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Complications And Referrals Of Patients With Protein-Calorie Malnutrition.

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COMPLICATIONS AND REFERRALS OF PATIENTS WITH PROTEIN-CALORIE MALNUTRITION

by

DORIS C. FORD

A DISSERTATION

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ABSTRACT OF DISSERTATION
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Self-care concepts (Orem, 1985) and physiological events of protein-calorie malnutrition (Weinsier & Butterworth, 1981) were interrelated as a framework in order to describe complications sustained by patients classified according to a protein-calorie malnutrition index and nurse reported referral of those patients. A retrospective design was used to study the variables: complications and nurse reported referrals.

Using a sample of randomly selected patients between 20 and 65 years of age with no recorded intake of immunosuppressive drugs, 100 subjects were classified according to admission serum albumin levels and total lymphocyte counts. Demographic, biochemical, and variable data were recorded on a patient profile and analyzed by use of descriptive statistics.

The subjects were predominantly white, female, medical patients between the ages of 60 to 65 years. Of 100 patients, 63 had serum albumin levels and/or total lymphocyte counts indicating mild, moderate, or severe protein-calorie malnutrition at time of admission according to a protein-calorie malnutrition index. Thirty-seven patients sustained 1 or more of 52 complications in eight categories. Of the 52 complications, 41 were sustained by patients with some degree of protein-calorie malnutrition.

Reported complications were extended hospitalization, infection, hematological disorders, fever, decubiti, atelectasis, pleural effusion, and death. Of 100 subjects, 63 of whom had some degree of malnutrition at admission, none had reported nutritional referrals by nurses.

The findings indicated that patients who were malnourished on admission and who sustained complications associated with malnutrition were not referred by nurses for nutrition care. Additional findings indicated that few nurses recorded admission height and weight, usual weight, serial weights, nutritional assessment, nutritional history, and comments regarding nutritional status.

Abstract Approved by: **Committee Chairman** Mary Collette Smith, Ph.D.

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Date _____ **Dean of Graduate School** Kenneth J. Roozen

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CHAPTER I

Introduction

Adequate food and sound nutrition are essential to good health. Adequate nutrition is crucial for human survival and is a key factor in the prevention of and recovery from illness (Williams, 1985). In effect, nutrition plays a vital role in all phases of the life cycle from pre-conception to death (Frankle & Owen, 1978).

Historically, interest in nutrition in the United States has fluctuated greatly. During the 1920s and 1930s, there was an emphasis on nutrition deficiency diseases. Many American scientists contributed significantly to knowledge of the vitamins, including explanation of their structure and functions. After the Depression in the late 1930s, and with the entry into World War II, large numbers of men were unfit for military service because of nutritionally related problems. These findings resulted in a Conference on Nutrition and National Defense and led to a wide-scale nutrition education program (Frankle & Owen, 1978).

The 1950s became the era of biomedical research. Not until the 1960s, however, did malnutrition become a national issue. The state of poverty, hunger, and malnutrition in the United States was brought to the attention of the American people, not by health professionals but by Dr. Martin Luther King (Frankle & Owen, 1978). By the 1970s, Senator George McGovern had made nutrition a major public policy issue (Owen, Lanna, & Owen, 1979).

In 1972, a Ten State Nutrition Survey was conducted. Findings of this survey indicated that a significant proportion of the population was malnourished or at high risk for developing nutritional problems (Frankle & Owen, 1978). Factors affecting nutritional status are many and complex. Inadequate income has been identified as a major determinant of nutritional status (Inauo & Pringle, 1975). Life-styles which include cigarette smoking (Fehily, Phillips, & Yarnell, 1984), alcohol consumption (Sauberlich, 1984), food fads (Williams, 1985), rapid growth in children and adolescents (Heald, 1983), and aging (Sauberlich, 1984; Williams, 1985) can alter nutritional status. Chronic illnesses (Worthington, 1979), including renal, liver, and gastrointestinal diseases (Williams, 1985), may result in altered nutritional status. Drugs (Sauberlich, 1984), especially catabolic steroids (Stotts, 1982), influence nutritional status. An increased metabolic rate during stress (Sauberlich, 1984), infection (Keighly, 1983), fever, injury (Bessey & Custer, 1987), and surgery (Williams, 1985) creates increased nutritional needs. Neoplastic disease (Stotts, 1982; Williams, 1985) and its treatment (Stotts, 1982) result in altered nutritional status.

Other studies during the 1970s revealed that even hospitalized patients were not safe from malnutrition. Butterworth, in 1974, called malnutrition "the skeleton in the hospital closet." In the 1980s, malnutrition remains a major hazard of hospitalization ("Specter of Hospital Malnutrition," 1985). A major factor affecting the nutritional status of individuals is failure by care givers to recognize increased nutritional needs of the hospitalized patient (Butterworth, 1974; Morgan, 1984; Weinsier, Bacon, & Butterworth, 1982; Weinsier, Hunker, Krundieck, & Butterworth, 1979).

Hospital-associated malnutrition has been disclosed with an unexpectedly high frequency (Weinsier et al., 1982). Either overt or subclinical protein-calorie malnutrition has been identified in as many as 50% of medical and surgical patients in various hospital settings (Bistrian, Blackburn, Hallowell, & Heddle, 1974; Bistrian, Blackburn, Vitale, Cochran, & Naylor, 1976; Kamath, Lawler, Smith, Kalat, & Olson, 1986; Orr et al., 1985; Weinsier et al., 1979; Willard, Gilsdorf, & Price, 1980).

Malnutrition has been defined as a state of impaired functional ability, structural integrity, or development that occurs because of a discrepancy between the supply of essential nutrients and calories and the body's specific demand for them (Stotts, 1982). Malnutrition may result in a defective immune system which increases a patient's risk of infection, sepsis, and death (Sauberlich, 1984). Complications resulting from the patient's defective immune system include temperature elevation greater than 101 degrees Fahrenheit (Jones, Ford, & Cordell, 1985), cellulitis, septicemia, upper respiratory infection, pneumonia, peritonitis, osteomyelitis (Anderson & Wochos, 1982), urinary tract infection (Mughal & Meguid, 1987), thrombophlebitis, wound infection, and wound rupture (Warnold & Lundholm, 1984). Other complications include pneumothorax, hemorrhage (Seltzer et al., 1979), thrombosis, pulmonary embolism, myocardial infarction, and death (Warnold & Lundholm, 1984). Extended hospitalization is also considered to be a complication (Robinson, Goldstein, & Levine, 1987; Sauberlich, 1984).

There appear to be substantial gaps in the overall quality of nutrition care in hospitals. One group of investigators reported a worsening of nutrition parameters in 75% of the patients who were hospitalized for 2 weeks or longer (Weinsier et al., 1979). Other

investigators reported that primary physicians ordered nutrition support for fewer than half of the undernourished patients; morbidity and mortality rates were substantially higher among those who did not receive nutrition support (Mullen, Buzby, Matthews, Smale, & Rosato, 1980; Mughal & Meguid, 1987). Two investigators reported that only 10% of the hospital patients whose charts contained evidence of a nutritional problem received the appropriate follow-up care (Tobias & Van Itallie, 1977). Care givers often have not been aggressive enough in evaluating the patient's individual needs and assuring that he has proper nutriment (Buergel, 1979; Caly, 1977). Nutrition assessments are not routinely performed by nurses in many hospital settings (Morgan, 1984).

