NURSING INTERVENTIONS AND THE OCCURRENCE OF DEATH

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We hereby recommend that the Thesis prepared under our supervision by Susan Peck entitled Nursing Interventions and the Occurrence of Death be accepted as fulfilling this part of the requirements for the Degree of Master of Science.

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CHAPTER I

INTRODUCTION

Man is continuously bombarded with stressors of varying severity. A small amount of stress occurs with the body's maintenance of normal functions. The stress of work, decision making, recreation, and maintaining interpersonal relations provide man with challenge. Meeting the challenge results in progress in man's life. But when a sudden forceful stressor or several stressors occur simultaneously to an individual, illness and/or injury can occur.

Intensive care units have enabled treatment and subsequently survival for some critically ill and injured patients. Complex technical monitoring systems, mechanical ventilators, advanced diagnostic tests and miracle drugs have been developed to enhance the care the critical patient receives. At the same time, research has shown that many factors inherent in the intensive care milieu are stress provoking. Included are noise, lights, twenty-four hour activity, proximity to other critically ill or injured patients, fear of pain and loss of contact with significant others, and fear of loss of life.

More research needs to be done on how stressful certain nursing interventions are to the critically ill or injured patient. Data from such studies may help intensive care nurses to determine if there is a point at which nursing interventions are additive to the preexisting stress caused by the illness or injury and its treatment. Some of the nursing interventions immediately preceding death may potentiate exhaustion and death in the critically ill or injured patient.

Statement of the Problem

The problem of this study was to determine whether or not there was a relationship between the occurrence of death and performance of nursing intervention(s) in critically ill or injured patients according to the major system of involvement.

Statement of Purpose

The purposes of this study were to:

1. Identify occurrence of death
2. Identify performance of nursing intervention(s)
3. Identify major system of involvement
4. Compare collectively occurrence of death and performance of nursing intervention(s)

5. Compare occurrence of death and performance of nursing intervention(s) according to major system of involvement

Background and Significance

Much of the literature included in the background and significance was chosen specifically from literature written about ill and injured patients who experienced the added stress of hospitalization. Literature on stress the critically ill and injured patient experiences in an intensive care unit is included.

Stress

Stress has been defined by Selye as the "nonspecific response of the body to any demand made upon it." It is immaterial whether the stressor is pleasant or unpleasant, what is important is the intensity of the demand for readiness and adaptation that the stressor places on the individual (Selye 1956).

Stressors create specific responses, such as heat stimulates sweating to cool the body, cold stimulates shivering to warm the body. Stressors also create nonspecific responses to which the body performs certain homeostatic adaptive functions to reestablish normalcy. The homeostatic adaptive functions are independent of

the specific responses to specific stressors. This process of adaptation has been termed by Selye (1973) the General Adaptation Syndrome.

The General Adaptation Syndrome (GAS) consists of three stages:

> I. Alarm reaction: a generalized call to arms of the defensive forces in the organism
> II. Stage of resistance: the adaptation to the continued presence of the stressor
> III. Exhaustion stage: occurs immediately after the alarm reaction or after a period of adaptation when the stressor has continued for too long, or a new stressor has occurred to break the load the individual can withstand. Exhaustion leads to death (Selye 1973).

A chain of neural and hormonal reactions make up the GAS which helps the body adapt to the physical and emotional environment created by the stressor. Via the central nervous system (CNS) the stressor effect stimulates the hypothalamus to secrete corticotropin-releasing-factor (CRF). CRF stimulates the pituitary gland, which secretes adrenocorticotropic hormone (ACTH). ACTH reaches the adrenal gland via the circulation and stimulates corticoid secretion from the adrenal cortex. Catecholamines are secreted concommitantly from the adrenal medulla. Each of the adrenal hormones affects the body systems to initiate a fight or flight response. The autonomic nervous system effects local organ changes

and adrenal stimulation similar to that effected by hormonal influence.

At various intervals in the sequence of hormonal reactions, ACTH and corticoid feedback to the hypothalamus can occur to stop or increase the reaction. The reaction may be stopped because the stressor is abolished, returning the organism to stability, or because the stressor has come under control, resulting in the stage of resistance, stage II of the GAS.

During stage II hormonal and neural reactions may remain elevated from the pre-alarm stage allowing coexistence with the stressor. If however, the stressor demands continued or increased hormonal and neural response which gradually exhausts the body and its protective mechanisms; or if further stressors occur, the intensity of the demand for readiness and adaptation made by the stressor(s) may exceed the body's capabilities. Illness, injury, and even death can then occur (Selye 1976).

Within Selye's definition of stress, illness and injury are regarded as stressors, and so an ill or injured person can be regarded as a stressed person. When illness or injury requires the individual to be hospitalized, many factors including the unfamiliarity of surroundings,

fear of serious illness, loss of contact with family and friends, painful treatments and procedures.....add to the stress created by the illness or injury. An illness or injury of a severity to require therapy in an intensive care unit (ICU) augments these stress factors even further. Selye contends too much stress adversely affects the ability of patients to cope with and recover from illness (Selye 1965).

For the ICU patient, Selye's contentions become critical. The illness or injury of an ICU patient is already severe enough that death is often a real possibility if treatment is not instituted (West 1975). The physiological and emotional aspects of severe illness are compounded for the ICU patient by the factors Selye mentions above; along with painful procedures, lack of sleep (which often occurs in the ICU), and round the clock nursing care and treatment. The total round the clock care of the critically ill or injured patient is necessary to maintain life (West 1975).

Melia (1977) states that there may be a point where nursing interventions become too stressful, and adversely affect the ability of patients to cope with and recover from illness or injury. An understanding of signs and symptoms of stress and how man responds to

stress is necessary for nurses to assess how much the critical patient is stressed and his/her ability to cope. Until the time when optimal stress levels can be predicted for individual patients, it would seem reasonable to minimize stress for patients (Melia 1977).

Nursing Research on Stress

One study which attempts to measure the degree of stressfulness of nursing interventions was conducted by Mitchell and Mauss (1978). This study investigated the relationship between patient-nurse activity and variations of intracranial pressure. The physiologic response of severe elevations of intracranial pressure can be blockage of brain blood flow with focal areas of brain death, or more severely, herniation of the brain stem into the spinal column, causing neurological death.

Nine patients with elevated intracranial pressure were studied. Pressure elevations were secondary to trauma, hemorrhage, tumor and surgery. The patients were observed for incidence of ventricular fluid drainage (VFD) associated with patient or nurse-initiated activity. An indication of elevated intracranial pressure is the incidence of VFD. One of the nine patients had no incidence of VFD. This patient had an occipital bone flap removed surgically, allowing expansion of

intracranial contents without increase of the intracranial pressure. Seven of the remaining eight patients had a greater incidence of VFD with activity than with nonactivity. One patient had a greater incidence of VFD with nonactivity.

Several activities were identified which consistently accounted for VFD: turning or changing position (five patients); conversation about the patient's condition, either with or over him at the bedside caused VFD in both alert and comatose patients (six patients); two patients had VFD when they spoke of their own pain, restraints or headache. General conversation which did not concern the patient's condition did not cause VFD in any patient. Activities which caused VFD consistently in only one or two patients were rapid eye movement sleep, periodic breathing, snoring, suctioning, coughing, painful procedures, combinations of nursing activities and rectal temperatures.

Mitchell and Mauss' (1978) study indicates that there are particular nursing interventions which cause enough stress to elevate intracranial pressure in head injured patients. There may be nursing interventions which are stressful to patients with other illnesses or injuries besides head injuries. The added stress of

some nursing interventions may potentiate exhaustion and death in critically ill patients. Further research is necessary to determine just how stressful nursing interventions are to critically ill and injured patients.

Definition of Terms

The following definitions have been established:

1. Occurrence of death--the initial notation of the patient becoming unresponsive in pulse or respiration

2. Major organ system of involvement--the organ system which is compromised the most by the illness or injury

3. Nursing interventions--any act normally performed as a part of the care of the patient by a nurse

   (a) Invasive nursing interventions--any nursing act which entails entering a natural or surgically produced body orifice or of penetrating the skin

   (b) Noninvasive nursing interventions--any nursing act which does not enter a body orifice, either natural or surgically produced, and does not involve penetration of the skin

   (c) No nursing interventions--the complete lack of recorded nursing interventions on the patient's chart

Limitations

The following limitations have been identified:

1. The sample data have been derived from all patients who expired in an intensive care unit and data may not be generalizable to all patients

2. All patient care information may not have been recorded, or may have been recorded incorrectly, giving false data in the nursing intervention categories

3. Interventions administered by other personnel are not included in this study

Delimitations

The following delimitations have been identified:

1. Notation of time of initial unresponsiveness in pulse or respiration must be evident on the chart

2. Nurses notations must be present

3. The organ system(s) involved in disease or injury must be evident on the chart

Assumptions

The following assumptions have been made:

1. Stress is additive

2. Nursing interventions can be stressful

3. Illness or injury are stressful

Summary

This study was an attempt to identify nursing interventions administered in the hour just prior to death, the occurrence of death, and the major organ system of involvement in illness or injury from the charts of critically ill and injured patients who have died. In Chapter II, the review of literature, Selye's theory of stress and the effects of stress on the body are discussed. Current literature from the medical and nursing fields is presented which describes particular interventions and patient activities which have been found to be stressful. Some nursing procedures that have been researched in an attempt to decrease the stress patients experience are also included. In Chapter III the setting for the study, the population, the method of data collection, the tool used and the treatment of the data are described. Chapter IV presents the raw data and its analysis. A complete summary of the study, conclusions drawn from the study and their implications for nursing practice, and recommendations for further study are presented in Chapter V.

CHAPTER II

REVIEW OF LITERATURE

The theoretical framework for this study is based on Selye's theory of stress. The stress theory and the physiological importance of hormone secretion initiated by the stress response are discussed. Research from the medical and nursing fields is presented which provides evidence of the stressfulness of some medical and nursing interventions, and steps which are being taken to decrease some of this stress for patients.

Selye's (1973) General Adaptation Syndrome provides a sound explanation for the nonspecific physiological response to a stressor. Selye (1956) believes emotions not outwardly expressed through somatic effectors tend to be inwardly expressed through visceral effectors. Lazarus (1974) states that stress emotions play a key role in illness because under conditions of harm or danger the body mobilizes as part of the effort to cope. Although this is an adaptive evolutionary mechanism of species survival, under conditions creating excessive or prolonged bodily disturbances, it also results in disease. If one cannot find an outlet for emotional tension by

works or actions, the body will find a means of expressing itself through organ language. Physical stressors create the organ language immediately and this can be compounded by the emotional aspects of being severely ill or injured. The result is a chain of hormonal and neural reactions which take place to help the body adapt to its physical and emotional environment (Selye 1956).

