Perhaps the BMT experience did not cause severe enough or prolonged enough levels of fatigue so that high levels of depression did not occur or perhaps the patients combatted depression by maintaining hope.
Anger-hostility was highly correlated with appearance and moderately correlated with pain intensity during the BMT procedure. Peck (1972) and Peck and Boland (1977) reported that anger was a common response in patients undergoing cancer treatment, but no research was found that could shed light on these correlations. It seemed reasonable that patients would be angry that their appearance was getting worse without them having any control over the changes. Surprisingly, pain intensity was correlated with anger, but pain existence was not. Perhaps patients could cope with frequent pain, but when it became intense they were more likely to become angry. All of these factors increased during the administration of chemotherapy and radiotherapy when patients received large amounts of medications; hence, their threshold for anger may have been diminished at the same time as the chemotherapy effects on appearance occurred.

Vigor was highly negatively correlated with both distress of pain intensity and existence. No research was found that addressed these correlations, but it seemed logical that a person distressed by pain would be less apt to be vigorous especially if the pain was intense. Fatigue was moderately correlated with distress from problems with appearance, pain existence and intensity. No research was found that linked these factors. It may have been coincidental that fatigue and appearance were highly correlated; however, fatigue could easily be correlated with pain because it may have been tiring. All these factors occurred during the administration of chemotherapy and radiotherapy where all the patients were receiving sedating medications which most likely made the patients feel tired at the same time as the chemotherapy and radiotherapy were causing changes in appearance and pain.

Confusion-bewilderment positively correlated with distress of appearance, concentration, pain existence and intensity. Literature sources use confusion as a synonym to decreased ability to concentrate (Conti, 1989; Massie & Holland, 1989); hence, it seemed logical that distress from decreased ability to concentrate and confusion were highly correlated. Nerenz and associates (1982) reported that pain was associated with emotional disturbance giving credence to the moderate correlation between confusion and pain existence and intensity that was found in this study. The literature did not have information that connected appearance with confusion;
however, the high correlation between appearance and confusion may be explained because they had a decreased ability to groom themselves when they were likely to be confused mostly during administration of chemotherapy and radiotherapy and one day post-infusion. When they were the most confused at time two, alopecia began or, perhaps, they had less ability to cope with the worsening of their appearance when they had increased degrees of confusion.

**Methodological Concerns.**

Methodological concerns related to sample size, characteristics of the sample, and the reliability of the tools. The small, convenience sample may have skewed results in that each individual response had a fairly large impact on the overall results. In addition, four people elected not to be involved in the study because they were "too upset" and their responses might have given a wider variance to the results. The sample, after the withdrawals, was entirely male which may have had a different range of responses than females. Finally, the tool may not have measured distressing symptoms experienced by the subjects such as chills, rigors, fever, petechiae, or idiosyncratic side effects (eg. specific infections) which may have changed the overall degree of symptom distress.

**Summary**

The samples' mean age was 41.8 years and consisted of ten male and two female subjects. The majority of subjects were either married or living common-law with two being divorced and two never been married. Fifty-eight per cent of the subjects had college education with equal number of subjects being in one of following occupational categories: professional/manager, sales, laborer, or unemployed. Ten of the subjects lived in B. C. and two lived in Alberta. In terms of health-related characteristics, a range of cancer diagnoses were represented including leukemia, lymphoma, ovarian cancer, Hodgkins disease, neuroectodermal sarcoma, myeloma, and testicular cancer. The average time since diagnosis was 13.3 months. There were eight autologous bone marrow transplants, three allogeneic transplants, and one repeat allogeneic transplant. Equal number of transplants were done at BCCA and at VGH. Blood counts, medications, treatments, visitors, and the environment of the room tended to
change over the course of the transplant. The sample was reasonably representative of those who had BMT's at the two hospitals where the subjects were recruited.