Assessment of the nutritional status of every patient should be as fundamental a part of the workup as listening to the heart or doing a urinalysis (Weinsier & Butterworth, 1981). Nutritional status may be measured using a battery of tests, including anthropometric measures, clinical examination, and laboratory data. Various combinations of these measures of protein-calorie malnutrition have been used by different investigators (Anderson & Wochos, 1982; Bistrian, Blackburn, Sherman, & Scrimshaw, 1975; Blackburn, Bistrian, Maini, Schlamm, & Smith, 1977; Buzby, Mullen, Matthews, Hobbs, & Rosato, 1980; Harvey, Moldawer, Bistrian, & Blackburn, 1981; Linn, 1984; Mitchell & Lipschitz, 1982; Mullen et al., 1980; Warnold & Lundholm, 1984). Some investigators have concluded that the two most valuable indicators of possible malnutrition are serum albumin and total lymphocyte counts (Kaminski, Pinchcofsky-Devin, & McCormick, 1985; Seltzer et al., 1979).

Identification of the protein-calorie malnourished patient is clinically significant because a malnourished patient is less able to withstand stress occurring during illness and injury and because

malnutrition may be alleviated through appropriate nutrition intervention (Kamath et al., 1986). Several studies have correlated the incidence of nutritional risk with hospital cost-influencing factors such as nosocomial infection rates (Mullen et al., 1980; Seltzer et al., 1979; Weinsier et al., 1979) and longer lengths of hospital stay (Robinson et al., 1987; Weinsier et al., 1979).

Conceptual Framework

The conceptual framework for this study was derived from selected concepts of Orem's (1985) self-care deficit theory of nursing and malnutrition (Weinsier & Butterworth, 1981). The elements of health-deviation self-care requisites and nursing agency, which are delineated in Orem's theory of nursing (1985), are interrelated with the events of malnutrition in order to formulate a nursing system to assist individuals in meeting their therapeutic self-care demands.

Orem's Self-Care Deficit Theory of Nursing

The core of Orem's Self-Care Deficit Theory of Nursing (1985) lies within two basic beliefs. First, each individual's person belongs to himself and only he has "rights" over that person. Second, the health professional's relationship to that individual exists primarily to assist the person to maintain, restore, or increase the ability to provide his own care (Mullin, 1980). The inability of persons to perform self-care activities is the origin of the problem that stimulated the development of the Orem theory.

Orem's theory is based on the premise that all persons require self-care in order to maintain health and life. When individuals are unable to meet all of the requirements for self-care, nursing is required. Orem (1980) proposed that nursing is concerned with helping persons meet their needs for self-care through the use of nursing

systems. Nursing care is legitimate only when persons are unable to maintain the amount and quality of self-care required for health.

The interrelated constructs of Orem's theory are self-care, self-care agency, self-care requisites, therapeutic self-care demand, self-care deficit, nursing agency, and nursing system. The constructs are defined and their interrelatedness is presented in the following discussion.

Self-Care. Self-care is "the production of actions directed to self or to the environment in order to regulate one's functioning in the interests of one's life, integrated functioning, and well-being" (Orem, 1985, p. 31). Self-care is purposeful and performed freely by individuals (Orem, 1980). An individual who provides care to self is termed a self-care agent.

Self-Care Agency. Self-care agency is "the complex capability for action that is activated in the performance of the actions or operations of self-care" (Orem, 1985, p. 31). Self-care agency is the power of the individual to do work to meet therapeutic self-care demands. Adequacy of self-care agency depends upon the nature of the self-care demand and the ability of the individual to engage in self-care activities (Orem, 1980).

Therapeutic Self-Care Demand. Therapeutic self-care demands are "the measures of care required at moments in time in order to meet existent requisites for regulatory action to maintain life and to maintain or promote health and development and general well-being" (Orem, 1985, p. 31). Individuals may be able to calculate their own therapeutic self-care demands. The experiencing of a therapeutic self-care demand by an individual activates the self-care agency (Orem, 1980).

Self-Care Deficit. Self-care deficit is "a relationship between self-care agency and therapeutic self-care demand in which self-care agency is not adequate to meet the known therapeutic self-care demand" (Orem, 1985, p. 31). Self-care deficits may be complete or partial. Individuals can benefit from nursing when self-care deficits render them incapable of self-care or result in ineffective or incomplete care (Orem, 1985).

Nursing Agency. Nursing agency is "the complex capability for action that is activated by nurses in their determination of needs for, design of, and production of nursing for persons with a range of types of self-care deficits" (Orem, 1985, p. 31). The concept of nursing agency includes ". . . cognitive, affective, and volitional elements as well as elements that point to the skilled performance of actions" (Orem, 1985, p. 143). Nursing agency may be thought of as being unactivated or activated. When a nurse activates nursing agency, the result is a series of nursing actions or operations related to self-care agency and self-care requisites of others (Orem, 1985). These actions may incorporate one or all of the following methods: (a) acting or doing for, (b) teaching, (c) guiding, (d) supporting, and/or (e) providing a developmental environment (Orem, 1985).

Nursing System. Nursing systems are created by nurses to assist individuals in meeting self-care deficits. Nursing systems occur when nurses link ways of helping to their own actions (nursing agency) or to actions of persons with self-care deficits (Orem, 1985). A nursing system may be wholly compensatory, partly compensatory, or supportive-educative. A wholly compensatory nursing system is required by the individual who is unable to engage in any self-care actions. The partly compensatory system allows both nurse and patient to perform

care, the distribution of responsibility depending upon the patient's limitations. In the supportive-educative system the patient can, with assistance, meet the demand of self-care. The goal of the nursing system is to meet the patient's needs for therapeutic self-care by moving the patient toward responsible self-care or assisting the patient's family or others in meeting the patient's needs (Orem, 1980).

Self-Care Requisites. The purposes of self-care are expressed in terms of meeting self-care requisites. Three types of self-care requisites have been identified: universal, developmental, and health-deviation (Orem, 1985). Universal self-care requisites are common to all human beings and are associated with life processes and maintenance of human integrity. Developmental requisites are associated with processes and events that occur during various stages of the life cycle. Health-deviation requisites are associated with genetic deficits, pathological states, or other abnormal variations in human functioning (Orem, 1985).

Universal self-care requisites represent actions that are required by all human beings to meet their basic needs. When universal self-care requisites are met by individuals, or others, human structure and function are maintained. In turn, human development and maturation are supported.

Orem (1985) identified universal self-care requisites as:

1. Maintenance of sufficient intake of air;
2. Maintenance of sufficient intake of water;
3. Maintenance of sufficient intake of food;
4. Provision of care related to elimination and excrement;
5. Maintenance of balance between activity and rest;
6. Maintenance of balance between solitude and social interaction;

7. Prevention of hazards to human life, functioning, and well-being;

8. Promotion of human functioning and development in accord with potential, limitations, and the desire to be normal.

The maintenance of sufficient air, water, and food provides individuals with adequate nutrients for metabolism, energy production, and the pleasurable experiences of breathing, drinking, and eating. Effective care of the elimination process ensures the integrity and regulation of the processes, disposal of excrements, and maintenance of sanitary conditions. A balance between activity and rest regulates energy expenditure and environmental stimuli and provides an outlet for individual interests and talents. The balance between solitude and social interaction provides conditions conducive to reflection, interchange of ideas, and the achievement of the human potential.

Prevention of hazards to life, functioning, and well-being contributes to the maintenance of integrity and promotes development. The promotion of human social functioning and development, in turn, prevents conditions of internal hazards and promotes normalcy (Orem, 1985).

Developmental self-care requisites are specialized universal self-care requisites which pertain to one's development or maturation, as in progressing from one life stage to another. Developmental self-care requisites also result from transitional problems such as social adaptation, loss of family members or friends, changes in employment, mobility, or terminal illness (Orem, 1980).

Health-deviation self-care requisites occur when a person becomes ill, is injured, or experiences structural changes as a result of treatment for health-related conditions (Orem, 1980). In other words,

health-deviation self-care requisites arise from both the disease state and the measures used in its diagnosis or treatment (Orem, 1985).