"The first response to a stressor is nonspecific, little is known about it. It doesn't need to be an excess or deficit to something" (Selye 1976). The response depends on the specific and nonspecific stressor effects, and previous exogenous and endogenous conditioning to similar stressors (Selye 1976). Conditioning includes three interrelated action impulses, and the physiological changes related to species specific forms of mobilization for action. Evaluation influencing previous conditioning include threat, harm, challenge and positive well-being (Lazarus 1974).

Eventually the stressor acts on the hypothalamus and the ME, regulated by means of nervous stimuli coming from the cerebral cortex, the reticular formation and the limbic system (see figure 1). Nervous stimuli reach certain neuroendocrine cells, mostly located in the ME which transforms nervous signals into a humoral messenger

call CRF. CRF reaches the anterior lobe of the pituitary via the hypothalamo-hypophyseal portal system and travels down the pituitary stalk to trigger ACTH secretion from the adenohypophysis into the general circulation. When ACTH reaches the adrenal gland, several adaptive functions are begun. Corticoid secretion stimulates gluconeogenesis for a ready supply of energy, other enzymatically regulated adaptive metabolic responses are facilitated, and the immune reaction and inflammation are suppressed. An ACTH feedback mechanism exists to prevent an overload of ACTH secretion. A second pathway that mediates the stress response is carried through catecholamines liberated under the influence of acetylcholine discharge at autonomic nerve endings and in the adrenal medulla. Chromaffin cells of the adrenal medulla secrete epinephrine which provides ready energy for adaptation, forms glucose from glycogen deposits, frees fatty acids from triglyceride stores, increases pulse and blood pressure and stimulates the central nervous system (Selye 1976).

Each of the hormones whose secretion is triggered by the nonspecific physiologic response to the stressor plays a particular role in the adaptation of the body to the stress. Homeostasis of the body depends on two types of hormonal reactions, syntoxic and catatoxic. A

syntoxic response acts as a tissue tranquilizer permitting tolerance of the stressor. The catatoxic response causes chemical changes in the body which lead to an active attack on the stressor. The body chooses which defense will occur by instituting syntoxic or catatoxic utilization of the hormonal secretions (Selye 1976). If the stressor exists for too long a period of time, bodily defense mechanisms wear out. If the body was utilizing hormones syntoxically, the amounts of hormones produced eventually cannot continue to increase to meet the demands of the stressor. Or if the body issued a catatoxic response to the stressor, the active attack may begin to break down body organs and elements necessary for cell life. In either event, continued presence of the stressor, or the occurrence of other stressors at the same time, leads to exhaustion and death of the individual due to the inability to cope with the continued presence of the stressor, or to cope with such a great amount of stressors (Selye 1976).

The hormonal secretions which are triggered by the stress response are ACTH, GH, corticoids and catecholamines. Glucose and insulin also show major alterations in response to stress.

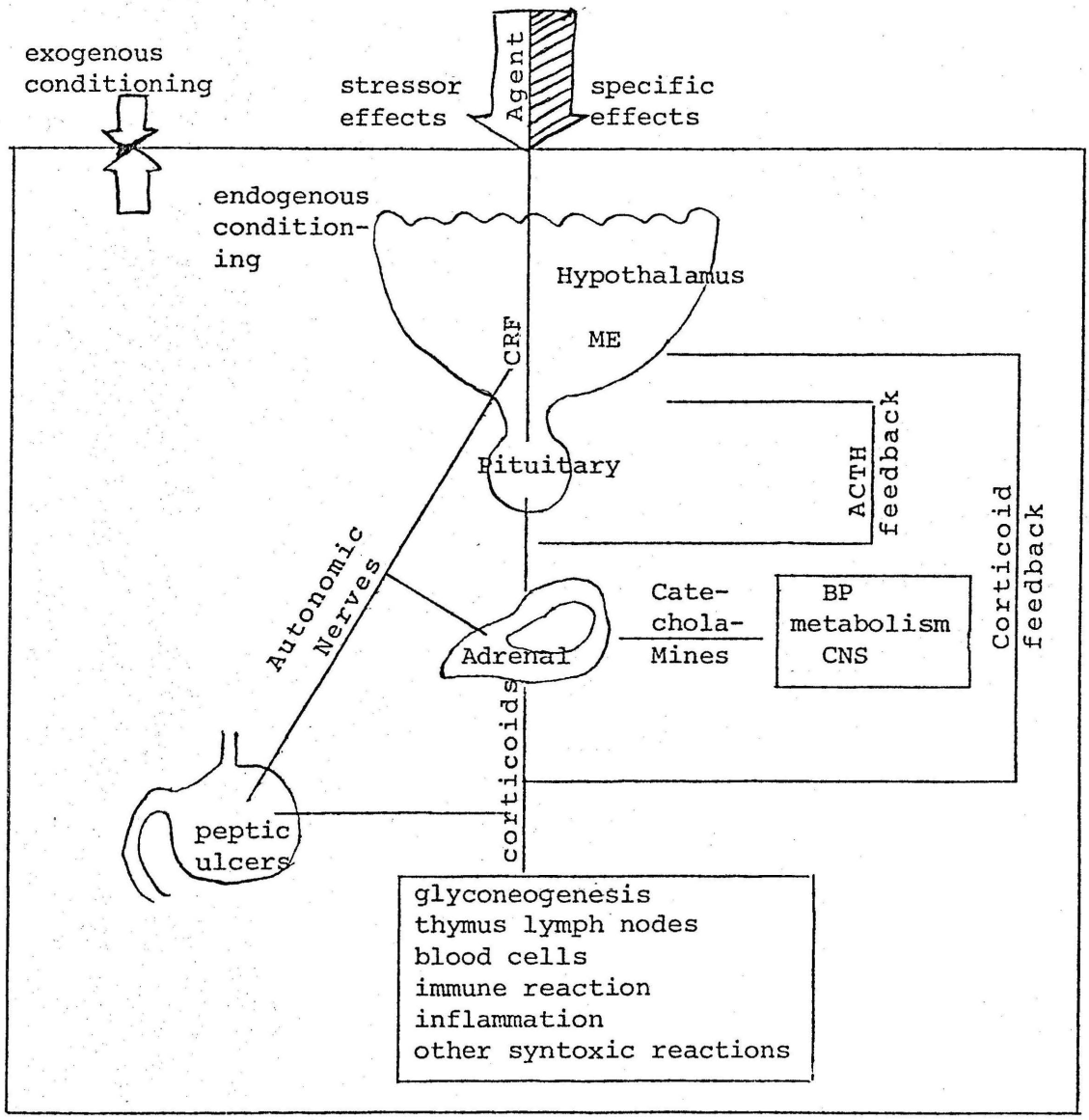


Fig. 1. Principle pathways mediating the response to a stressor agent and the conditioning factors which modify its effects (Selye 1976).

Adrenocorticotrophic hormore is secreted by the pituitary gland when pyrogens, emotional stress, surgery, severe physical trauma or other stressful stimuli occur.

The ACTH stimulates secretory activity of the adrenal cortex, promotes an increase in adrenal blood flow, and hypertrophy of the adrenal gland. The result is secretion of corticoids. Corticotropin releasing factor regulates further ACTH release when blood levels of corticoids reach a predetermined level, preventing ACTH overload in the body (Wintrobe 1976).

Corticoids act on intermediary metabolism which is predominantly anti-insulin and includes regulation of protein, carbohydrate, lipid and nucleic acid metabolism. These are mainly catabolic effects, causing increased protein breakdown and nitrogen excretion. Corticoids increase hepatic glycogen content and promote gluconeogenesis (Wintrobe 1974). The outpouring of corticoids also causes immunologic suppression. There's a decrease in circulating lymphocytes, eosinophils and basophils. This altered immune response and the effects of anesthesia, narcotics and immobility make the patient a prime candidate for pulmonary infection (Marcinek 1977). In vascular trauma the increased platelet adhesiveness secondary to the injury itself is compounded when corticoids stimulate platelet production and its resulting increased blood viscosity. The vascular trauma patient is thus predisposed to thrombus formation (Marcinek 1977).

Cortisol and cortisone are the most important corticoids. They enhance gluconeogenesis for the energy needed for the fight or flight response to stress. If cortisol and cortisone are in excess however, protein depletion and a state similar to diabetes mellitus result. Without adequate cortisol and cortisone, the pressor response of catecholamines may be significantly reduced (Wilson 1976).

Catecholamines are secreted by the adrenal medulla. The major catecholamines are epinephrine (EP) and norepinephrine (NEP). The two differ in the degree of their pharmacologic actions, but tend to produce the same effects. NEP is more potent in producing a sustained arteriolar contraction and a positive ionotropic effect on the heart. EP has a predominant effect on glycogenolysis. EP and NEP have equal effects in the liberation of nonesterified fatty acids from neutral lipids (Shires 1966). High levels of catecholamines can produce ventricular arrhythmias, as is seen with acute stress and diverse psychological states (Lown et al. 1977).

Another hormone secreted in response to stress is GH. Growth hormone is secreted by the pituitary and has a general somatic effect on growth. It acts particularly on muscle, adipose tissue, cartilage and other connective

tissue (Catt 1970). In addition, GH facilitates amino acid transport and incorporation into protein, mobilizes free fatty acids from peripheral fat stores, reduces lipid synthesis, and causes renal retention and body storage of sodium, potassium, calcium, phosphorous, and nitrogen (Wintrobe 1974). Growth hormone has an anti-insulin or diabetogenic effect--it causes hyperglycemia by antagonizing the hypoglycemic effects of insulin (Wright and Johnston 1975). When GH levels are extremely high, glucosuria, impaired glucose tolerance and insulin resistance occur (Catt 1970). During surgical stress and trauma GH is anti-insulinogenic. At times of nonacute stress, when the metabolic balance is shifted toward catabolism, stimulation of GH serves to moderate protein loss, and may produce a positive nitrogen balance (Newsome 1975).

The decreased levels of insulin in the body due to increased GH secretion during stress allows liberation of hepatic glycogen. Glucose is thus provided for the body for energy. When the acute stress is over or lessened, decreased levels of GH and other hormones allow insulin to move glucose back into the cells for storage. Insulin also increases synthesis of protein from amino acids and formation of fat from excess carbohydrates. Glucose

storage, protein synthesis and fat formation serve as body reserves for future stressors, or for chronic continuance of the original stressor so that severe protein depletion is allayed (Wilson 1976).

The changes various stressors cause within the body have been researched in many varying situations. The medical and nursing fields are defining what kinds of interventions and patient activities are stressful to patients, and what can be done to decrease or alleviate stress to patients.