Scores obtained from the symptom distress scale indicated that most subjects experienced moderate levels of distress overall. High levels of symptom distress were associated with changes in appetite and insomnia. Moderate levels were reported for distress related to fatigue, pain, concentration, nausea, and bowel changes. Changes in appearance, breathing, and coughing caused low levels of distress. Distress related to overall symptom distress changed significantly over time in that distress was moderate on admission to hospital, increased to high levels during the administration of chemotherapy and radiotherapy and then decreased to moderate levels seven and twenty-five days post-infusion. The overall pattern of distress was closely linked to clinical events where patients suffered greater levels of symptom distress during the more intensive phases of treatment except for outlook where distress began high and gradually decreased during the BMT procedure. The changes in symptom distress related to the pre-BMT work-up, side effects of treatment, medications, nutrition, environment, infection, and reactions to blood transfusions.

Moderate levels of emotional disturbance occurred during the BMT with the pattern showing increases during the administration of chemotherapy and radiotherapy and one day post-infusion. However, moderate levels of vigor and moderate levels of fatigue, albeit at different times, were seen during the BMT procedure. Moderate levels of anxiety and confusion were reported and low levels of anger and depression were found. Vigor and fatigue were closely related to the times when the patient was the most ill which was during the administration of chemotherapy and one day post-infusion. Coping strategies and cognitive appraisals probably balanced the side effects of treatment and medications to keep anxiety and confusion to moderate levels. Although overall there was a low level of anger, anger levels were increased when large amounts of drugs were administered such as during the administration of chemotherapy and radiotherapy. Depression never rose significantly during the BMT procedure.
Total symptom distress and emotional state were not highly correlated except one day after bone marrow infusion. Selected individual emotions and specific symptom distress were found to be correlated.
CHAPTER FIVE

Summary, Conclusions, Implications and Recommendations

Introduction

This study was designed to describe the symptom distress and emotional states experienced by BMT patients, how these variables changed over time, and the relationship between these variables throughout the procedure. Chapter five presents an overview of the study, conclusions, implications for nursing practice and recommendations for further research.

Summary

A review of the literature suggests that symptom distress and emotional states change during a stressful situation and that there may be a relationship between these two variables. Although symptom distress has not been examined for BMT patients, it seems likely that symptom distress is associated with BMT side effects such as nausea, vomiting, mucositis, thrombocytopenia, leucopenia, alopecia, fatigue, and anorexia (Ford & Ballard, 1988). Additionally, the physical threat and uncertainty related to the outcome of the BMT procedure likely produces some degree of emotional disturbance.

No research was found that linked symptom distress and emotional states throughout the BMT procedure nor was there any research on the relationship between these factors. Therefore, this study was designed to assess the type and degree of symptom distress and emotional states and how they changed throughout the BMT. In addition, it sought to describe the relationship between these two variables during the BMT.

This descriptive, correlational repeated measures study was conducted in the BMT units at Vancouver General Hospital and British Columbia Cancer Agency. The investigator interviewed the patients on admission to hospital, during the administration of chemotherapy and radiotherapy, and one, seven, and 25 days post bone marrow infusion. Three questionnaires were used: McCorkle and Young's (1978) Symptom Distress Scale, McNair and colleague's
Profile of Mood States, and a data collection guide that was designed for this study. The data were analyzed using descriptive and parametric statistics.

The sample initially consisted of ten males and two females; however, two subjects later withdrew and one female was an outlier. The mean age for the participants was 41.8 years. Eight of the 12 participants were either in a common-law or marital relationship and the other four were either divorced or single. The average number of children per participant was 2.3. Seventy-five percent of the sample had at least a high school education. Nine of the subjects were employed and three were unemployed. Ten of the 12 subjects lived in B. C.