There are six categories of health-deviation self-care requisites according to Orem (1985):

1. Seeking and securing appropriate medical assistance if exposed to agents associated with human pathology, or if there are genetic, physiological, or psychological states associated with pathology;

2. Being aware of and caring for effects of pathological conditions;

3. Effectively carrying out medically prescribed measures for the prevention or treatment of pathology, regulation of integrated functioning, correction of abnormalities, or compensation for disabilities;

4. Being aware of and attending to discomforting or deleterious effects of care performed or prescribed by the physician;

5. Modifying the self-concept and self-image in accepting oneself in relation to state of health and forms of health care; and

6. Learning to live with the effects of pathological conditions and medical treatment in a life-style that promotes personal development.

Interrelatedness of the Constructs. The major constructs defined by Orem interrelate to identify the action domain and boundaries of nursing. Self-care provides the basis for the model and thus partially defines each of the other constructs. Self-care agency is exercised in order to meet therapeutic self-care demands. Self-care requisites provide the purpose for the exercise of self-care agency. A self-care deficit exists when self-care agency is qualitatively or quantitatively inadequate to meet the therapeutic self-care demand. A self-care deficit signals the need to activate nursing agency. Nursing agency, combined with ways of helping, creates a nursing system which assists

with the achievement of self-care by decreasing therapeutic self-care demands and increasing self-care agency. When self-care agency is sufficient to meet self-care demands, nursing agency is no longer required.

Protein-Calorie Malnutrition

In the past 50 years, major strides have been made in the study of human nutrition. Malnutrition in the 1980s can be best described as overnutrition and undernutrition (Owen, 1984). Overnutrition results in obesity and all of the illnesses related to obesity.

Undernutrition can be divided into vitamin and mineral deficiencies and protein-calorie malnutrition. Vitamin and mineral deficiencies result in impairments of growth, sexual maturation, immune functions, bone formation, cardiovascular function, and glucose tolerance. Other vitamin and mineral deficiencies result in the development of anemia or caries (Mertz, 1984). Rarely, however, will a clinician see a nutritional deficiency of significant medical importance that is not associated with protein-calorie malnutrition (Weinsier & Butterworth, 1981).

Protein-calorie malnutrition includes two distinctly different disease processes, marasmus and kwashiorkor (Weinsier & Butterworth, 1981). The physiological events and clinical findings occurring with these disease processes are presented in the following discussion.

Marasmus. Marasmus is a chronic form of protein-calorie malnutrition wherein a lack of adequate calories has depleted the body's carbohydrate stores and caused mobilization of the body proteins for energy (Stotts, 1982). The body is depleted of fat and muscle stores. Clinically, the patient is underweight, appears starved, and has a wasted appearance. Diminished skinfold thickness reflects the loss of calorie reserves, and reduced arm circumference with temporal and interosseous muscle wastage reflects the reabsorption of protein from the

parietal and visceral muscles, including the heart. Laboratory values are relatively normal; occasionally the serum albumin is slightly reduced (Weinsier & Butterworth, 1981). Despite a morose appearance, the patient's immunocompetence, wound healing, and ability to handle short-term stress are reasonably well preserved (Weinsier & Butterworth, 1981).

Kwashiorkor. In contrast, kwashiorkor is an acute state of insufficient protein intake with stress superimposed. In children, this protein malnutrition is often the result of a starchy, low-protein diet while the child is under the stress of growth and incurs a parasitic or viral infection. In adults, kwashiorkor typically occurs in the hospitalized patient who is under acute stress and who is supported only with 5% glucose solution. The time for development of kwashiorkor may be as short as 2 weeks (Weinsier & Butterworth, 1981).

Clinical findings in kwashiorkor are few. Fat reserves and muscle mass tend to be normal or above normal, giving the deceptive appearance of adequate nutrition. Signs that indicate kwashiorkor include easily pluckable hair, edema, and delayed wound healing. Laboratory findings include severely depressed levels of serum albumin (less than 2.8gm/100dl) and transferrin (less than 150ng/100ml) or reduced iron-binding capacity (less than 250ng/100ml). Associated with the fall in levels of circulating protein is a depression of cellular immune function as reflected by lymphopenia (less than 1,200/mm^3) and skin anergy (Weinsier & Butterworth, 1981).

Persons with kwashiorkor have significantly higher morbidity and mortality rates than do persons with normal visceral proteins (Warnold & Lundholm, 1984). In full-blown kwashiorkor, the prognosis is poor without aggressive nutritional support. Dehiscence of surgical wounds

is likely, host defenses are compromised, and death from overwhelming infection may occur despite antibiotic therapy (Weinsier & Butterworth, 1981).

Marasmic Kwashiorkor. The combined form, marasmic kwashiorkor, is a condition characterized by features of both marasmus and kwashiorkor and is a form of severe protein-calorie malnutrition that occurs when stress is superimposed on a chronically ill, starved patient. Body fat stores as well as both somatic and visceral protein stores are depleted. This condition is marked by a high incidence of life-threatening complications. Immunocompetence is lowered. The prognosis is poor because of the high risk of infections and poor wound healing (Weinsier & Butterworth, 1981).

Interrelatedness of Orem's Self-Care Deficit Theory of Nursing and Protein-Calorie Malnutrition

Orem's (1985) theory provided the basic structure for interrelating the concepts of health-deviation self-care requisite, protein-calorie malnutrition, and nursing agency. A health-deviation self-care requisite exists in patients with protein-calorie malnutrition because the self-care agency has been inadequate to meet the therapeutic self-care demand. This health-deviation deficit signals the need to activate nursing agency. When self-care agency is sufficient to meet self-care demands, nursing will no longer be required by the individual.

In order to identify health-deviation self-care requisites, screening and nutritional assessment are necessary. Once individuals have been identified through the screening process, a more comprehensive nutritional assessment can be conducted (Owen, 1984) and nurse referrals can be initiated.

It appears that two essential elements are missing in the identification, referral, and treatment of the patient with or at risk of developing protein-calorie malnutrition. The first element is confirmation of complications associated with protein-calorie malnutrition. The second is a standardized approach to screening for protein-calorie malnutrition that is practical, inexpensive, and easy to use for nurse referrals. Screening is the process by which various parameters are evaluated in individuals for the purpose of identifying those persons likely to be at greatest risk (Owen et al., 1979). A systematic program to detect protein-calorie malnutrition and aggressively encourage activation of nursing system offers a substantial potential for improving nutrition care in hospitals in a way that can be measured with clinical as well as financial markers (Kamath et al., 1986).

Statement of the Purpose

The purpose of this study was to describe complications sustained by patients with protein-calorie malnutrition classified according to a protein-calorie malnutrition index and to identify nurse reported nutritional referral of those patients.

Statement of the Problem

The questions to be answered from this study were:

1. What are the complications sustained by patients with protein-calorie malnutrition classified according to a protein-calorie malnutrition index?

2. Of patients classified by a protein-calorie malnutrition index, how many have nurse reported nutritional referrals?

Definition of Terms

The operational definitions for this study are presented as follows:

Complications - Complications refer to temperature elevation greater than 101 degrees Fahrenheit (Jones et al., 1985), urinary tract infection (Mughal & Meguid, 1987), cellulitis, septicemia, upper respiratory infection, pneumonia, peritonitis, osteomyelitis (Anderson & Wochos, 1982), thrombophlebitis, wound infection, and wound rupture (Warnold & Lundholm, 1984) which were not present or recorded at time of admission to the hospital. Complications are also operationally defined as pneumothorax, hemorrhage (Seltzer et al., 1979) requiring transfusion, thrombosis, pulmonary embolism, myocardial infarction, and death (Warnold & Lundholm, 1984) which occurred during hospitalization. In addition, extended hospitalization greater than the mean is defined as a complication (Sauberlich, 1984).