Medical Research on Stress

In a study of cardiac care unit (CCU) patients monitored continuously over a 24 hour period (N not reported in the study), stressful situations were consistently associated with the emergence of ectopic ventricular activity. The stressful situations included Chief of Medicine rounds, explanations of procedures and their results, and denying the patient's wish to see his family. When the stressful situation was over or remedied, the ectopic ventricular beats ceased. Catecholamines released during the stress response have been cited as the cause of ventricular ectopic beats. The potential exists for ectopic ventricular beats to be triggered if sufficient levels of catecholamines are generated when treatments

and patient activities add stress to the already compromised myocardial integrity (Lown et al. 1977).

Cardiac catheterization is a frequent and now customary stressful diagnostic procedure. The procedure is threatening for most patients, and a variety of behavioral and affective reactions have been identified (Greene et al. 1970). Twenty-two patients scheduled for elective cardiac catheterization procedures were studied to answer questions regarding the stressfulness of the experience as defined by any correlations between short-term psychological change and change in the level of GH, variations in the degree of change in the level of GH associated with different types of psychologic reactions, and associations between any changes in the levels of GH, blood cortisol and free fatty acids (FFA).

Two observers made independent estimates of each patient's behavior during the catheterization procedure. The following six behavioral categories had been previously defined and patient behaviors were classified within the categories. Affectivity: (1) anxious, (2) depressed, (3) hostile, (4) calm; Activity: (5) aroused-withdrawn; and Interpersonal Relating: (6) engaged-not engaged. Eight patients were described as anxious-engaged. They were hypervigilant, startled

with injections and perpetuated conversation with the cardiologist, often on extraneous topics. Six patients were anxious-not engaged. They also were tense, hypervigilant, and startled easily, but did not engage in conversation. Answers to the cardiologist's questions were monosyllabic. Six other patients were categorized as depressed. Their facial expression was slack, and their eyes were closed much of the time. Some cried, groaned or complained. No depressed patients conversed with the cardiologist. Answers to questions were monosyllabic. Two men remained quietly alert throughout the three hour procedure. The two men answered the cardiologist's questions fully and in a normal voice. Later they said the test had not bothered them very much, but that they were tired. Patients in the other three categories said later that they felt scared, or like running away, but otherwise were guarded in speaking of their feelings during the catheterization. The depressed patients expressed disappointment about the catheterization and were pessimistic about the future and their disability.

The various psychological reactions observed in the twenty-two patients undergoing cardiac catheterization are associated with different degrees of change in the plasma levels of GH and cortisol. Initial plasma glucose

levels showed no significant difference between patient groups, and varied only minimally during the catheterization. Plasma FFA levels increased during the procedure in all patients.

The FFA elevations were assumed to be due to the catecholamine secretion incident to the threat of the procedure. The anxious-engaged group showed high initial levels of cortisol persisting throughout the catheterization, but very low levels of GH. The anxious-not engaged group had similar levels of FFA, slightly lower initial levels of cortisol rising throughout the procedure and were the only group with meaningful GH elevations. The depressed group had the highest FFA levels, the lowest initial cortisol levels with continued low cortisol and GH levels during the procedure. In the calm group one patient had extremely high levels of FFA during the catheterization and initially had the highest levels of cortisol of all twenty-two patients. GH levels were also low. Those patients who showed increasing GH levels during the procedure also showed increasing cortisol levels.

In another study, O'Keefe and Sender (1974) showed that operative stress causes protein catabolism and a fall in protein synthesis. Protein catabolism is

a physiological attempt to use protein to meet caloric requirements during surgery or trauma. It also provides injured tissues with the amino acids needed for synthesis of other substances necessary for cell life. Four patients undergoing moderate severity abdominal surgery (cholecystectomy, vagotomy and pyloroplasty, abdominal-perineal resection and laparotomy) were monitored for three days after surgery. Urine nitrogen levels were calculated. The patients were not fed or hyperalimented for the three days. It was found that protein synthesis had decreased by 12 percent, or thirty-four grams of protein. At this low level of synthesis continued protein catabolism soon depletes all body stores. The stress of certain health care interventions could cause further protein catabolism which adds stress to the patient's already critical state (O'Keefe and Sender 1974).

The effect of surgical operation on GH levels in plasma is investigated in another study done by Wright and Johnston (1975). Eighteen male patients undergoing various surgeries were studied. All surgeries were performed under general anesthesia. The patients were divided into three groups according to severity of the surgery. Group I patients underwent inguinal

herniorraphy, Group II vagotomy and pyloroplasty, and Group III aortofemoral bypass graft.

Preoperatively, fasting glucose tolerance tests were performed on all patients. The fasting levels were all within normal limits. During surgery however, all three groups showed a significant depression of glucose utilization, being significantly worse in Group III. Glucose utilization gradually returned to normal in Groups I and II during recovery, but took slightly longer in Group II. In Group III utilization improved on the first postoperative day and deteriorated so that by day eight it was little better than during operation.

The fasting serum GH levels were within normal limits in all patients. After glucose loading there was no significant elevation in GH levels in any of the three groups. Group II patients showed a slight increase in GH levels during operation. In Group III there was a more marked elevation of GH during operation. The elevation in Group III persisted for eight days after operation. These reported changes confirm the presence of glucose intolerance during and after operation. A cycle exists with falling glucose utilization stimulating GH release and the released GH antagonizing insulin activity and causing a further deterioration of glucose utilization.

Growth hormone (GH) and ACTH were again shown to be elevated by stress by Newsome and Rose (1971). Newsome and Rose studied twenty-two patients undergoing abdominal surgery for cholecystectomy (Group I), inguinal herniorraphy (Group II), and inguinal herniorraphy under spinal anesthesia (Group III). Groups I and II had general anesthesia. Newsome and Rose found that in Group I ACTH and GH levels rose significantly ($p = 0.05$) immediately after the skin incision was made, through one hour after skin incision. For Group II, ACTH and GH levels rose slightly from just before the pre-operative medication was given, and continued to rise slightly in three subsequent blood samples--just prior to anesthesia, just prior to skin incision and through one hour post-incision. In Group III significant rises of ACTH and GH were not found. Newsome and Rose indicate that spinal anesthesia blocks the conduction of stressors through the CNS so the hypothalamus does not receive the neural input of the stressor. Under general anesthesia the CNS pathway from the surgical site to the hypothalamus is not blocked, and a stress response is elicited from the hypothalamus. Surgery under general anesthesia is thus interpreted as sufficient stress to cause increased secretion of GH and ACTH. The psychological component of experiencing

surgery probably accounted for the slight rise in GH and ACTH seen in the patients undergoing spinal anesthesia.

Trauma patients also display GH elevations. Of seven acute trauma victims (five motor vehicle accidents, one fall, one stabbing) five showed elevated or high normal GH levels on initial blood samples drawn on admission to the emergency room. Admitting time ranged from thirty to 180 minutes post-trauma. Four hours after emergency room admission a second blood sample was drawn. Four of the five patients who had initial GH elevations showed a decrease in GH in the second sample, which was drawn after treatment. The fifth patient, involved in a minor accident, had not been treated before the second sample was drawn (Schalch 1967).

In summary of the Newsome and Rose and Schalch studies, two factors influenced the ACTH and GH elevations: (1) the emotional aspects of the surgery and trauma including fear of findings, pain and prognosis, and (2) the tissue physiologic response to injury, incision and handling. Both aspects continue after surgery. The patient experiences pain from the incision, traumatized tissues, coughing and turning. Fear of the pain often compounds the perception of pain. Intramuscular injections of analgesics often create some pain, and a

sense of dreaded anticipation of a "shot." Dressing changes can create pain, or the fear of pain, and create a physiologic tissue response from handling and cleansing the incision or traumatized tissues. Over time, it becomes possible for GH and ACTH levels to rise if the treatment of the patient is stress producing (Newsome and Rose 1971, Schalch 1967).

Carey et al (1970, 1972) determined a glucose rise, insulin inhibition, and rises of GH and adrenocortical response in humans in shock. Three groups of subjects were investigated. Group I consisted of ten normal hospital corpsmen, working regular hours, eating balanced meals and not subjected to abnormal stress. Group II consisted of sixteen combat marines who were subjected to blood testing before and after a combat patrol for glucose, insulin, GH and plasma cortisol levels. The conditions imposed by the patrol included limited sleep (average four hours per night), physical stress of temperatures of over 100 degrees Farhenheit with 80 to 90 percent humidity, limited water intake and the carrying of heavy packs, ammunition and weapons. Nonphysical stress was imposed by the constant threat of physical injury from mines and the enemy. Group III consisted of fourteen men admitted to the United States Naval Station hospital,

DaNang, Republic of Vietnam. All were severely injured and in profound shock. Since the individuals were awake during the injury, the stress was psychological as well as physiological. Blood samples for glucose, insulin, GH and plasma cortisol were drawn on admission before treatment was begun and every thirty minutes thereafter for five hours.

The normal corpsmen had mean GH levels of 1.8 mμg/ml in the morning and 1.6 mμg/ml in the evening. Morning cortisol levels averaged 23.1 μg/100ml and evening levels 4.3 μg/ml. Blood glucose and insulin levels were also normal.

The combat patrol marines levels of GH were not statistically different from control values for Group I. Following patrol GH levels had risen to 8.1 mμg/ml. Before and after patrol plasma cortisol levels were below morning levels in the Group I subjects, but within normal limits. Glucose and insulin levels are not reported for Group II.

Growth hormone levels averaged 58.8 mμg/ml for Group III. The variance from Group I and Group II before and after patrol was significant and had decreased to 25 mμg/ml in five hours. Two patients died during the study. A third man had a GH level of 200 mμg/ml on admission,

which rose to 242 mμg/ml during operation. One of the men who died had a rise in GH to 668 mμg/ml right before death, the other to 400 mμg/ml.

Cortisol response in Group III patients was not statistically different from Group I morning samples, but was higher than Group II subjects before and after patrol. The two men who died had the highest cortisol levels. The man who had a GH level of 668 mμg/ml had a cortisol level of 100 μg/100ml at death. The other man's cortisol levels dropped from 86 μg/100ml on admission to 34 μg/100ml at death.

Seven of the fourteen patients were admitted to the hospital within thirty minutes of wounding. Their mean blood glucose was 215 mg/100ml, indicating that hyperglycemia occurs quickly after shock and injury. One of the men who died (not specified) was admitted with a blood glucose of 370 which reached 622, and then fell to 25 mg/100ml in the next thirty minutes just prior to death. Five patients including the two who died were admitted with no detectable blood pressure. The mean blood glucose for the five men was 351 mg/100ml. From these comparisons it appears that there is a definite relationship between the severity of shock and hyperglycemia. Blood glucose elevations persisted for the

total five hours of observation. There was a decline in the average for 180 minutes, a levelling off for the next two hours, and all patients returned to normal levels in twelve to twenty-four hours.