A range of diagnoses were represented in the sample including leukemia, ovarian cancer, lymphoma, Hodgkins disease, neuroectodermal sarcoma, myeloma, and testicular cancer. Time since diagnosis ranged from three months to five years. There were eight autologous transplants, three allogeneic and one repeat allogeneic transplant. Blood counts, medications, treatments, visitors, and the environment of the isolation room were noted at each data collection period. Platelets remained high enough to prevent bleeding for most patients until one week following the infusion. By 25 days post-infusion, platelet levels for seven of the ten participants had gradually returned to levels where transfusions were no longer needed. Hemoglobin remained at safe levels throughout the procedure due to transfusion therapy. White blood cell (WBC) counts were adequate until one day following bone marrow infusion, with most recovering by 25 days post-infusion. All patients required the usual antibiotics and anti-emetics with nine patients requiring TPN and four requiring a morphine infusion for stomatitis. All but one patient had visitors. The environment of the isolation rooms ranged from no personal items to the walls being covered with decorations and get-well cards.

Overall, the BMT caused moderate levels of total symptom distress with a wide range of total symptom distress reported by the subjects. In relation to individual symptoms, low levels of distress were reported from appearance changes, outlook changes, and breathing and coughing problems. Moderate to low distress was generated by the existence and intensity of both pain and nausea as well as bowel problems, concentration difficulties and fatigue. Appetite and insomnia caused the greatest levels of distress.
Clinical events precipitated from the timing of treatments and procedures and the subsequent side effects seemed to dictate the pattern of symptom distress. Distress related to problems with nausea existence, appetite, insomnia, bowel patterns, and concentration showed a significant change throughout the BMT procedure. Nausea existence distress was less initially and on discharge from the hospital than during the administration of chemotherapy and radiotherapy. Distress from both appetite problems and insomnia was less at the beginning than at later times. Bowel problem distress was less on admission to hospital and on discharge than during the infusion and engraftment period. Distress from concentration difficulties was greater at 7 days post-infusion than on discharge from hospital.

These changes in symptom distress patterns can be explained by looking at the impact that the BMT procedure and its accompanying treatments and medications had on the subjects. Medications such as anti-emetics, antibiotics, analgesics, and treatments such as chemotherapy, radiotherapy and bone marrow infusion generated side effects at fairly predictable times. In addition, sleeping difficulties were likely due to constant monitoring, frequent administration of medications such as anti-emetics and analgesics and their effects. Fatigue levels were likely related to low hemoglobin levels, reactions to blood transfusions and medications such as anti-emetics and analgesics. Pain was related to the pre-BMT work-up, invasive procedures, and stomatitis; however, levels were probably kept moderate through the judicious use of analgesics. Nausea distress was strongly associated with the administration and effects of chemotherapy and radiotherapy. Changes in bowel pattern distress were likely due to the effects of chemotherapy, radiotherapy, medications such as antibiotics, TPN and not taking food by mouth. Low levels of distress due to appearance changes may be related to the all male sample and the knowledge that their hair would grow back. Breathing and coughing difficulties were only problematic when complications occurred during the BMT.

Overall, the participants experienced low to moderate levels of emotional disturbance. Lack of vigor and presence of fatigue were felt to the greatest degree. Low to moderate levels of anxiety and confusion were experienced. Anger and depression were the least felt emotions.
As with symptom distress, the pattern of emotions was linked to what was happening to the patient. On admission subjects had high levels of vigor which decreased during the administration of chemotherapy and radiotherapy and finally began to return to initial levels toward the end of treatment, whereas, fatigue levels were the greatest during the administration of chemotherapy and radiotherapy and one day post-infusion. Anxiety was initially moderately high, likely due to the uncertainty patients' were experiencing. Anxiety increased during the administration of chemotherapy and radiotherapy and remained high one day post-infusion probably due to the intensive nature of the treatment at this time and continued uncertainty. Gradually anxiety decreased as engraftment occurred and side effects subsided. Confusion levels seemed to be the highest during times of administration of anti-emetics, analgesics, and antihistamines which were given most often during the administration of chemotherapy, one and seven days post-infusion. Nutritional and environmental effects may have played some role in confusion levels. Anger was significantly higher during the administration of chemotherapy and radiotherapy then at any other time which may have been due to the effects of some medications which are said to decrease anger thresholds (Averill, 1982). Depression remained low perhaps because subjects were hopeful throughout the treatment period.