Patients - Patients are defined as individuals, randomly selected at admission to a selected hospital, who are 20 to 65 years of age and have no recorded history of taking immunosuppressive drugs.

Protein-Calorie Malnutrition - Protein-calorie malnutrition refers to a condition of serum albumin less than 3.5 gm/dl (Blair et al., 1980; Seltzer et al., 1979) and/or total lymphocyte count (TLC) less than 1,800/mm^3 (Blair et al., 1980; Kamath et al., 1986).

Protein-Calorie Malnutrition Index - Protein-calorie malnutrition index is defined as a method of classifying according to severity by assignment of numerical values to categories.

Score	0	1	2	3
S-Alb (gm/dl)	>3.5	3.5-3.	<3.-2.5	<2.5
TLC (/mm^3)	>1,800	1,800-1,500	<1,500-900	<900

Using these scores, a sum of the two yields an index of 0 to 6. An index of 0 indicates normal nutrition while an index of 5 to 6 is indicative of severe malnutrition (Blair et al., 1980; Jones et al., 1985).

Nutritional Referral - Nutritional referral is defined as any recorded notation, in the patient's record or dietary department's record, that a dietitian was requested by a nurse to evaluate the patient's status.

Assumptions

This study was based on the following assumptions:

1. Complications exist as sequellae of protein-calorie malnutrition.

2. Diagnoses are recorded in the patient's records and can be identified as complications related to protein-calorie malnutrition.

3. Nurse nutrition referrals are recorded in the patient's records or can be retrieved from nutrition referral records.

Significance of the Study

Asnwers to the study questions may provide knowledge which can contribute to nursing practice, research, theory, and education. Patients with the health-deviation self-care requisite of protein-calorie malnutrition do not tolerate the stress of illness well. These patients tend to experience delayed wound healing and have a greater susceptibility to infection and other complications (Weinsier et al., 1979). Thus, early identification of the patient with a health-deviation self-care deficit of protein-calorie malnutrition can prevent a potentially prolonged, complicated, or even catastrophic hospital course.

Bistrian et al. (1975) suggested that a partial explanation for the general failure to recognize protein-calorie malnutrition is that

the significance of decreased serum albumin as a marker is not generally appreciated. Long before the signs of protein-calorie malnutrition become evident clinically, a progression through marginal and subclinical states of a nutritional deficit has transpired. Therefore, the capability to detect incipient nutritional deficiency states with laboratory tests of one form or another needs to be further explored.

Since there is a paucity of literature to substantiate whether or not nurses recognize protein-calorie malnutrition and initiate nursing referrals, an important contribution of this study could be to provide baseline data supporting or refuting that appropriate nursing referrals are made in cases of the health-deviation self-care requisite of protein-calorie malnutrition. Once recognized, the interrelated concepts of health-deviation self-care deficits and malnutrition can be utilized to define, predict, and control to some extent the patient's outcome.

Summary

Adequate nutrition is crucial for survival and is a key factor in the prevention of and recovery from illness (Frankle & Owen, 1978; Williams, 1985). In the past decade, malnutrition has been reported to exist in as many as 50% of hospitalized patients (Bistrian et al., 1974; Dickhaut, DeLee, & Fage, 1984). Protein-calorie malnutrition contributes to increased morbidity and mortality (Seltzer, Fletcher, Slocum, & Engler, 1981).

One of the main reasons for the high incidence of malnutrition in hospitalized patients is the lack of identification of patients at risk (Haider & Haider, 1984). Sophisticated methods for assessment as well as more simplified schemes have been developed to assess nutritional status (Seltzer et al., 1979). A method of instant nutrition

assessment has been proposed using only those data acquired by routine hospital admission laboratory tests and can be used by the most novice professional (Seltzer et al., 1979).

Two of the most valuable indicators of possible protein-calorie malnutrition are serum albumin and total lymphocyte count (Kaminski et al., 1985; Seltzer et al., 1979). These indicators are available on most patients at admission and can be used as a protein-calorie malnutrition index to identify patients at risk.

Orem's (1985) theory provided the constructs of health-deviation self-care requisite, nursing system, and nursing agency. These elements combined with the events of protein-calorie malnutrition constitute the framework within which one can identify this self-care deficit, design the role relationships of nursing systems, and initiate the exercise of appropriate nursing agency for the identification and referral of patients at risk for protein-calorie malnutrition.

CHAPTER II

Review of Research

Review of the research literature includes studies reporting the prevalence of protein-calorie malnutrition and complications associated with protein-calorie malnutrition in hospitalized patients. Studies in which various nutritional indices were used to identify patients with protein-calorie malnutrition are also discussed.

Prevalence of Protein-Calorie Malnutrition

The frequent occurrence of malnutrition in hospitalized patients in municipal and university hospitals in the United States has been reported in several studies (Bistrian et al., 1974; Bistrian et al., 1976; Hill et al., 1977; Muncie & Carbonetto, 1982; Weinsier et al., 1979; Willard et al., 1980). An average prevalence of malnutrition in 50% of patients is not unusual (Bistrian et al., 1974; Hill et al., 1977; Kamath et al., 1986; Muncie & Carbonetto, 1982).

In 1974, Bistrian et al. conducted a study on an entire surgical patient population of an urban municipal hospital. Of the 131 patients surveyed, approximately 50% were found to exhibit measures indicating protein-calorie malnutrition.

Bistrian et al. (1976) conducted three single-day nutritional surveys at weekly intervals in a general medical ward of an urban municipal teaching hospital. The prevalence of protein-calorie malnutrition was determined to be 44% or greater. The results were reproducible without significant variance. In 34% of the 251 patients, a lymphopenia of

1,200 cells/mm^3 or less was found. These findings were compared to their previous study of surgical patients, and the investigators concluded that protein-calorie malnutrition occurred commonly in municipal hospitals in both medical and surgical patients.

In 1977, Hill et al. measured the nutritional state in 105 surgical patients. These investigators concluded that abnormal values for the various nutrition indices were common in the group as a whole and most frequent (50%) in patients who were hospitalized for more than a week after major surgery.

Weinsier et al. (1979) evaluated nutritional status in 134 consecutive admissions to a general medical service and throughout hospitalization among patients hospitalized 2 weeks or longer. These investigators found that at admission, 48% of patients had a high likelihood of malnutrition. Likelihood of malnutrition increased with hospitalization in 69% of patients with abnormal determinants. Nutritional parameters worsened in over 75% of patients admitted with normal values. These investigators concluded that there was an association between nutrition status and hospital course with a worsening trend during hospitalization.

In 1980, Willard et al. conducted an assessment of protein-calorie status on 200 consecutive adult nonobstetric admissions to a private hospital from two group family practices. A total of 63 patients (31.5%) were found to be malnourished. These investigators concluded that chronic calorie depletion was more prevalent than protein depletion at admission and continued through hospitalization. Acute protein depletion was reported to develop frequently during the course of hospitalization.

In a study conducted in an extended care facility (Muncie & Carbonetto, 1982), 30 patients were randomly selected. The investigators

reported between 47% and 66% of the patients had moderate or severe protein-calorie malnutrition according to the various measures.

One group of investigators (Jones et al., 1985) conducted two studies in a regional medical center using a malnutrition index as a screening technique to identify patients at risk. These investigators reported that protein-calorie malnutrition of at least a mild degree was found in 58.5% of the 338 patients screened in the first study. A similar rate was found in the second study of 68 adult medical surgical patients.

In 1986, a collaborative study involving nutrition screening of 3,047 patients at admission to 33 hospitals was conducted. The investigators reported that more than 50% of the patients had below normal values for one or more of the variables studied. A large number (40%) of the patients were also considered at nutritional risk as judged by one set of variables (Kamath et al., 1986).