The insulin levels in the patients in shock on admission were quite similar to those in men before and after combat patrol. Insulin levels rose toward normal with treatment, with a peak occurring during operation. The average insulin level for those admitted without blood pressure was 24.8 μu/ml compared to 14.2 μu/ml for those with a detectable blood pressure. In the two patients who died, insulin fell from admission levels of 50 μu/ml to 6.7, then rose to 195, and finally dropped to 9.0 just prior to death.

Carey et al. (1970) summarized their study with the following points. Growth hormone levels are strikingly elevated in response to shock and injury. Cortisol levels remain near normal or are slightly elevated. Severe hyperglycemia occurs within minutes after traumatic shock. The magnitude of the hyperglycemia is related to the severity of the shock. There appears to be a relationship between the pattern of decline in blood glucose and survival. Serum insulin in man is unresponsive to the hyperglycemia of shock.

Engel (1971) reviews documentation of various stressful emotional situations known to cause ventricular arrhythmias in susceptible individuals. Individuals Engel has studied and studies of others whom Engel cites, had profound neurogenic and cardiovascular influences present at the time of death. Death had occurred suddenly to the individuals under conditions of psychological and emotional stress.

Engel states that death during psychological stress has been a topic of interest dating back to biblical times. The Bible tells that when Anaias was charged by Peter, "You have not lied to man but to God," he fell down dead; as did Sapphira, his wife, when told that "the feet of them that have buried thy husband are at the door and shall carry thee out" (5 Acts 3:6). Emperor Nerva is said to have died of a "violent excess of anger" against a senator who offended him. Pope Innocent IV succumbed suddenly to the "morbid effects of a grief upon his system: soon after the disastrous overthrow of his army by Manfred. Early eighteenth and nineteenth century medical writings abounded in writings of sudden unexpected deaths following situations of great emotion. But with the taboo on studying death now disappearing, acceptance of multifactorial concepts of

disease now makes possible the consideration of how disease and death may be induced through the interaction of many factors, including psychic and neural (Engel 1971).

Engel studied the mechanisms mediating such psycho-physiological accidents with which sudden death is alleged to be associated. He surveyed those deaths reported in the daily press over a six year period, collecting 170 items. Only reports with a clear reference to a precipitating situation were used. All instances where suicide was even a remote possibility were excluded. Most deaths occurred within one hour of the event reported, although all victims were considered still to be reacting to the event at the moment of their death. The life settings in which death was reported to have occurred could be divided into eight major categories. Groups I to V represented various kinds of losses: on the death of a close person, during a period of acute grief, on the threat of loss of a close person, during mourning or an anniversary, and on loss of status or self-esteem. Groups VI and VII included personal danger or threat, and after danger was over. Group VIII (happy ending) and some of the Group VII included people who died at times of relief, pleasure or triumph. Settings of loss accounted

for 59 percent of the deaths, danger 34 percent and happy ending 6 percent. Women were more often reported as dying in relationship to a loss than men, and men more often in response to danger.

Reliability of the reported incidences of death were made by Engel's contacts with physicians of several of the expired individuals and from several necropsy findings. The instances in which physician or necropsy data was obtained only elaborated the press accounts further, and in none was the press story discounted. Most medical literature accounts are anecdotal, emphasizing mainly situations that they believed were evocative of intense grief, fear, rage or triumph, and closely resemble those reported in the press (Engel 1971).

Nursing Research on Stress

Nursing research has tried to define interventions nurses administer which are stress producing and what kinds of activities are particularly stressful to patients. Nurses are also researching various nursing approaches to patient care which may decrease the amount of stress the patient experiences.

Volicer and Bohannon (1975) attempted to define what patients perceive as stressful about hospitalization. In a pilot study they used the Holmes and Rahe Social

Readjustment Rating Scale (SRRS). Previously hospitalized laymen, nurses and doctors were interviewed. From their comments, a list of forty-five items was compiled from those things the interviewees had perceived as stressful. Next, Volicer and Bohannon asked 216 well persons to rate the forty-five items on a scale of zero to fifty, from least to most stressful. With these baseline ratings, comparisons were made with the ratings forty-six patients gave to the same forty-five items. The items were then revised slightly, most revisions were in the wording of the phrases used; and the items were printed on cards. It was felt that sorting the forty-five items printed on cards into piles would be easier than a number rating of the items. The three piles were defined to contain cards depicting highly stressful items, moderately stressful items, and items of low stress.

Volicer and Bohannon were satisfied with reliability of the forty-five item SRRS they had developed, and next tested it on 261 patients. The patients were chosen by willingness to participate, from among all medical and surgical ward patients admitted over a twelve week period. Each patient was interviewed to explain the card-sorting procedure of the forty-five items. Patients were to place the cards in three piles: items of high

stress, moderate stress and low stress, and then arrange each pile from least to most stressful. These 261 patients were also rated by the interviewers on Wyler's Seriousness of Illness Rating Scale (SIRS), a list of 126 diseases, ranging from trivial to serious. The SIRS was developed similarly to Holmes and Rahe's SRRS. Correlations of the SIRS with patients' life change units showed that the more serious the illness for which a patient was hospitalized, the higher the life stress score he had for the period of six months to two years prior to illness.

A summary of the ratings the 261 patients gave the forty-five items includes these examples from each of the three categories. Items rated as least stressful included having strangers sleep in the same room, eating at different times than you usually do, and being in a room that's too hot or cold. Moderately stressful items included staff being in a hurry, thinking about losing income, and having nurses or doctors talk too fast or use words you can't understand. Items which were rated as highly stressful were not getting pain medicine when you need it, not knowing results or the reasons for your treatment, not being told your diagnosis, knowing you have a serious illness, and thinking you might lose a

limb, organ or your sight. Ratings by all patients showed little variation with regard to age, sex, marital status, education and occupation.

Volicer conducted another study in 1978. The Hospital Stress Rating Scale (HSRS) was used to quantify the psychosocial stress patients perceived as associated with hospitalization. The HSRS was based on Volicer's previous SRRS studies. Patients on medical and surgical wards were interviewed on the third or fourth day of hospitalization (medical) and on the second or third day after surgery (surgical). A total of 535 patients participated. All patients were rated by the HSRS, SRRS, SIRS (see 1975 Volicer and Bohannon study above), and a Recovery Inventory (RI) developed by Wolfe and Davis. The correlations of all the ratings were used to determine the possible effects of hospital stress on patients' self-evaluations of their pain and physical status.

The patients were divided into four groups after interviewing. Group I contained medical patients who rated low on the SIRS; Group II--medical patients who rated high on the SIRS; Group III--surgical patients who rated low on the SIRS; and Group IV--surgical patients who rated high on the SIRS. Group III had the highest life change scores as determined by the SRRS; but also

had the shortest hospital stay. Group IV reported the highest stress associated with hospitalization. Groups I and IV had the most females, but all groups were similar in education and marital status. All four groups reported an average of 25 (0--poor to 45--excellent) in subjective physical status as measured by the RI. Two weeks after hospital discharge, all four groups reported perceiving higher physical status, with larger increases in physical status reported in the surgical groups.

Analysis of data for all groups indicated that there are associations between hospital stress and patient self-reports of pain and physical status during and subsequent to hospitalizations. High stress during hospitalization was associated with high pain and low physical status. Low stress during hospitalization was associated with low pain and higher physical status. Women rated their physical status lower than men during and after hospitalization (Volicer 1978).

Other studies have been done to develop an experimental nursing approach to decrease hospitalization stress. One such study was undertaken by Pride (1968). Pride utilized three different nursing approaches on three separate groups of thirty-six patients each. Subjects

were patients on four medical wards. Assignment to groups was random. The first patient group acted as a control group. No variations were made from normal hospital routines or nursing interactions. Patients in Group II were given the same treatment and care as Group I, but in addition, information was provided about the hospital, the ward, the ward personnel, the procedures, tests and treatments the patient would experience, and information was given about the study. Group III patients were treated the same as Group II, and in addition, nursing investigators attempted to clarify with the patient his perception of hospitalization. In order to assist the patient with clarification the investigators (1) made hunches about the patient's perceptions and expectations of hospitalization based on his verbal and nonverbal behavior, (2) validated the hunches with the patient, (3) allowed the patient to express feelings about the validated perceptions and expectations, (4) clarified areas of misinformation or ignorance that were revealed in steps (1) and (2) about hospital and staff, about the problem that prompted hospitalization, and about the patient's expectations of his role in the hospital. The nursing approaches for Groups II and III constituted the experimental nursing approach.

Urine potassium excretion was chosen as a measure of the stress the patient perceived when experiencing the three approaches while hospitalized. An admission urine sample was collected when the patient was admitted to the study, upon admission to the hospital. The initial measure of urine potassium was used as an indication of the level of anticipatory stress for the subject. All urine voided after the admission sample was collected for each individual patient. Urine specimens were analyzed and measured every twelve hours thereafter for forty-eight hours. Urine potassium levels on admission were compared with the second two twelve-hour periods. Admission mean values of potassium excretion (mEq/L) for Group I was 51.29, for Group II 74.73, and for Group III 100.13. On the second day of the study, and exposure to the nursing approaches, mean values of potassium excretion dropped for all groups: Group I 34.19, Group II 52.09, and Group III 67.88. Group III showed the greatest decrease in mean value of potassium excreted, with Group II showing the next greatest decrease. Groups II and III were the patient groups receiving the experimental nursing approaches. Since the output of urine potassium is increased during stress, a decrease in urine potassium output could be designated as

an index of patient welfare that would serve as a measure of nursing effectiveness (Pride 1968).

A second study undertaken to measure nursing effectiveness was done by Putt (1970). Putt utilized two experimental nursing approaches to determine the most effective way for nurses to facilitate a return to health in patients with peptic ulcer disease. One experimental approach emphasized psychological support and the other patient instruction. The two experimental approaches were tested against a control of routine hospital care. Putt attempted to determine if the experimental approaches were more effective than routine care in speeding healing, decreasing length of hospital stay and helping patients learn about their disease.

Thirty-six male and female patients with x-ray confirmation of peptic ulcer disease made up the population. No patients requiring gastric surgery, steroids, or having other complicating diagnoses were included. On admission the patients were randomly assigned to three groups. Group I, the control group, received routine hospital care. They were seen by the investigator only to sign permission forms, and later to fill out the IPAT Anxiety Scale and the Semantic Differential Scale. Group II received in addition to the routine hospital nursing

care, a daily visit from the investigator for unstructured interaction. The patient led the topics and pace of the interaction. No structured effort was made by the investigator to cover any content. Little emphasis was placed on topics of diet and medication, allowing the patient to form his own conclusions. Group III received in addition to routine hospital nursing care, a daily period of instruction by the investigator who focused on teaching aspects of the illness, treatment and healing. A booklet on the healing of ulcers was utilized. A post-discharge interview was conducted by a second nurse investigator who had no knowledge of which treatment the patients had received. During this interview patients rated how much they had learned during their hospitalization about food, trusting people, medications, talking about concerns, solving problems and healing. The patients also rated who they had learned the most from--the staff nurses or the nurse investigator.