At one day post-infusion, a significant positive relationship was found between symptom distress and emotional states (r=0.8, p=0.01). All the emotional subscales and the total emotional state were significantly positively correlated except for vigor which was not correlated with any other emotions. Several emotional subscales had significant positive relationships with specific symptom distress: a) tension-anxiety and anger-hostility with outlook, appearance, and pain intensity, b) depression-dejection with outlook and appearance, c) fatigue-inertia with appearance, pain existence and intensity, and d) confusion-bewilderment with appearance, pain existence and intensity, nausea intensity and concentration. Vigor-activity significantly negatively correlated with distress from pain existence and intensity. Total symptom distress correlated positively with confusion-bewilderment and fatigue-inertia.
Conclusions

The small sample size and the convenience sampling procedure limits the generalizability of the findings to this sample only. However, the study does suggest some general trends and relationships particularly for patients who have a BMT without major complications.

Overall BMT causes moderate levels of distress and the pattern of distress is linked with clinical events. When the patient is receiving the most aggressive treatments with the accompanying medications and experiencing the most side effects, symptom distress is at its greatest level except in the case of outlook where distress is initially high and then basically decreases over the course of the BMT. The highest levels of distress are from loss of appetite and difficulty sleeping. Moderate levels of distress are generated from fatigue, pain, changes in concentration, nausea, and bowel changes. Changes in appearance results in low levels of distress, but this may be gender related with males experiencing less distress. Coughing and breathing distress are not usually problems associated with the BMT procedure.

The BMT causes moderate levels of emotional disturbance. Like symptom distress, the pattern of overall and specific emotions is closely associated with clinical events. High levels of vigor occur initially and at the end of treatment, whereas high levels of fatigue occur during the administration of chemotherapy and radiotherapy and one day post-infusion. Moderate levels of anxiety exist at the beginning of the procedure probably due to uncertainty. Anxiety level continues to increase during the administration of chemotherapy and radiotherapy and one day post-infusion and gradually decreases as engraftment takes place. Moderate levels of confusion are likely associated with the administration of anti-emetics, analgesics, and anti-histamines during the intensive phase of treatment. Low levels of anger occur during the BMT except during the administration of chemotherapy and radiotherapy which may be related to the effects of anti-emetics on anger thresholds or the possibility that cancer patients have difficulty expressing anger. BMT patients seem to have low levels of depression which may be due to maintaining feelings of hope throughout the procedure.

Total symptom distress and emotional disturbance are associated with each other, but only for a limited time at one day after the infusion. However, correlation is more consistently seen
between specific emotions and distress from various symptoms. For example, the correlation between a) tension-anxiety and anger-hostility with outlook, appearance, and pain intensity, b) depression-dejection with outlook and appearance, c) fatigue-inertia with appearance, pain existence and intensity, and d) confusion-bewilderment with appearance, pain existence and intensity, nausea intensity and concentration. Vigor-activity significantly negatively correlated with distress from pain existence and intensity. Total symptom distress correlated positively with confusion-bewilderment and fatigue-inertia.

Lastly, for uncomplicated BMT's, the greatest distress and emotional disturbance occurs during the administration of chemotherapy and radiotherapy and one day post-infusion. The complicated BMT course seems to begin the same as the uncomplicated where the greatest distress is seen during the administration of chemotherapy and radiotherapy and one day post-infusion. For the complicated BMT, the distress and negative emotions are higher and continue to remain high over the course of the BMT.

**Implications**

The results have implications for nursing practice in the specialty of BMT nursing if the findings are confirmed in subsequent studies.