Complications Associated with Protein-Calorie Malnutrition

In 1979, Seltzer et al. conducted a study using admission serum albumin levels and total lymphocyte counts as instant nutritional assessment in a series of 500 consecutively admitted patients. Abnormalities of these parameters were associated with markedly increased morbidity and mortality. An abnormal serum albumin was associated with a 4-fold increase in complications and a 5-fold increase in deaths, both of which were statistically significant ($p < 0.001$; $p < 0.25$). An abnormal total lymphocyte count was associated with an increase of 1.8 times in complications, which was not significant, and a 4-fold increase in deaths, which was significant ($p < 0.05$). When both serum albumin and total lymphocyte count were abnormal, an almost 4-fold increase in complications

($p < 0.003$) and a 20-fold increase in deaths ($p < 0.001$) were reported. Complications reported in this study included infection, post-operative hemorrhage, lower extremity phlebitis, and pneumothorax.

Anderson and Wochos conducted a study in 1982 to assess nutritional status in 47 patients admitted to a nephrology service. Renal failure was present in 39 of the 47 patients studied. These investigators reported that 25 patients had a depressed serum albumin concentration at the time of admission. These 25 patients stayed significantly (single-tailed t-test, $t = 2.03$, $p < 0.025$) longer in the hospital than those patients with normal serum albumin. Of the 47 patients, 15 had a clinically important infection during their hospital stay. Peritonitis, pneumonia, septicemia, and osteomyelitis accounted for nine of the infections. Cellulitis, a perineal fistula, infected nephrolithiasis, prostatitis, hepatitis, and a viral upper respiratory infection were each observed once.

In 1984, Warnold and Lundholm conducted a prospective study of 215 noncancer patients classified into three groups according to type of surgery: major vascular, minor vascular, and abdominal. These investigators reported that patients with low nutritional status stayed an average of 29 days in the hospital compared to 14 days if the nutritional status was normal ($p < 0.01$). The overall complication frequency was higher in patients with low nutritional status compared to normal status (48% and 23%, respectively; $p < 0.01$). The frequency of serious complications was 31% in undernourished and 9% in well-nourished patients ($p < 0.05$). Furthermore, four of five deaths were found in the malnourished group. These investigators concluded that it was possible to predict the post-operative outcome and duration of hospital stay by means of preoperative nutritional assessment.

In 1985, a study was conducted by investigators using a malnutrition index to identify the incidence of protein-calorie malnutrition and to examine the correlation of nutritional status with length of stay and complications (Jones et al.). These investigators reported a 92.3% rate of complications among 68 adult, medical-surgical patients. The most significant complications reported were septic shock, respiratory failure requiring intubation, and death. The patients sustaining these complications had malnutrition index scores of 3, 4, or 5. The most common complication reported was fever greater than 101 degrees Fahrenheit. The mean length of hospitalization for this sample was 7.8 days. Of patients whose length of stay was greater than 10 days, 82.3% had protein-calorie malnutrition to some degree. Four patients with greater than 20 days length of hospitalization had scores of 2 to 5 indicating moderate to severe malnutrition at time of admission.

The effect of nutritional status on the morbidity and mortality of major gastrointestinal surgery for benign disease was studied by Mughal and Meguid (1987). Of 32 patients studied, 15 were classified as being well-nourished and 17 were classified as being malnourished. In the well-nourished group, 3 patients (20%) sustained six complications. One patient died. Of the 17 malnourished patients, 10 (59%) sustained 16 complications. There were five (29%) deaths in the malnourished group. Complications sustained included septicemia, pancreatitis, intraabdominal abscess, small bowel obstruction, protracted ileus, wound infection, wound dehiscence, urinary tract infection, and cardiopulmonary imbalances.

Robinson et al. (1987) conducted a prospective audit of 100 admissions to a general medical unit to determine the relationship of the initial nutritional status of the patients to the actual length of stay

and hospital charges. These data were then compared with the allowed length of stay and estimated reimbursement under the prospective payment system of diagnosis-related groups. Forty-five percent of the malnourished patients were hospitalized longer than that allowed under the prospective payment system, compared to 30% for normal patients and 37% in the borderline group. The average length of stay was 15.6 $\pm$ 2.2 days in the malnourished group compared to approximately 10 days in the other two groups ($p < 0.01$). These investigators suggested that early recognition of malnutrition and aggressive treatment may lead to a decrease in the length of stay and cost deficit incurred by malnourished patients.

Nutritional Indices

Since Butterworth's (1974) classic published report of malnutrition in hospitalized patients, many studies have been conducted using various criteria to evaluate protein-calorie nutritional status. Anthropometric measures such as weight/height, triceps skinfold, arm muscle circumference, and biochemical measures such as serum albumin, hematocrit, creatinine height index, transferrin, and total lymphocyte count have been used as measurements of protein-calorie malnutrition.

In 1974, Bistrian et al. surveyed the protein nutritional status of 131 surgical patients. These investigators reported that they used anthropometric measurements because of ease and simplicity of measurement and the potential value for clinical monitoring. Significant protein-calorie malnutrition of both moderate and severe degree was reported to be identified by the criteria of weight for height, triceps skinfold, arm muscle circumference, or recent serum albumin levels. These investigators reported that weight for height was not a sensitive measure, since it identified only one severely depleted patient. There was a highly significant correlation between arm muscle circumference and serum

albumin ($p < .001$). Of 30 patients with low serum albumin values, 21 or 70% were associated with low skinfold measurements. In 15 patients with very low serum albumin values, 12 or 80% were associated with low skinfold measurements. These investigators concluded that weight for height was relatively insensitive as an indicator of protein-calorie malnutrition. They also confirmed the value of serum albumin determinations as a measure of significant protein deficit by the high correlation with arm muscle circumference.

Bistrian et al. (1975) studied the sensitivity of creatinine height index as a simple measure of total lean body mass to identify malnourished patients. These investigators compared the creatinine excretion of 30 young males serving as controls and 11 malnourished male surgical patients. The mean creatinine height index was 1.09 in the normal males and 0.50 in the 11 malnourished males, a difference which was statistically significant ($p < 0.005$). These investigators reported that creatinine height index was more sensitive than weight for height, nitrogen balance, and serum albumin levels.

In a 1976 study, Bistrian et al. conducted three single-day nutritional surveys at weekly intervals on 251 medical patients using weight for height, triceps skinfold, arm muscle circumference, serum albumin, and hematocrit values. The prevalence of protein-calorie malnutrition was 44% or greater by these criteria (weight for height, 45%; triceps skinfold, 76%; arm muscle circumference, 55%; serum albumin, 44%; and hematocrit, 48%). These investigators also reported significant association by chi-square testing between arm muscle circumference and serum albumin level but not between triceps skinfold and serum albumin. They concluded that although low serum albumin levels may be seen in conditions other than decreased intake, it would be difficult to consider a

patient with hypoalbuminemia well-nourished, whatever the cause. The significant correlation of arm muscle circumference with serum albumin level in the study would tend to support this conclusion, since arm muscle circumference would not be primarily affected by renal, hepatic, or gastrointestinal disease. These investigators also reported lymphopenia in 34% of patients surveyed and reported that nutritional deprivation is one cause of lymphopenia and impaired cell-mediated immunity.