On analysis the groups differed significantly at the level of .05 for healing. Instruction was not significantly different when measured against psychologic support, but instruction did exceed psychologic support in effectiveness when compared to the control. For decreasing the length of hospitalization, instruction was more

effective than psychologic support or control at the level of .01. Psychologic support exceeded nursing measures for the control group at the .001 level. The IPAT Anxiety Scale scores showed no significant differences for any of the main effects of group, sex or type of ulcer. The Semantic Differential scale scores showed a stronger concept among males of the role of food in ulcer disease; and that patients in Group III had a lessened perception of tension. Overall patients reported instruction resulted in significantly more learning than psychological support, which in turn resulted in significantly more learning than routine nursing care.

Stephenson (1977) in reviewing the sources of stress defines those patients who are more susceptible than others to stress added to illness. Stephenson describes five categories of stressors: physical, chemical, biological, physiological, and emotional/social. When stress exceeds the body's capabilities to adapt, illness occurs. When the patient is then hospitalized in intensive care, factors such as his previous reaction patterns, coping habits and biological rhythms must be assessed in order to define the nursing care he needs. Assessment of which of the five stressors predominate, and biologic rhythms become even more important for

patients who have diseases which increase their vulnerability to stress. These patients include those with diabetes, liver disease, fluid and electrolyte imbalances, inadequate nutrition, adrenal disease, those on steroid therapy, and those with cardiac, pulmonary or cerebral damage (Stephenson 1977).

The reasons these patients do poorly under further stress are based on the body's physiologic capabilities to adapt. Steroid therapy suppresses adrenal cortex function, so the cortex cannot immediately produce more corticoids during the alarm stage when it is needed. The increased blood pressure, pulse, respirations and alertness triggered by catecholamine release can pose special problems for the person who has pulmonary or cardiovascular problems or cerebral damage; this person may not be able to meet the increased oxygen needs of his tissues, or to handle the circulatory demands. Problems will arise in diabetic patients, who cannot increase insulin production in response to the elevated blood glucose levels that occur in response to stress. Gluconeogenesis takes place in the liver, so patients with liver disease may have problems in meeting the energy requirements of the alarm reaction. The cachetic patient lacks the nutritional base to support the increased

energy requirements of the alarm reaction. Fluids must be given with great care to the severely stressed person. Intravascular volume is expanded as a safeguard against blood loss, and is caused by antidiuretic hormone, catecholamines, and corticoids that stimulate the retention of sodium, chloride, and water, and the excretion of potassium. The net effect may be potassium depletion, fluid overload, and a low urinary output (Stephenson 1977).

A study which attempts to measure the degree of stressfulness of nursing interventions was conducted by Rose and Hurst (1975). In a study of twenty-nine men, Rose and Hurst attempted to determine the possible influence on intravenous catheterization on plasma cortisol and growth hormone levels. All twenty-nine subjects had one catheterization experience. Eighteen subjects who had a response on the first catheterization were catheterized a second time along with several subjects who failed to have an increased secretion of either hormone the first time. Five milliliter samples were drawn every twenty minutes, either continuously over the twenty minutes, or at the end of the twenty minute time interval. Total time of study ranged from eighty minutes up to five hours for some subjects.

The results indicated a general response to catheterization in plasma cortisol levels that decreased during a second experience, a decrease in response over time within an experience that was consistent with a diurnal rhythm, and a small difference between having the catheterization experience in the morning or afternoon. Growth hormone response appeared to be an all-or-none response compared to the cortisol response. The majority of the time, growth hormone release was minimal. But in those subjects when it was released, the levels were very high. Growth hormone release dropped off in the second catheterization experience. Those subjects who had a response in one hormone had a response in the other. Those subjects who failed to respond in one hormone generally had lower levels of the other hormone. There was a significant correlation between the number of symptoms the subject checked on a post-catheterization questionnaire and the individual's mean cortisol during the first hour of the first catheterization. The higher the cortisol level for the individual, the more symptoms he checked.

Murray (1975) describes responses patients manifest during acute illness or injury which indicate psychologic stress. The physical and emotional reactions to stress can tip the balance negatively during the

patient's recovery course. When the patient experiences psychologic stress, one or more of several behaviors can be seen. Overt behavior changes or personality changes may occur. The patient may become self-preoccupied, regressed, withdrawn, apathetic, uncooperative, or demonstrate emotional lability. The patient may speak frequently of death. Disturbed affect or inappropriate emotional reactions may occur. The patient may be irritable, impatient, angry, cry or complain without apparent cause, or laugh inappropriately. There may be impaired level of consciousness, memory or concentration. The patient may have inadequate or inaccurate recall or may have minimal response to stimuli even though his physical condition does not warrant impaired consciousness. Disturbed thought processes and perceptual disturbances may be manifested by confusion, impaired judgment, delusions, phobias, illusions, hallucinations and parastheias. The unconscious use of defense mechanisms such as regression, denial and rationalization may be present. Impaired attention and communication may be responses indicating psychologic stress, and expressions of an altered self-image indicate psychologic maladaption to the stress. The patient may overreact to feelings of insecurity, inferiority and mutilation by assuming a superior

attitude of aloofness or making excessive demands. In the ICU and during acute illness or injury, when behavioral defenses are low because most of the person's energy is going into survival or healing, purposeless movements or restlessness can be the first sign of a mounting state of anxiety. Much energy is then diverted from physical recovery (Murray 1975).

Conclusion

Selye's theory of stress states that stress can be tolerated to a certain extent. When the point of tolerance for the stressor is surpassed, breakdown of body systems and coping mechanisms occur. Should the stressor exist long enough, exhaustion of the individual occurs, and death follows. Current literature in the medical and nursing fields has defined some interventions which are stressful to patients, and measures which can be taken to reduce stress for patients so that exhaustion and death are not potentiated.

CHAPTER III

PROCEDURE FOR COLLECTION AND TREATMENT OF DATA

Introduction

The agency chosen for data collection for this study has a well diversified cultural and ethnic background. Expired patients' charts were used as the death of patients cannot now be predicted, and observation of the nursing care given in the hour just prior to death must be done in retrospect. The setting, population, tool, method of data collection and the treatment of the data are presented here.

Setting for the Study

The setting for the study was a nine hundred plus bed hospital in a metropolitan area of greater than one million persons. Data was gathered in the Medical Records Department from the charts of patients who expired in two intensive care units. The two intensive care units were similar in physical set-up, were in close proximity, and were staffed by one nursing staff rotating between the two units.

Population

The population of data of this study included information on all patients who expired in the two intensive case units between January 1, 1974 through December 31, 1978. The agency is utilized by families of diversified cultural backgrounds: Mexican, Black and Caucasian Americans. The patients are primarily from lower and middle income groups, although a small number of upper income patients are admitted as victims of acute trauma.

Tool

A flow sheet was utilized to record data from patient charts. Data was recorded in five categories: (1) time of death, (2) invasive nursing interventions, (3) noninvasive nursing interventions, (4) no nursing interventions, and (5) major organ system of involvement. Criteria for placement of data into the five categories were developed to maintain consistency (Appendix D).

Method of Data Collection

This descriptive, ex-post facto study (Kerlinger 1973) attempted to identify nursing interventions performed in the hour prior to death, occurrence of death and the major system of involvement. The sample data

was obtained from charts of patients who expired in two intensive care units in a large metropolitan public hospital.

Study was made of the census log books of the two intensive care units to locate those patients admitted to the intensive care units who expired. The expired patient's name, unit number, admitting diagnosis, and time of death were recorded on the flow sheet. With this information, the expired patient's chart was obtained from the Medical Records Department. The chart was examined to (1) verify the time of death, (2) determine the nursing interventions performed in the hour just prior to death, and (3) verify the admitting diagnosis. If all three of these criteria were available from the chart, information from the expired patient's chart was included in the study.

Treatment of Data

The type of analyses used on this descriptive ex-post facto study varied with the characteristics of the data. The Kolmogrov-Smirnov test for uniformity of frequency, and Chi-square determinations were used to analyze the frequency of death across time, the frequency of occurrence of nursing interventions and the relationships between time of death and nursing

interventions and time of death and nursing interventions according to major system of involvement.

Summary

The charts of patients who expired in two intensive care units of a large, culturally diversified metropolitan public hospital were studied. All charts of patients who expired over the stated five year period were studied. Data was recorded on a flow sheet into five categories: time of death, invasive nursing interventions, noninvasive nursing interventions, no recorded nursing interventions and major system of involvement. The data was analyzed with two statistical procedures, the Kolmogrov-Smirnov test and the Chi-square test.

CHAPTER IV

ANALYSIS OF DATA

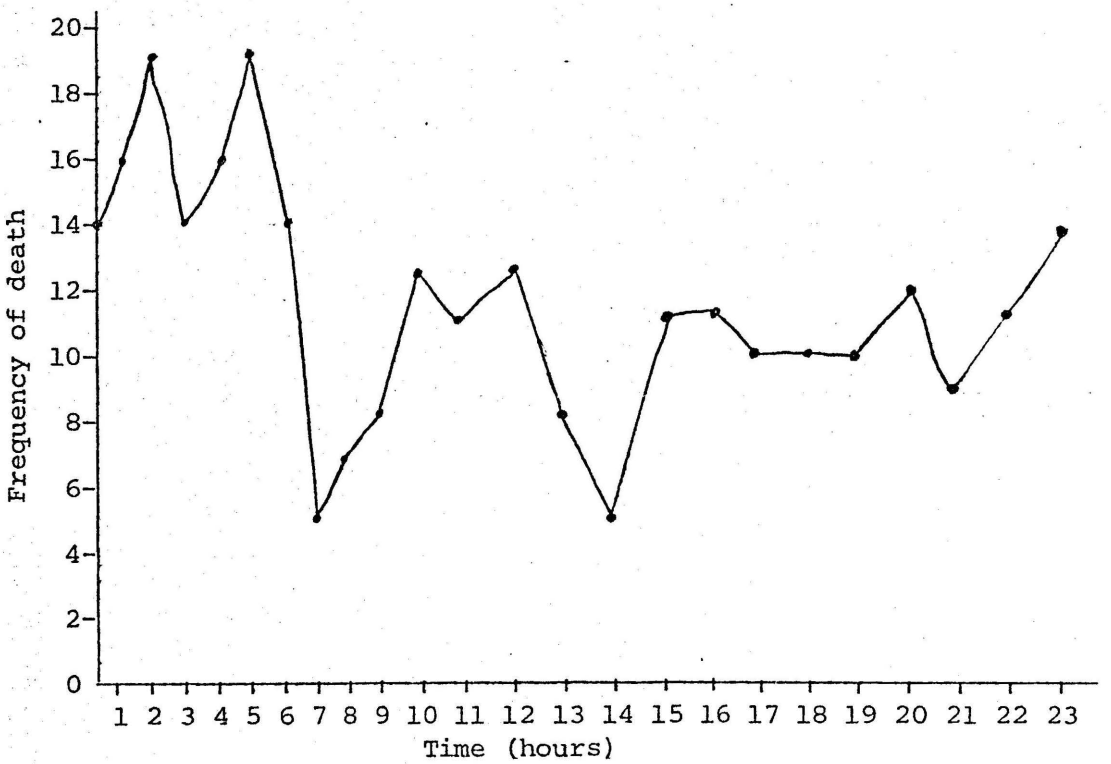
Introduction

This study of the relationship between nursing interventions and the occurrence of death was done by obtaining data from the charts of all patients who expired over a five year period, January 1, 1974 through December 31, 1978. The charts of 287 patients met criteria for acceptance as data. The remaining 139 charts consisted of fourteen charts that did not fit the criteria for acceptance as data, and 125 charts that were not available for consideration. The analysis of the data obtained from the 287 charts which met criteria for acceptance is described in the text and tables to follow. The data are presented according to the purposes of the study.