Because certain emotions and types of symptom distress are more frequent at specific times in the course of treatment, the nurse should address them prior to their occurrence or at these times in an effort to prevent or minimize them. Because concerns about outlook are the most distressing initially and then become less distressing over the course of the transplant, nurses should provide emotional support initially that focuses on concerns about outlook and gradually re-focus to include other factors during the intensive and engraftment phase of the BMT. Anger and confusion are more problematic during the administration of chemotherapy and one day post-infusion and higher levels of anxiety tend to occur before the engraftment phase; therefore, it is appropriate for the nurse to address these concerns at times when they are most likely to be problematic.
Because problems with appetite, sleeping and fatigue are worst during the administration of chemotherapy and radiotherapy and for the duration of the BMT course, interventions should continue to be directed at preventing or minimizing these distressing symptoms. Nausea, pain, fatigue, and bowel changes, cause the worst distress during the administration of chemotherapy and radiotherapy through to seven days post-infusion and measures that decrease distress should continue to be most intense at these times. Difficulties with appearance, coughing, and breathing, do not seem to be particularly problematic for most patients and therefore the need for interventions should be assessed on an individual basis. Because the pattern of symptom distress and emotional disturbance seems to differ for those with a complicated versus an uncomplicated BMT, the nurse should be on the alert to identify those at risk for a complicated course and therefore in need of a continuing high level of support.

The study clearly indicates that the BMT is a stressful experience for the patients. Nurses who care for these patients need to be adept at assessing patients for risk factors and emotional disturbance to ascertain when additional support is needed. Good counselling and interviewing skills are essential for the nurse. Active listening, encouraging realistic hope, and being there when needed are essential. BMT patients may sense that they have very little control in many areas of their treatment. Therefore it is important to give them control in decision making regarding their daily routines or other aspects whenever possible. BMT nurses should foster the patient's support networks of family and friends and perhaps enlarge this to BMT survivors if this seems appropriate. To assist the patient to cope with stress, it may be beneficial to encourage relaxation or imagery. In addition, nurses should assess the need for referral to other professionals such as to the clinical nurse specialist, social worker or clergy.

Although this study did not specifically address the emotional toll on BMT nurses, it must still be recognized and addressed. The manager of a BMT unit must foster a team spirit so that nurses feel they are part of a cohesive work group where their personal attributes are respected and where they can openly discuss their patients and their own emotional needs. The manager must consider the nurses' ideas when making decisions that affect the nurses in order to promote this team atmosphere. Changes in moral must be monitored to allow early intervention such as
involving specialists in facilitating helpful coping techniques. Lastly, it is important for nurses to hear about successful transplants particularly when there have been several patients experiencing a complicated course.

Recommendations for Further Research

While this study is only a beginning attempt to describe the BMT patients' experience, it does give direction for further research such as replicating the present study with a larger time frame and larger sample, comparing patients with complicated versus uncomplicated BMT courses, and describing factors that influence the BMT experience.

This study should be repeated, using a larger sample to further verify the findings and provide more information about results that were not expected such as low levels of depression and lack of distress related to appearance changes. In addition, it seems from verbal accounts and literature sources that other symptoms may have caused distress such as chills, rigors, fever, and blood counts. These symptoms should also be measured in subsequent research studies.

Further studies should expand the time frame for studying each subject. An assessment prior to hospitalization may provide a better baseline picture. An additional assessment at 15 days post-infusion would be useful to show when symptom distress decreases and emotional states begin to improve. Continuation of the data collection beyond 25 days when the patient is either still in hospital or discharged home would be very useful in providing more information about the total BMT experience.

While some patients experience a typical transplant with the usual side effects, others have serious complications that can affect the treatment and outcome. Findings indicate that patients who experience complications seem to show greater symptom distress and emotional disturbance than the typical BMT patient. It would be useful to compare patients with a complicated and an uncomplicated BMT course.