Weinsier et al., in 1979, evaluated nutritional status in 134 consecutive admissions to a general medical service and throughout hospitalization among patients hospitalized 2 weeks or longer. Likelihood of malnutrition was determined using eight nutrition-related parameters: weight for height, arm muscle circumference, triceps skinfold, serum folate and vitamin C, serum albumin, hematocrit, and total lymphocyte count. According to the investigators, serum folate and vitamin C were chosen as representative vitamins likely to be specific indicators of nutrition support. Triceps skinfold was used as an indicator of calorie reserves. Arm muscle circumference was used because it had been shown to reflect mass of muscle protein. Weight for height was used as a complementary measure of calorie reserve. Total lymphocyte count was used because one evident cause of lymphopenia is nutrition deprivation. Because hypoalbuminemia had been shown to be a key diagnostic feature of protein-calorie malnutrition, heralding the critical phase of kwashiorkor, serum albumin was used as a measure. Lastly, hematocrit was included on the basis that it reflected multiple nutrient deficiencies. These investigators reported that all nutritional parameters measured declined during hospital stay except for vitamin C, which increased. Hematocrit fell in 100% of patients entering the hospital with normal values. Serum albumin values decreased in 67% of patients

with normal admission values. Triceps skinfold measures showed a decline in 80% of patients. The investigators concluded that the study documented a downward trend in nutritional parameters during hospitalization, with an increase in mortality rate and length of hospitalization for patients who are malnourished.

Willard et al. conducted a study in 1980 to assess protein-calorie status of 200 consecutive adult, nonobstetric admissions to a private hospital. Weight, triceps skinfold, midarm muscle circumference, serum albumin level, and total lymphocyte counts were used as indicators of protein-calorie status. These investigators commented that serum albumin, an early indicator of acute protein depletion, requires correction for several nonnutritional causes of hypoalbuminenia; that lymphopenia is well-established as a market of acute protein depletion but should not be used by itself as a criterion of malnutrition; and that midarm muscle circumference can be affected by nonnutritional factors. From the findings, it was concluded that criteria for defining protein-calorie malnutrition, including those used in this study, are somewhat arbitrary and should not supplant the value of clinical judgement in diagnosing protein-calorie malnutrition.

In 1981, Harvey et al. investigated factors that might predict sepsis and mortality in 282 hospitalized patients referred for nutritional therapy. Assessment parameters included weight for height, midarm muscle circumference, triceps skinfold, serum albumin, serum transferrin, total lymphocyte count, creatinine height index, and antigen testing. These investigators reported that serum albumin was found to be the best single indicator of concurrent sepsis and anergy and predictor of mortality. An initial serum albumin < 2.2gm/dl was associated with a greater than 75% chance of having concurrent anergy with sepsis and death during

hospitalization. An improvement in delayed hypersensitivity response was the most accurate predictor of an improved prognosis. These investigators concluded that response to skin antigens and serum albumin, together with the presence or absence of sepsis or cancer, provided an objective index to identify high risk patients and to predict the outcome of their hospital course.

Serum albumin, total iron-binding capacity, arm muscle circumference, triceps skinfold, and weight for height were used by Anderson and Wochos as measures for nutritional assessment in a 1982 study. Of the 47 patients studied, renal failure was present in 39. These investigators reported that all the patients with a low arm muscle circumference, a low triceps skinfold value, or low body weight also had a low serum albumin concentration. Two of the three patients with a low total iron-binding capacity also had a depressed serum albumin concentration. These investigators concluded that in spite of the influence of extracellular fluid volume on serum albumin concentration, low serum albumin values were more closely associated with length of hospital stay than were total iron-binding capacity values. Further, admission body weights alone in relation to ideal body weight did not seem to identify the patient with a recent important weight loss.

In 1982, Bienia, Ratcliff, Barbour, and Kummer studied the nutritional status of 59 consecutive geriatric male patients admitted to the medical service of a Veterans Administration Hospital and compared those nutritional measures with nutritional measures of 93 younger patients admitted during the same time period. These investigators used seven measures of nutrition: serum albumin, serum transferrin, total lymphocyte count, hemoglobin, weight for height, midarm muscle circumference, and skin test reactivity. All seven nutrition measurements were

reported to be more often abnormal in the population 65 years or older. Anemia and skin-test anergy were reported to be more common in malnourished patients regardless of age. These investigators questioned whether standard nutritional norms are appropriate for geriatric patients, since serum albumin concentration and skeletal height both decrease with advancing age.

Mitchell and Lipschitz (1982) performed nutritional assessments on groups of 40 healthy young and elderly males and females. Their values were compared to measurements in 65 young and 44 elderly subjects with protein-calorie malnutrition. These investigators reported that creatinine height index was a good predictor of reduction in lean body mass in malnourished young males but was of less value in young females. In healthy elderly, creatinine height index was significantly lower than in the young and wide overlaps between well and malnourished elderly groups were found. In both sexes and all age groups, percentage ideal body weight and arm muscle circumference were reported to be of limited value in detecting malnutrition. Triceps skinfold thickness was only useful in elderly females. Anemia was usually found in young subjects with malnutrition but only distinguished well from malnourished elderly if a lower limit of normal for hemoglobin was used (12 g/dl for males; 10 g/dl for females). The total iron-binding capacity was a good indicator of malnutrition in males of all ages but was of less value in females in whom iron stores, rather than nutritional status, exerted a major influence on the measurement. These investigators reported the best predictor of malnutrition in any age group to be the serum albumin.

Muncie and Carbonetto conducted a study in 1982 of 30 randomly selected patients at an extended care facility. Measures used to study these patients' nutritional status included: weight for height, midarm

muscle circumference, triceps skinfold, hematocrit, white blood cell count, albumin, and transferrin. These investigators reported that there was a significant correlation ($r > .5$) between the percentage of standard weight/height and midarm muscle circumference ($r = .601$, $p < 0.001$) as well as triceps skinfold ($r = 6.13$, $p < 0.001$). Serum albumin was highly correlated to hematocrit ($r = .721$, $p < 0.001$). Of these patients, 60% were reported to be anemic and 24% were leukopenic.

Warnold and Lundholm (1984) assessed the nutritional status of 215 noncancer patients using percentage weight loss, body weight in relation to reference weight, midarm muscle circumference, and serum albumin. Weight loss correlated closely with serum albumin ($p < 0.01$). Midarm muscle circumference was the least sensitive marker compared to weight index, albumin, and weight loss ($p < 0.01$). Serum albumin was reported to correlate with the variables of complication frequency ($p < 0.01$) and hospital stay ($p < 0.01$). Weight loss correlated with complication frequency ($p < 0.01$). No significant correlations were found between midarm muscle circumference or serum transferrin and any of the clinical variables. These investigators reported that since many of the markers of malnutrition are interrelated and may also correlate with important factors of nonnutritional origin, multiple regression analysis using such markers might falsely influence the predictive ability of the index.

Orr et al., in 1985, conducted a prospective nutritional evaluation of 78 patients with untreated cervical cancer. These investigators used measurements of triceps skinfold, midarm muscle circumference, weight for height, serum albumin, serum hemoglobin, total iron-binding capacity, serum zinc, serum copper, total lymphocyte count, and skin testing. When possible, creatinine height index was measured. These investigators reported no apparent relationship between any of the biochemical

assessments with age or race, with the exception of lower hemoglobin in black patients ($p < 0.016$). The presence of low serum albumin level was predictive of the presence of abnormally low total iron-binding capacity ($p < 0.001$). Abnormally low zinc levels correlated with an abnormal weight/height ratio ($p < 0.004$), an abnormal midarm muscle circumference ($p < 0.03$), and an abnormal serum albumin level ($p < 0.005$). There was no apparent relationship between failure to respond to skin testing and stage of disease, age, or race; however, there was an apparent correlation with an abnormal serum albumin level ($p < 0.007$). The presence of protein-calorie malnutrition was reported to correlate with a history of recent weight loss ($p < 0.0002$). These investigators commented that no single abnormal laboratory parameter can be considered synonymous with malnutrition. The evaluation of a number of anthropometric, immunologic, or biochemical determinations was recommended in order to detect or predict the risk of complications in the malnourished.