Purpose One: Identify the Occurrence of Death

The frequency of time of death varied across the twenty-four hour time period. The times of greatest frequency of death were from 0200-0600, with 82 deaths. The frequency then dropped sharply to 0700, with 5 deaths,

and then increased from 0700-1000 to a point halfway to the high frequency of 0200-0600, numbering 34 deaths. A plateau was maintained from 1000-1500 (54 deaths). At 1500 the frequency again fell to the low reached at 0700 (5 deaths), and then gradually rose to the early morning levels for the remaining 100 deaths (see figure 2).



N = 287

Fig. 2. Frequency of death over time.

In analysis of the occurrence of death a Kolmogrov-Smirnov test for uniformity of frequency was used. The Kolmogrov-Smirnov test compares the frequency of distribution that is equal over time with the

frequency of the data. The resulting value is labelled "D." The actual frequency of death over a twenty-four hour time period resulted in D = .944 with $p < .001$. Thus the frequency of death was not uniform throughout the twenty-four hour period because the D value approaches one. For uniformity to exist the D value must be zero.

A chi-square analysis was used to compare the frequencies of death for equality across given time periods which were coincident with work shifts employed in the agency. The frequency of time of death was first separated into three time periods (table 1). A Chi-square analysis to compare the frequencies of death between the three time periods for equality yielded $x^2 = 5.86$ with $p = .053$ which approached significance for the greater frequency of death from 2301-0700. By separating the frequency of time of death into two time periods (table 1), and again using the Chi-square analysis, $x^2 = 4.77$ with

TABLE 1

FREQUENCY OF TIME OF DEATH

	Time			Time	
	0701-1500	1501-2300	2301-0700	0701-1900	1901-0700
Frequency of death	86	86	115	125	162

$p = .029$. This was a significant difference, meaning that a significantly greater number of deaths occurred during the night (1901-0700) than during the day (0701-1900).

The greatest incidence of death at night was a significant finding. It was a serendipitous finding as the data was obtained secondary to the problem of the study.

Purpose Two: Identify Performance of Nursing Intervention(s)

The nursing interventions performed in the hour just prior to death were recorded in three categories, invasive, noninvasive and no nursing interventions. Fifty-two patients had one invasive nursing intervention, eighty-two patients had two invasive interventions, ninety patients had three invasive interventions, forty-five patients had four invasive interventions, eleven patients had five invasive interventions, and three patients had six invasive interventions. Fifteen patients had one non-invasive intervention, 140 patients had two noninvasive interventions, ninety-seven patients had three noninvasive interventions, twenty-eight patients had four non-invasive interventions, and seven patients had five noninvasive interventions. The frequency of performance of invasive and noninvasive interventions is shown in

table 2. The nine charts with no recorded interventions are included in the analysis.

TABLE 2

FREQUENCY OF PERFORMANCE OF NURSING INTERVENTIONS

Number of Nursing Interventions	Frequency	Number of Patients	Percent	Cum. Percent
INV 0	52	52	18.118	18.118
INV 1	138	86	29.965	48.084
INV 2	228	90	31.358	79.443
INV 3	273	45	15.679	95.122
INV 4	284	11	3.832	98.955
INV 5	287	3	1.045	100.000
NINV 0	15	15	5.226	5.226
NINV 1	155	140	48.780	54.007
NINV 2	252	97	33.797	87.805
NINV 3	280	28	9.756	97.561
NINV 4	287	7	2.439	100.000

Key: INV - invasive nursing interventions; NINV - noninvasive nursing interventions

The frequencies of particular invasive nursing interventions were: blood transfusion--twenty-six patients, naso/endo/tracheal suction--thirty-seven patients, administration of intravenous drugs--124 patients, venous/arterial puncture--forty-five patients, nasogastric drugs or instillations--sixty-two patients, rectal temperature taking--126 patients, and intramuscular drug administration--twelve patients. The

frequencies of particular noninvasive nursing interventions were: taking of vital signs--249 patients, bathing--sixteen patients, central venous pressure (CVP) reading--sixty-four patients, repositioning--forty-nine patients, dressing changes--ten patients, and Swan-Ganz readings--fourteen patients. Table 3 shows the frequency of performance of particular nursing interventions. Only those interventions which occurred greater than ten times are presented.

TABLE 3

FREQUENCY OF PERFORMANCE OF PARTICULAR INTERVENTIONS

Nursing Intervention	Freq.	Nursing Intervention	Freq.
INVASIVE		NONINVASIVE	
blood transfusion	26	vital signs	249
naso/endo/tracheal suction	37	bath	16
intravenous drugs	124	CVP reading	64
veni-/arterial puncture	45	repositioned	49
nasogastric drugs or instillations	62	dressing changes	10
rectal temperature	126	Swan-Ganz reading	14
intramuscular drugs	12		
total for all INV measures	470	total for all NINV measures	465

Invasive nursing interventions which were performed less than ten times included enemas (4), foley catheter irrigations (6), intravenous fluid bolus

administration (8), oral care (4), administration of painful stimuli (1), removal of a stool impaction (1), and manual reduction of a hernia (1). Noninvasive nursing interventions which were performed less than ten times were axillary temperature (8), 12-lead electrocardiogram (4) and weighing (8).

Purpose Three: Identify Major System of Involvement

The major systems of involvement were classified into ten categories. Gastro-intestinal involvement alone accounted for 33.8 percent of all illnesses or injuries. Of the 163 patients with multiple systems involved in illness or injury, fifty-five (33.7 percent) had accompanying gastro-intestinal involvement. A total of 52.9 percent of all patients had gastro-intestinal involvement. Frequency of occurrence in each category is listed in table 4.

Purpose Four: Compare Collectively Occurrence of Death and Performance of Nursing Intervention(s)

The comparison of the occurrence of death and the performance of nursing interventions was analyzed with a Chi-square determination. The Chi-square determination compared the distribution of time of death for those expired patients classified into the three intervention

TABLE 4

FREQUENCY OF OCCURRENCE OF MAJOR SYSTEM OF INVOLVEMENT

Organ System	Number of Patients	Percent
cardiac	0	0.00
gastro-intestinal	97	33.79
musculo	0	0.00
neuro	5	1.74
pulmonary	1	0.34
renal	6	2.09
sepsis	4	1.39
skeletal	1	0.34
vascular	10	3.48
multiple	163	56.79

groups (no recorded nursing interventions, noninvasive and invasive). The comparison of nursing interventions over three time periods had a $x^2 = 3.49$ with a $p = .479$. The same comparison over two time periods had a $x^2 = 3.12$ with $p = .210$. Both Chi-square analyses were nonsignificant. There is no evidence from the study to indicate that the presence, absence, or type of nursing interventions is related to time of death (table 5).

TABLE 5

COMPARISON OF NURSING INTERVENTIONS OVER TIME

Time	None	NINV	INV
0701-1500	3	16	74
1501-2300	5	8	63
2301-0700	3	17	98
0701-1900	4	13	108
1901-0700	7	28	127

Purpose Five: Compare Occurrence of Death and Performance of Nursing Intervention(s) According to Major System of Involvement

The analyses for comparison of frequency of time of death for the three (sometimes two) nursing intervention groups, based on major organ system of involvement, are identical to the analyses for purpose four. Determination of Chi-square and in some cases exact-conditional Chi-square was used. The data is presented separately for each separate organ system, with time breakdowns coincident with the two different shift groupings as defined for analysis of purpose one (group 1:

0701-1500, 1501-2300, 2301-0700; group 2: 0701-1900, 1901-0700). Chi-square and p values accompany each table. Treatment of data was possible for the separate categories of gastro-intestinal and multiple only, as these two categories were the only ones with sufficient data for calculations. The other organ systems did not have enough data for separate calculations. Analyses of the other categories were therefore made using combinations of the multiple categories and do not necessarily indicate that the organ system analyzed (such as neurological) was in fact the patient's major problem. None of the analyses for any of the categories was significant, indicating that there is no relationship between time of death and nursing interventions for any system of involvement (tables 6-14).