Many factors seem to influence the BMT patient's symptom distress and mood state. An understanding of these factors is critical in fully appreciating the BMT experience and should therefore be addressed in future research designs. Factors that are likely to affect distress and
emotional states are the patients' assessments of their situation and their coping, along with
gender, age, culture, diagnoses, type of transplant, and education level. In addition, the findings
suggest that the number and severity of side effects in the mild, moderate, and seriously ill patient
influence the relationship between symptom distress and emotional states and thus should be
looked at in further research.
REFERENCES


APPENDIX A
Symptom Distress Scale
Each of the following cards lists 5 different numbered statements. Think about what each statement says, then place a circle around the one statement that most closely indicates how you have been feeling for the last 24 hours. The statements on each card are ranked from 1 to 5, where number 1 indicates no problems and number 5 indicates the maximum amount of problems. Numbers 2 through 4 indicate you feel somewhere in between these two extremes. Please circle one number on each card.

### NAUSEA (1)

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<th>1</th>
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<th>3</th>
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<tr>
<td></td>
<td>I seldom if ever have nausea</td>
<td>I have nausea once in a while</td>
<td>I have nausea fairly often</td>
<td>I have nausea half the time at least</td>
<td>I have nausea almost continually</td>
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### NAUSEA (2)

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<tr>
<td></td>
<td>When I do have nausea, it is very mild</td>
<td>When I do have nausea, it is mildly distressing</td>
<td>When I have nausea, I feel pretty sick</td>
<td>When I have nausea, I nausea, usually feel very sick</td>
<td>When I have I am it is very it sick as I could possibly be</td>
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### APPETITE

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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I have my normal appetite and enjoy good food</td>
<td>My appetite is usually, but not always, pretty good</td>
<td>I don't really enjoy my food</td>
<td>I have to force myself to eat my food</td>
<td>I cannot stand the thought of food</td>
</tr>
</tbody>
</table>

### INSOMNIA

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I sleep as well as always</td>
<td>I occasionally have trouble getting to sleep and staying asleep</td>
<td>I frequently have trouble getting to sleep</td>
<td>I have difficulty getting to sleep and staying asleep almost every night</td>
<td>It is almost impossible for me to get a decent night's sleep</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>PAIN(1)</strong></td>
<td>I almost never have pain</td>
<td>I have pain once in a while</td>
<td>I have pain several times a week</td>
<td>I am usually in some degree of pain</td>
<td>I am in some degree of pain almost constantly</td>
</tr>
<tr>
<td></td>
<td>When I have pain, it is very mild</td>
<td>When I do have pain, it is mildly distressing</td>
<td>When I do have pain, it is fairly intense</td>
<td>The pain I have is very intense</td>
<td>The pain I have is almost unbearable</td>
</tr>
<tr>
<td></td>
<td>I seldom feel tired or fatigued</td>
<td>There are periods when I am rather tired fatigued</td>
<td>There are periods when I am quite tired and fatigued</td>
<td>I am usually very tired and fatigued</td>
<td>Most of the time, I feel exhausted</td>
</tr>
<tr>
<td><strong>BOWEL</strong></td>
<td>I have my normal pattern</td>
<td>My bowel pattern occasionally causes me some discomfort</td>
<td>My present bowel pattern occasionally causes me considerable discomfort</td>
<td>I am usually in considerable discomfort because of my present bowel pattern</td>
<td>I am in almost constant discomfort because of my bowel pattern</td>
</tr>
<tr>
<td><strong>CONCENTRATION</strong></td>
<td>I have my normal ability to concentrate</td>
<td>I occasionally have trouble concentrating</td>
<td>I occasionally have considerable trouble concentrating</td>
<td>I usually have considerable difficulty concentrating</td>
<td>I just can't seem to concentrate at all</td>
</tr>
</tbody>
</table>
### APPEARANCE

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>My appearance has basically not changed</td>
<td>Occasionally I am concerned about the worsening of my physical appearance</td>
<td>I am often concerned that my appearance is worsening</td>
<td>Most of the time I am concerned that my physical appearance is worsening</td>
<td>The worsening of my physical appearance is a constant pre-occupying concern</td>
</tr>
</tbody>
</table>