A 33-hospital screening study was conducted in 1986 by Kamath et al. These investigators collected demographic data on sex, age, and admitting diagnosis. Nutritional parameters screened included serum albumin, hemoglobin, total lymphocyte count, and weight for height. These investigators identified two important issues from this study. First was the incidence of potential nutritional risk in the study population which was reported to be 58%. The second issue identified was the high percentage of missing values for each of the nutritional markers.

Serum albumin levels and total lymphocyte counts were used as an instant nutritional assessment tool by Seltzer et al. (1979). A series of 500 consecutive admissions were retrospectively studied. These investigators recommended that serum albumin and total lymphocyte counts should serve as an early warning system for an increase in potential

complications and death. With such a warning, expanded assessment using anthropometrics, skin testing for anergy, and blood and urine studies of serum transferrin and nitrogen balance would be of additional value.

In 1984, Dickhaut et al. conducted a study to examine the influence of preoperative nutritional status on morbidity in 23 diabetic patients who underwent an amputation. These investigators used serum albumin levels and total lymphocyte counts as valid tests of a patient's nutritional status. A z-test of the significance of proportions was done, and the results indicated a highly significant relationship between the serum albumin level and total lymphocyte count and healing of Syme amputations ($z = 2.70$, $p < 0.0035$). A normal albumin level and total lymphocyte count were predictive of a successful amputation, and an abnormal albumin level and total lymphocyte count were predictive of failure. Abnormal values for albumin level and total lymphocyte count were significantly more sensitive ($z = 0.36$, $p = 0.36$) or specific ($z = 85$, $p = 0$) in predicting failure than normal values were in predicting success.

In conclusion, various nutritional indices have been correlated by investigators in studies of malnutrition. Weight for height has been correlated with midarm muscle circumference and triceps skinfold (Muncie & Carbonetto, 1982). Recent weight loss has been correlated ($p < 0.0002$) with protein-calorie malnutrition. Other investigators reported weight for height to be less than a sensitive measure, since weight identified only the severely depleted patient (Bistrian et al., 1974; Mitchell & Lipschitz, 1982).

Some investigators have reported that creatinine height index is a more sensitive measure than weight for height or serum albumin (Bistrian et al., 1975). Others, however, reported creatinine height index as a

good predictor of body mass in the malnourished young male but of less value in young females (Mitchell & Lipschitz, 1982). Creatinine height index is the only anthropometric measure shown to correlate with outcome by one group of investigators (Harvey et al., 1981).

There has been no reported relationship between age and race with any biochemical measures except for decreased hemoglobin in black women (Orr et al., 1985). However, all measures are reported to decrease in patients 65 years of age and older (Bienia et al., 1982).

Anemia and anergy have been reported to be more common in malnourished patients regardless of age (Bienia et al., 1982). Anemia has been reported to be usual in young subjects with malnutrition but only distinguished well from malnourished elderly if a lower limit of normal for hemoglobin was used (Mitchell & Lipschitz, 1982).

Total iron-binding capacity has been reported to be a good indicator of malnutrition in males of all ages but has been of less value in females whose iron stores influenced the measure (Mitchell & Lipschitz, 1982). Serum albumin has been reported to be an equal predictor of decreased total iron-binding capacity (Mitchell & Lipschitz, 1982) and more closely associated with length of stay than iron-binding capacity (Muncie & Carbonetto, 1982). No correlation between transferrin and any of the clinical variables studies was reported (Muncie & Carbonetto, 1982).

A relationship between total lymphocyte count and serum albumin has been reported (Dickhaut et al., 1984). One evident cause of lymphopenia is nutritional deprivation (Bistrian et al., 1975; Willard et al., 1980), and lymphopenia occurs frequently with depressed serum albumin values (Bistrian et al., 1974). Total lymphocyte count should not be used alone, however, as a criterion of malnutrition (Willard et al., 1980).

A high correlation between midarm muscle circumference and serum albumin has been reported (Bistrian et al., 1974; Bistrian et al., 1976). Decreased serum albumin has also been associated with decreased triceps skinfold (Anderson & Wochos, 1982; Bistrian et al., 1974). One study, however, reported no correlation between triceps skinfold and serum albumin (Bistrian et al., 1976).

Depressed serum albumin has been reported to be associated with complications, length of hospital stay (Muncie & Carbonetto, 1982), concurrent anergy, sepsis, and death (Harvey et al., 1981). Hypoalbuminemia has been shown to be a key diagnostic feature of protein-calorie malnutrition, heralding the critical clinical and biochemical phase of kwashiorkor (Whitehead, Conrad, & Lunn, 1973). Serum albumin has also been reported to be the best predictor of malnutrition in any age group (Mitchell & Lipschitz, 1982).

Nutritional Referral

Little research has been reported regarding the nurse's responsibility for the nutritional aspect of patient care. Newton, Beal, and Strauss (1967) explored the roles of nursing staff in meeting the nutrition needs of patients in hospital settings. These investigators conducted field studies in 22 hospitals over a 2-year period of time. A total of 876 interviews were conducted using a sample of 276 patients, 347 nurses, 95 physicians, 134 dietitians, and 24 others (such as volunteers, social workers, and chaplains). Major findings reported by these investigators included: nurses on all staff levels reported negative reactions to their educational experience in nutrition; physicians, in general, evidenced little concern about diet with the exception of treatment in diabetes mellitus; patients relied on physicians for dietary

advice; and the chief reason for nursing or medical staff to call the dietitian was to answer patient complaints about the food or service.

Summary

Frequent occurrence of malnutrition in hospitalized patients has been supported in the research literature during the last decade (Bistrian et al., 1974; Bistrian et al., 1976; Hill et al., 1977; Kamath et al., 1986; Muncie & Carbonetto, 1982; Weinsier et al., 1979; Willard et al., 1980). Infections (Anderson & Wochos, 1982), extended length of hospitalization (Anderson & Wochos, 1982; Warnold & Lundholm, 1984), death (Warnold & Lundholm, 1984), and various other complications have been reported to be associated with malnutrition.

A battery of tests have been used by investigators to assess malnutrition in the hospitalized patient. Correlations among various nutritional indices have been supported (Anderson & Wochos, 1982; Bienia et al., 1982; Bistrian et al., 1974; Bistrian et al., 1976; Dickhaut et al., 1984; Harvey et al., 1981; Mitchell & Lipschitz, 1982; Muncie & Carbonetto, 1982; Orr et al., 1985; Willard et al., 1980). Total lymphocyte counts and serum albumin levels (Seltzer et al., 1979) have been utilized as nutritional indices to form the basis of instant nutritional assessments.

A paucity of research has been reported regarding the actual role of the nurse in meeting the nutrition needs of patients in hospital settings. It has been reported, however, that nurses accord low priority to their responsibility in meeting the nutritional needs of patients (Newton et al., 1967).

In conclusion, protein-calorie malnutrition is reported to exist in hospitalized patients where it is largely unrecognized and untreated. The high prevalence of nutritional deficiencies among hospitalized

patients has been attributed to failure to recognize the nutritional needs of patients. In turn, this failure has been attributed to lack of emphasis given to nutrition in medical curricula (Butterworth, 1974) as well as the negative responses of nurses to nutrition education (Newton et al., 1967).

It appears that a systematic standardized approach to screening for protein-calorie malnutrition that is practical and inexpensive and will aggressively encourage appropriate intervention offers a substantial potential for improving nutrition care in hospitals (Kamath et al., 1986). Professionals whose responsibility is for the care of patients are in the ideal position to detect nutrition needs early and to become the patient's nutrition advocate during hospitalization (Kamath et al., 1986).