In table 6-14 the following key was used:

None - no recorded nursing interventions; NINV - noninvasive nursing interventions; INV - invasive nursing interventions

TABLE 6

GASTRO-INTESTINAL ONLY

Time	None	NINV	INV	
0701-1500		2	30	
1501-2300		5	26	$x^2 = 1.66$
2301-0700		3	38	$p = .41$
0701-1900		3	44	$x^2 = 1.79$
1901-0700		7	40	$p = .32$

TABLE 7

ALL GASTRO-INTESTINAL

Time	None	NINV	INV	
0701-1500	3	5	55	
1501-2300	4	8	43	$x^2 = 2.68$
2301-0700	3	12	70	$p = .613$
0701-1900	4	6	77	$x^2 = 4.27$
1901-0700	6	19	91	$p = .118$

TABLE 8

NEUROLOGICAL

Time	None	NINV	INV	
0701-1500		3	10	
1501-2300		2	12	$x^2 = 3.86$
2301-0700		1	28	$p = .145$
0701-1900		4	20	$x^2 = .66$
1901-0700		2	30	$p = .42$

TABLE 9

CARDIAC

Time	None	NINV	INV	
1701-1500		0	11	
1501-2300		1	3	$x^2 = 2.87$
2301-0700		3	11	$p = .23$
1701-1900		1	11	$x^2 = .51$
1901-0700		3	14	$p = .62$

TABLE 10

VASCULAR

Time	None	NINV	INV	
0701-1500		1	17	
1501-2300		4	11	$x^2 = 3.0$
2301-0700		4	13	$p = .223$
0701-1900		2	23	$x^2 = 3.39$
1901-0700		7	18	$p = .14$

TABLE 11

PULMONARY

Time	None	NINV	INV	
0701-1500	1	3	13	
1501-2300	2	3	9	$x^2 = 1.33$
2301-0700	2	6	20	$p = .857$
0701-1900	1	4	23	$x^2 = 2.83$
1901-0700	4	8	21	$p = .28$

TABLE 12

RENAL

Time	None	NINV	INV	
0701-1500		3	9	
1501-2300		5	9	$x^2 = .91$
2301-0700		4	15	$p = .64$
0701-1900		5	15	$x^2 = .05$
1901-0700		7	18	$p = .92$

TABLE 13

SKELETAL

Time	None	NINV	INV	
0701-1500	0	2	7	
1501-2300	3	5	12	$x^2 = 4.05$
2301-0700	2	3	23	$p = .41$
0701-1900	1	4	16	$x^2 = .68$
1901-0700	4	6	26	$p = .71$

TABLE 14

MULTIPLE

Time	None	NINV	INV	
0701-1500	2	5	38	
1501-2300	3	9	31	$x^2 = 2.92$
2301-0700	2	13	59	$p = .57$
0701-1900	3	7	55	$x^2 = 2.72$
1901-0700	4	20	73	$p = .257$

Summary

The charts of 287 patients were examined from among 424 patients who had expired in two intensive care units. All deaths occurred within the five year period specified. Analysis of the data showed that the frequency of death was not uniform over a twenty-four hour period. More deaths occurred from 1901-0700h than from 0701-1900h, which was significant at $p = .029$. Analyses of data to determine a relationship between the occurrence of death and nursing interventions showed that there is no evidence to indicate that the presence or absence or type of nursing interventions is related to time of death. The major systems of involvement most frequently afflicting the patient were the gastro-intestinal tract and the multiple

category. Analysis of data comparing occurrence of death and performance of nursing interventions according to major system of involvement also showed nonsignificant differences for all organ systems.

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

A summary of the study of the relationship between the occurrence of death and nursing interventions is presented. The summary is followed by conclusions derived from the study, implications of the data results for nursing practice and recommendations for further study.

Summary of the Study

The study of the relationship between the occurrence of death and nursing interventions is based on Hans Selye's theory of stress. The problem of the study was to determine whether or not there was a relationship between the occurrence of death and the performance of nursing interventions in critically ill and injured patients according to major system of involvement. The purposes of the study were to (1) identify occurrence of death, (2) identify performance of nursing intervention(s) (3) identify major system of involvement, (4) compare collectively occurrence of death and performance of nursing intervention(s), and (5) compare occurrence of death and performance of nursing intervention(s) according

to major system of involvement. Based on Selye's theory of stress and the background literature, the following assumptions were made: stress is additive, nursing interventions can be stressful, and illness or injury are stressful.

In Chapter II, the review of literature, Selye's theory of stress and the effects of stress on the body are discussed. Current literature from the medical and nursing fields was presented which described particular interventions and patient activities which have been found to be stressful. Some research of nursing procedures that attempted to decrease the stress patients experience were also included.

The population, methodology and treatment of data were described in Chapter III. Data was collected from 287 available charts of the total 424 patients who expired in two intensive care units from January 1, 1974 through December 31, 1978. The intensive care units were part of a 900 plus bed hospital in a metropolitan area of greater than one million persons. The hospital serves a culturally diversified population. Data was recorded on a flow sheet into five categories: time of death, invasive nursing interventions, noninvasive nursing

interventions, no recorded nursing interventions and major system of involvement in illness or injury.

Chapter IV presented the analysis of data. The charts of 287 expired patients were examined from among 424 patients who expired in two intensive care units. All deaths occurred over the specified five year period. Analysis of the data showed that the frequency of death was not uniform over a twenty-four hour period. More deaths occurred from 1901-0700h than from 0701-1900h, which was significant at $p = .029$. The major system of involvement most frequently afflicting the patient was the gastro-intestinal tract. Analyses of data to determine a relationship between the occurrence of death and nursing interventions showed that there is no evidence to indicate that the presence or absence or type of nursing interventions is related to time of death. Analysis of data comparing occurrence of death and performance of nursing interventions according to major system of involvement also showed nonsignificant differences for all organ systems.

Conclusions

A review of the data analyses presents several factors of significance. The frequency of deaths over the

twenty-four hour period showed definite peaks and troughs. This pattern of rises and falls in the time of death is inversely related to the pattern of man's circadian rhythms. The number of deaths was highest during the low cycle of circadian rhythms and deaths were low during circadian rhythm high periods. A relationship may exist between circadian rhythms and the time of death even in the critically ill and injured patient. Such a relationship would have vast implications for nursing care in regard to when the patient was best able to tolerate the stress of care and treatments.

The number of deaths which occurred at night approached significance for the time period 2301-0700 and was significant for the time period 1901-0700. Many people believe more deaths occur at night; among them is Elisabeth Kübler-Ross who has done extensive work with terminally ill patients (personal communication, October 26, 1978). The significantly greater number of deaths at night is also supported by the myths, Biblical references and literature which claims that death does occur more frequently at night.

Overall, the numbers of invasive and noninvasive nursing interventions performed were the same. Even though statistical significance of the various

interventions in relation to time of death was not achieved, the studies cited in the review of literature have demonstrated the stressfulness of some of the individual interventions. In the study done by Mitchell and Mauss (1977) rectal temperatures and repositioning caused enough stress to significantly raise the intracranial pressure in head injured patients. Combinations of several nursing interventions also caused increased intracranial pressure. Many of the patients in this study had combinations of nursing interventions. A parallel may be drawn between the administration of intravenous and intramuscular drugs and venous and arterial punctures with the intravenous catheterization performed in Rose and Hurst's study (1975). In the study intravenous catheterization was found to increase plasma cortisol and growth hormone levels significantly in eighteen of twenty-nine patients. The administration of intravenous and intramuscular drugs may raise the plasma cortisol and growth hormone levels, along with the proven ability of venous and arterial puncture to raise cortisol and growth hormone levels.

Many non-nursing interventions took place in the charts studied which were performed by non-nursing personnel. The effect of these ancillary interventions is not known. Perhaps the combinations of all other

interventions with the demonstrated stress-producing nursing interventions is enough to influence the occurrence of death.

The major system of involvement which showed the greatest frequency of occurrence was the gastro-intestinal tract at 33.8 percent. Although separate figures testing the relationship between the time of death and performance of nursing interventions in gastro-intestinal patients was not significant, the total percentage (52.9 percent) of all patients with gastro-intestinal involvement would appear to be congruent with Selye's theory of stress. Selye's theory depicts ulcer formation as a common sequelae to stressors of varying severity. Ulcers have been proven to occur secondary to stress in both man and animals. Autonomic nervous stimuli emitted from the hypothalamus when the brain identifies a stressor, and corticoids secreted by the adrenal cortex team up in the gastro-intestinal tract of the stressed individual. The result is the formation of ulcers. It was defined earlier in this paper that nursing interventions can be stressful, and that the critically ill or injured patient is under much stress. Therefore, the critically ill or injured patient becomes a prime candidate for the formation of stress ulcers.

Implications for Nursing Practice

The major system of involvement with the greatest frequency of occurrence was the gastro-intestinal tract. The largest frequency overall was the multiple systems of involvement category. Thirty-three percent of the multiple systems of involvement category patients had gastro-intestinal involvement, either initially, or as a consequence of their initial illness or injury. Even though the frequency for the relationship between time of death and nursing interventions for all organ systems of involvement were not significant, the 52.9 percent of all patients who showed gastro-intestinal involvement may have developed the involvement secondary to the stress process. Nursing practitioners need to be aware of the many stressors created by illness, injury and the environment of the intensive care unit, and attempt to alleviate some of the stress the critically ill or injured patient experiences.

The greatest number of deaths occurred at night in this study. With this knowledge, nursing can attempt to arrange interventions to be few, and as nonstressful as possible at night so that patients can rest. Also important here is keeping noise levels low, lights dimmed or off, and keeping interruptions to a minimum.

Recommendations for Further Study

In view of the results of this study and the experience with the data collection process, the following recommendations are made:

1. Compare the frequency of death across time with known circadian rhythm patterns. Despite the current belief that circadian rhythms are suppressed or surpassed in the critically ill or injured patient, the pattern of deaths over a twenty-four hour period indicates that some rhythmicity may still exist. The times of greatest frequency of deaths appears to correspond with known lows in circadianly fluctuating endocrine levels in man. The times of lowest frequency of death likewise appear to correspond with known highs of circadian endocrine levels in man. A close look at what happens to the endocrine levels in man during prolonged stress may show a circadian pattern exists. This circadian pattern may be linked, even in critically ill or injured patients, to greater susceptibility to death at particular intervals of the twenty-four hour period.

2. Repeat the study using a population of cardiovascular, neurological, pulmonary or renal patients. The patient charts under study were from surgical and trauma

background. This kind of population may have accounted for the high number of patients with gastro-intestinal involvement and lack of sufficient data to make any calculations about what happens in patients with a focus on other systems of involvement. Repeating the study and using a population focused on another system may yield different and significant results.

APPENDIX A

TEXAS WOMAN'S UNIVERSITY

Human Research Committee

e of Investigator: Susan Peck Center: Dallas

ress: 4912 Avery Place, Box 77904 Date: 3/21/79

Lewisville, Texas 75056

r Ms. Peck:

Your study entitled Nursing Interventions and the Occurrence of Death in the Acutely Ill

been reviewed by a committee of the Human Research Review Committee and appears to meet our requirements in regard to protection of the individual's hts.

Please be reminded that both the University and the Department of Health, cation and Welfare regulations require that written consents must be ained from all human subjects in your studies. These forms must be kept file by you.

Furthermore, should your project change, another review by the Committee required, according to DHEW regulations.

Sincerely,

Estelle D. Kurz

Chairman, Human Research
Review Committee

at Dallas .

APPENDIX B

TEXAS WOMAN'S UNIVERSITY
COLLEGE OF NURSING
DENTON, TEXAS 76204

CENTER
NWOOD ROAD
, TEXAS 75235

HOUSTON CENTER
1130 M. D. ANDERSON BLVD.
HOUSTON, TEXAS 77025

AGENCY PERMISSION FOR CONDUCTING STUDY*

arkland Memorial Hospital

TO Susan Peck
ent enrolled in a program of nursing leading to a Master's Degree at Texas
s University, the privilege of its facilities in order to study the follow-
oblem:

The problem of this study will be to determine whether or not
e is a relationship between the occurrence of death and perfor-
e of nursing intervention(s) in critically ill or injured patients
ng to major system of involvement.

nditions mutually agreed upon are as follows:

. The agency (may) (~~may not~~) be identified in the final report.