### BREATHING

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>I usually breathe normally</td>
<td>I occasionally have trouble breathing</td>
<td>I often have trouble breathing</td>
<td>I can hardly ever breathe as easily as I want</td>
<td>I almost always have severe trouble with my breathing</td>
</tr>
</tbody>
</table>

### OUTLOOK

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am not worried or frightened about the future</td>
<td>I am slightly worried but not frightened about things</td>
<td>I am worried and frightened about things</td>
<td>I am very worried and frightened about things</td>
<td>I am terrified by thoughts of the future</td>
</tr>
</tbody>
</table>

### COUGH

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>I seldom cough</td>
<td>I have an occasional cough</td>
<td>I often cough</td>
<td>I often cough, and occasionally have severe coughing spells</td>
<td>I often have persistent and severe coughing spells</td>
</tr>
</tbody>
</table>
APPENDIX B
Patient Information and Consent Form for Distress and Emotional States throughout Bone Marrow Transplantation Study
APPENDIX C
Data Collection Guide
Data Collection Guide Part A

I. D. Number__________________
Date_________________________
Day of BMT__________________

VGH/CCABC
AGE__________
SEX__________
Marital Status:
Single________ Married________ Widowed________
Divorced_______ Separated_______ Other_________
Number of Children______________
Occupation____________________
Education_______________________
Important family happenings at this time (Eg. wedding anniversaries, birthdays, special occasions, holidays)________________________________________
Place of Residence________________
Diagnosis_______________________
Date of original diagnosis__________
Type of transplant________________
Past Treatments and Medical History________________________________________________________________________
________________________________________________________________________
Data Collection Guide Part B

Data Collection Period
I. D. Number
Date
Day of BMT

Blood Counts Today: WBC Hgb Platelets

Medications taken today

Treatments Today

Did you have visitor in the past 24 hours? Who?

How does patient respond to question "How are you feeling today?" (to identify other emotions)

How does patient respond to question "What symptoms are bothering you today?"

Environment of the Room (Presence of decorations, cards, pictures etc.)
APPENDIX D

Emotion Factors
Emotion Factors

Positive Emotion Factors
lively active energetic cheerful alert full of pep carefree vigorous relaxed efficient

Negative Emotion Factors
tense shaky on edge panicky uneasy restless nervous anxious unhappy sorry sad blue hopeless unworthy discouraged lonely miserable gloomy desperate helpless worthless terrified guilty angry peeved grouchy spiteful annoyed resentful bitter ready to fight rebellious deceived furious bad-tempered worn-out listless fatigued exhausted sluggish weary bushed confused unable to concentrate muddled bewildered forgetful uncertain about things

APPENDIX E
Individual Blood Counts Throughout the BMT
### Individual Blood Counts Throughout the BMT

<table>
<thead>
<tr>
<th>Admission to Hospital</th>
<th>Chemotherapy and Radiotherapy</th>
<th>Bone Marrow Infusion</th>
<th>7 days post-infusion</th>
<th>25 days post-infusion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> Platelets</td>
<td>245</td>
<td>263</td>
<td>138</td>
<td>16</td>
</tr>
<tr>
<td>Hgb</td>
<td>78</td>
<td>105</td>
<td>84</td>
<td>96</td>
</tr>
<tr>
<td>WBC</td>
<td>7.0</td>
<td>8.3</td>
<td>1.4</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>2</strong> Platelets</td>
<td>360</td>
<td>305</td>
<td>76</td>
<td>39</td>
</tr>
<tr>
<td>Hgb</td>
<td>111</td>
<td>107</td>
<td>106</td>
<td>85</td>
</tr>
<tr>
<td>WBC</td>
<td>7.0</td>
<td>10.5</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>3</strong> Platelets</td>
<td>940</td>
<td>940</td>
<td>726</td>
<td>170</td>
</tr>
<tr>
<td>Hgb</td>
<td>123</td>
<td>98</td>
<td>94</td>
<td>100</td>
</tr>
<tr>
<td>WBC</td>
<td>51.0</td>
<td>18.6</td>
<td>5.0</td>
<td>0.6</td>
</tr>
<tr>
<td><strong>4</strong> Platelets</td>
<td>275</td>
<td>238</td>
<td>101</td>
<td>64</td>
</tr>
<tr>
<td>Hgb</td>
<td>114</td>
<td>97</td>
<td>97</td>
<td>98</td>
</tr>
<tr>
<td>WBC</td>
<td>3.2</td>
<td>3.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>5</strong> Platelets</td>
<td>227</td>
<td>179</td>
<td>130</td>
<td>46</td>
</tr>
<tr>
<td>Hgb</td>
<td>123</td>
<td>110</td>
<td>107</td>
<td>103</td>
</tr>
<tr>
<td>WBC</td>
<td>4.4</td>
<td>6.3</td>
<td>1.3</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>6</strong> Platelets</td>
<td>248</td>
<td>148</td>
<td>84</td>
<td>18</td>
</tr>
<tr>
<td>Hgb</td>
<td>134</td>
<td>115</td>
<td>131</td>
<td>115</td>
</tr>
<tr>
<td>WBC</td>
<td>6.7</td>
<td>1.0</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>7</strong> Platelets</td>
<td>319</td>
<td>44</td>
<td>29</td>
<td>23</td>
</tr>
<tr>
<td>Hgb</td>
<td>90</td>
<td>100</td>
<td>82</td>
<td>88</td>
</tr>
<tr>
<td>WBC</td>
<td>4.7</td>
<td>0.4</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>8</strong> Platelets</td>
<td>225</td>
<td>169</td>
<td>38</td>
<td>13</td>
</tr>
<tr>
<td>Hgb</td>
<td>109</td>
<td>110</td>
<td>93</td>
<td>111</td>
</tr>
<tr>
<td>WBC</td>
<td>9.2</td>
<td>3.1</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>9</strong> Platelets</td>
<td>288</td>
<td>135</td>
<td>124</td>
<td>23</td>
</tr>
<tr>
<td>Hgb</td>
<td>124</td>
<td>112</td>
<td>124</td>
<td>96</td>
</tr>
<tr>
<td>WBC</td>
<td>104.0</td>
<td>18.5</td>
<td>8.5</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>10</strong> Platelets</td>
<td>201</td>
<td>167</td>
<td>194</td>
<td>40</td>
</tr>
<tr>
<td>Hgb</td>
<td>105</td>
<td>101</td>
<td>109</td>
<td>91</td>
</tr>
<tr>
<td>WBC</td>
<td>54.9</td>
<td>17.5</td>
<td>4.9</td>
<td>0.3</td>
</tr>
</tbody>
</table>

**Note.** Normal Values=Platelets 125-400 X 10⁹/L  
WBC 4.0-11.0 X 10⁹/L  
Hemoglobin Men: 140-180 g/L, Women 120-160 g/L  
*subject not included in final analysis because of being an outlier on several variables.
APPENDIX F
Medications Commonly used During the Bone Marrow Transplant Procedure
Medications Commonly used During the Bone Marrow Transplant Procedure

Analgesics: demerol tylenol morphine
Gastrointestinal medications: motilium colace zantac ranitidine
Antimicrobials: vancomycin ceftazidine tobramycin mycostatin chlorhexidine acyclovir amphotericin B ketoconazole imipenum ciprofloxin acyclovir flagyl
Anxiolytics: serax ativan
Antihistamines: solucortef benadryl
Anti-emetics: maxeran stemetil gravol trilafon gravol
Anti-diarrheals: lomotil
Steroids: prednisone
Fibrinolysis inhibitor: amicar
Intravenous Additives: potassium chloride magnesium calcium
Nutrition Supplement: total parenteral nutrition
Diuretics: lasix
Anti-Rejection: cyclosporin
Blood Volume Expander: albumin
Bone Marrow Enhancer: GM-CSF