. The names of consultative or administrative personnel in the agency (may) (~~may not~~) be identified in the final report.

. The agency (~~wants~~s) (does not want) a conference with the student when the report is completed.

. The agency is (willing) (~~unwilling~~) to allow the completed report to be circulated through interlibrary loan.

. Other Mailed Title copy of the findings from the study

4/2/79

Signature of Agency Personnel

Susan Peck
Signature of Student

Lois Haight
Signature of Faculty Advisor

out and sign three copies to be distributed as follows: Original-Student;
t copy - agency; Second copy - TWU College of Nursing.

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APPENDIX C

FLOW SHEET

Name	Chart Number	Time of Death	Invasive Nursing Interventions	Noninvasive Nursing Interventions	No Nursing Interventions	Major System of Involvement

APPENDIX D

FLOW SHEET GUIDELINES

Incidence of death: Exact time of death recorded on the expired patient's chart will be used; if however, immediate resuscitative efforts went on for any length of time beyond the initial notation of the patient becoming unresponsive in pulse or respiration, the time of initial unresponsiveness will be used as the time of death.

Major organ system of involvement: Each patient will be classified according to the organ system which is compromised the most by the illness or injury. The organ system involved will be determined from the admitting diagnosis. In the event a patient is admitted who has major involvement of more than one organ system, that patient will be classified by the term "multiple." The organ systems include: pulmonary, cardiovascular, gastro-intestinal nal, musculoskeletal, nervous system, genitourinary, and multiple--combinations of any two or more of the above systems.

Invasive nursing measures: Any act normally performed as a part of the care of the patient by a nurse, which entails entering a natural or surgically produced body orifice or of penetrating the skin. It includes: tracheal, endotracheal, nasotracheal and oropharyngeal suctioning; oral hygiene; insertion, removal or adjustment

of a nasogastric tube; cleansing and redressing traumatic or surgically produced wounds; colostomy irrigations; wound irrigations; temperature taking; starting intravenous catheters; administering IV or IM injections; foley catheter insertion.

Noninvasive nursing measures: Any act normally performed as a part of the care of the patient by a nurse, which does not enter a body orifice, either natural or surgically produced, and does not involve penetration of the skin. It includes: repositioning the patient in bed; weighing on a bed scale; bathing and skin care; obtaining vital signs, except temperature; turning; teaching; cough and deep breathing; application or removal of antiemboli stockings; removing or adjusting intravenous catheters, foley catheters or other lines as ordered by the physician.

REFERENCES CITED

Books

Kerlinger, Fred N. 1973. Foundations of behavioral research. New York: Holt, Rinehart and Winston, Inc.

Selye, Hans. 1976. Stress in health and disease. Boston: Butterworth Publishing, Inc.

_____. 1956. The stress of life. New York: McGraw-Hill Book Co., Inc.

Shires, Thomas. 1966. Care of the trauma patient. New York: McGraw-Hill Book Co.

Wintrobe, M.; Thorn, G.; Adams, R.; Braunwald, E.; Isselbacher, K.; and Petersdorf, R.; eds. 1970. Harrison's principles of internal medicine. New York: McGraw-Hill Book Co.

Articles

Carey, Larry C.; Lowery, Brian D.; and Cloutier, Charles, T. 1972. Growth hormones and adrenal cortical response to shock and trauma in the human. Annals of Surgery. 174(3):451-58.

_____. 1970. Blood sugar and insulin response of humans in shock. Annals of Surgery. 172(9): 342-47.

Catt, K. J. May 2, 1970. ABC of endocrinology, III--growth hormone. The Lancet. pp. 933-939.

Engel, George L. 1971. Sudden and rapid death during psychological stress. Annals of Internal Medicine. 74:771-82.

Greene, William A.; Conron, Geoffrey; Schalch, Don S.; and Schreiner, Bernard F. 1970. Psychologic correlates of growth hormone and adrenal secretory

responses of patients undergoing cardiac catheterization. Psychosomatic Medicine. 32(6):599-615.

Lazarus, Richard S. 1974. Psychological stress and coping in adaptation and illness. International Journal of Psychiatry in Medicine. 5(4):321-33.

Lown, Bernard; Verrier, Richard L.; and Rabinowitz, Stephen H. 1977. Neural and psychologic mechanisms and the problem of sudden death. American Journal of Cardiology. 39(5):897-900.

Marcinek, Margaret Boyle. November 1977. Stress in the surgical patient. American Journal of Nursing. pp. 1809-1811.

Melia, E. M. February 3, 1977. The intensive care unit--a stress situation? Nursing Times. pp. 17-20.

Mitchell, Pamela H. and Mauss, Nancy K. 1978. Relationship of patient-nurse activity to intracranial pressure variation. Nursing Research. 27(1):4-10.

Murray, Ruth L. E. 1975. Assessment of psychologic status in the surgical ICU patient. Nursing Clinics of North America. 10(1):69-81.

Newsome H. H., Jr. 1975. Growth hormone in surgical stress. Surgery. 77(4):475-77.

Newsome, H. H. and Rose, James C. 1971. The response of human adrenocorticotrophic hormone and growth hormone to surgical stress. Journal of Clinical Endocrinology 33:481-87.

O'Keefe, S. J. D. and Sender, P. M. 1974. Catabolic loss of body nitrogen in response to surgery. Lancet pp. 1035-38.

Pride, Frances, L. 1968. An adrenal stress index as a criterion measure for nursing. Nursing Research 17(4):292-303.

Putt, Arlene M. 1970. One experiment in nursing adults with peptic ulcers. Nursing Research. 19(6): 484-93.

Rose, Robert M. and Hurst, Michael W. March 1975. Plasma cortisol and growth hormone responses to intravenous catheterization. Journal of Human Stress. pp. 22-37.

Schalch, Don S. 1967. The influence of physical stress and exercise on growth hormone and insulin secretion in man. Journal of Laboratory and Clinical Medicine. 69(2):256-69.

Selye, Hans. 1973. The evolution of the stress concept. American Scientist. 61:692-99.

_____. 1965. The stress syndrome. American Journal of Nursing. 65(3):97-99.

Stephenson, Carol A. November 1977. Stress in critically ill patients. American Journal of Nursing. pp. 1806-9.

Volicer, Beverly J. June 1978. Hospital stress and patient reports of pain and physical status. Journal of Human Stress. pp. 28-37.

Volicer, Beverly J. and Bohannon, Mary Wynne. 1975. A hospital stress rating scale. Nursing Research. 24(5):352-59.

West, Norman D. 1975. Stress associated with ICUs affect patients, families, staff. Hospitals, Journal of American Hospital Association. 49:62-3.

Wilson, Robert F. 1976. Endocrine changes in sepsis. Heart and Lung. 5(3):411-14.

Wright, Peter D. and Johnston, Ivan. 1975. The effect of surgical operation on growth hormone levels in plasma. Surgery. 77(4):479-86.

BIBLIOGRAPHY

Books

Fox, David J. 1970. Fundamentals of research in nursing. New York: Appleton-Century-Crofts.

Articles

Arguelles, Amilcar; Ibeas, David; Ottone, Jose Pomes; and Chekherdemian, Mateo. 1962. Pituitary-adrenal stimulation by sound of different frequencies. Journal of Clinical Endocrinology and Metabolism. 22:846-52.

Dimsdale, Joel E. 1977. Emotional causes of sudden death. American Journal of Psychiatry. 133(12):1361-65.

Dossett, Sylvia M. May 25, 1978. The patient in the intensive therapy unit. Nursing Times. pp. 890-91.

Egdahl, Richard H.; Megundy, Michael M.; and Aun, Frederico. 1977. The importance of the endocrine and metabolic responses to shock and trauma. Critical Care Medicine. 5(6):257-61.

George, Jack M., Peier, Charles E.; Lanese, Richard R.; Rower, J. Marvin. 1974. Morphine anesthesia blocks cortisol and growth hormone response to surgical stress in humans. Journal of Clinical Endocrinology and Metabolism. 38:736-41.

Goodenough, Donald R.; Witkin, Herman A.; Ottman, Philip; Cohen, Harvey D.; Gould Harry; and Shulman, Ernest. 1975. The effects of stress on components of the respiration cycle. Psychophysiology 12(4):377-80.

Hanson, E. L.; Brennan, M. F.; O'Connell, R. C.; and Moore, F. D. 1971. Response of glucose, insulin, free fatty acid, and human growth hormone to

norepinephrine and hemorrhage in normal man. Annals of Surgery. 177(4):453-57.

Kurokawa, Nobuo; Suematsu, Hiroyuki; Tamai, Hajime; Esaki, Masahiro; Aoki, Hirouki; and Ikemi, Yujiro. 1977. Effect of emotional stress on human growth hormone secretion. Journal of Psychosomatic Research. 21:231-35.

Kashoff, Shirley. March-April 1976. Nursing your stress. Journal of Emergency Nursing. pp. 12-20.

Porte, Daniel, Jr. and Robertson, R. Paul. 1973. Control of insulin secretion by catecholamines, stress, and the sympathetic nervous system. Federation Proceedings. 32(7):1792-96.

Slay, Connie L. 1976. Myocardial infarction and stress. Nursing Clinics of North America. 11(2):320-38.

Taylor, James W.; Hander, Edwin W.; Skreen, Robert; and Wilmore, Douglas W. 1976. The effect of central nervous system narcosis on the sympathetic response to stress. Journal of Surgical Research. 20:313-20.

Tanaka, H.; Manabe, H.; Koshiyama, R.; Hamanaka, Y.; Matsumoto, K.; and Uozumi, T. 1970. Excretion patterns of 17-ketosteroids and 17-hydroxycorticosteroids in surgical stress. Acta Endocrinologica. 65:1-10.

Wild, Bradford S. and Hanes, Carolyn. 1976. A dynamic conceptual framework of generalized adaptation to stressful stimuli. Psychological Reports. 38: 319-34.

Wimore, Douglas W.; Orcutt, Thomas W.; Mason, Arthur D., Jr.; and Pruitt, Basil A., Jr. 1975. Alterations in hypothalamic function following thermal injury. Journal of Trauma. 15(8):697-703.

Yalow, Rosalyn S.; Varsano-Aharon, Nora; Echemendia, Elsa; and Berson, Solomon A. 1969. HGH and ACTH secretory responses to stress. Hormones and Metabolic Research. 1:3-8.