CHAPTER III

Methodology

A retrospective ex post facto design was used to describe complications sustained by patients with protein-calorie malnutrition classified according to a protein-calorie malnutrition index and to identify nurse reported nutritional referral of these patients. A description of the patients was also compiled using demographic and biochemical data.

Subjects

A random sample of 100 was drawn from a population of all adult medical and surgical patients between the ages of 20 and 65 years who were admitted to a selected 372-bed, regional medical center between January 1983 and January 1986 without a history of immunosuppressive drug intake. The regional hospital was chosen because there was no systematic procedure used for identifying or treating patients with nutritional deficits.

Instrumentation

The instrument used for data collection was a Patient Profile which included demographic and biochemical data, complications recorded during the hospital course, and recorded nurse nutritional referrals. Other data documenting nutritional status also were included. This profile was constructed by the investigator as a worksheet to organize data (see Appendix A). Demographic data included variables which have been reported

to affect nutritional status such as age (Bienia et al., 1982), race (Orr et al., 1985), and gender (Mitchell & Lipschitz, 1982).

The method chosen to assess patients' nutritional status was analysis of two laboratory tests which are available on most hospital records, the serum albumin level and total lymphocyte count. Serum albumin levels were obtained from the SMA-12 laboratory report, and the total lymphocyte count was calculated from the Complete Blood Count laboratory report. Total lymphocyte count was calculated using the following formula: Total lymphocyte count = percent lymphocytes multipled by white blood count and divided by 100 (Blair et al., 1980).

Serum albumin values were calculated by one laboratory technician who performed the test as well as read the results. The SMA Profiler was used and calibrated twice per run. White blood count (WBC) and lymphocyte count were run on the Model S+4. This machine was calibrated daily. One technician may have performed the tests and read the results or one technician may have performed the tests while another read the results. The technicians were assigned to this area and worked no other area. Results were recorded on a computer, and the laboratory report was placed on the patient's chart by a laboratory technician (A. Overstreet, personal communication, April, 1985).

Once the serum albumin and total lymphocyte counts were obtained, patients were classified according to a protein-calorie malnutrition index (see Appendix B). Serum albumin values greater than 3.5 and total lymphocyte counts greater than 1,800 were each given a numerical value of 0. Serum albumin values of 3.5 to 3.0 and total lymphocyte counts of 1,800 to 1,500 were each given a numerical value of 1. Serum albumin values less than 3.0 or equal to 2.5 and total lymphocyte counts less than 1,500 or equal to 900 were each given a numerical value of 2. Serum

albumin values less than 2.5 and total lymphocyte counts less than 900 were given a numerical value of 3. Using these numerical values as scores, a sum of the two scores yielded an index ranging from 0 to 6. An index of 0 indicated normal nutrition while an index of 6 was indicative of severe malnutrition. These parameters were adopted from published tables (Blair et al., 1980) and unpublished manuscripts (Jones et al., 1985) and are similar to levels used in other studies (Bistrian et al., 1974; Bristrian et al., 1976; Seltzer et al., 1979; Weinsier et al., 1979).

The patient's record was searched for any notation of nurse nutritional referral. Nurses' notes were reviewed also for comments of nutritional status, nutritional assessments, nutritional histories, and nutritional intake. Notations were made as to whether admission weights were actual, estimated, or not recorded at all. Recordings of usual weights were also noted. The admitting diagnosis, admission and discharge dates, and recorded complications were noted on the profile.

Pilot Study

On May 8, 1985, a pilot study was conducted at the selected hospital. Approximately 100 patient records were screened and of those, 68 met the study criteria. The Patient Profile worksheet was found to be appropriate for recording data. No procedural difficulties were encountered.

There were 46 complications noted among the 68 patients in the pilot study. Some patients sustained more than one complication. According to the protein-calorie malnutrition index, patients with index scores of 0, indicating normal nutrition, experienced 12 complications; however, all were fever only. The most severe complications (septic shock, respiratory failure requiring intubation, and death) were sustained by patients with index scores of 3, 4, or 5. No patient had an index

of 6. Seventeen patients had extended hospital stays of 10 days or longer. Of those, 14 had at least an index score of 1. Four patients with hospital stays over 20 days had index scores of 2 to 5. No nurse referrals, indicating a dietitian had been requested to evaluate the patient's nutritional status, were found in the 68 records screened. Based on these findings, no changes were made in the design of the study.

Procedure

An application was completed and submitted for approval to the chairman of the Institutional Review Board of the University of Alabama at Birmingham. Subjects were deemed to be not at risk, and approval was granted to conduct the study. A letter of request for approval to implement the study was sent to the Vice President of Patient Affairs in the selected hospital. Approval was granted.

An appointment was made and the procedure for random selection was discussed with the Director of Medical Records at the selected hospital. Records were selected by Medical Records personnel who chose every 10th record, beginning with number 14 of the most recent records, until a total of 20 records were selected. The investigator reviewed the records to determine if they met the study criteria before the next 20 records were chosen. The process was continued until a sample of 100 medical and surgical subjects between the ages of 20 and 65 years with no recorded history of immunosuppressive drug intake was selected.

Records were reviewed and data were recorded on the instrument profile by the investigator while in the Medical Records Department. Patient records were not taken out of the department, and no identification labels were used. The data could not be related to patient, nurse, or physician. Confidentiality, therefore, was maintained.

Data Analysis

The data were calculated by computer using the Statistical Package for the Social Sciences (SPSS), a system of computer programs developed for analysis of social science data (Hull & Nie, 1981; Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975). Data were analyzed using descriptive statistics, frequencies, means, standard deviations, and percentages.

Limitations

Inherent in an ex post facto study are limitations such as: (a) inability of the researcher to actively manipulate independent variables and (b) inability to randomly assign subjects to a treatment. On the other hand, experimental manipulation was not feasible for this set of variables, and an ex post facto design describing the phenomena was most appropriate.

The study sample was selected from a population of medical-surgical patients admitted to one particular hospital. To the extent that the sample was not representative of all medical-surgical patients, the study findings are not generalizable to the target population.

Subjects younger than 20 and older than 65 years of age were excluded from the study. No generalizations, therefore, can be made for children, adolescents, or the elderly.

Screening for nutritional status may not identify some nutritionally depleted patients who can only be detected by more sophisticated techniques. Patients who become nutritionally depleted subsequent to admission may not be identified by admission screening techniques.

Factors other than inadequate intake of protein and calories are related to a decreased serum albumin and total lymphocyte count. In these conditions, however, the patient can hardly be considered to be well-nourished.

Summary

A profile instrument was used to record demographic data, to classify nutritional status according to a protein-calorie malnutrition index, and to record nurse nutritional referrals. Data were collected on 100 hospitalized adult, medical-surgical patients admitted to a 372-bed, regional medical hospital who met the study criteria. Data analysis consisted of descriptive statistics.

CHAPTER IV

Presentation and Analysis of Data

Purpose

The purpose of this study was to describe complications sustained by patients with protein-calorie malnutrition classified according to a protein-calorie malnutrition index and to identify nurse reported nutritional referral of those patients. Biochemical and demographic data were collected retrospectively using a sample of 100 patient records. Demographic and nutritional status data are presented in this section.

Description of the Subjects

One hundred medical and surgical patients between 20 and 65 years of age with no recorded intake of immunosuppressive drugs were studied. A frequency distribution of patients by age, gender, and race is presented in Table 1.

Table 1

Frequency Distribution of Race and Gender According to Age (n = 100)

		Race		Gender	
Age	f	White	Black	Female	Male
20 to 29	15	12	3	11	4
30 to 39	13	11	2	5	8
40 to 49	9	8	1	6	3
50 to 59	18	17	1	9	9
60 to 65	45	35	10	30	15
Total	100	83	17	61	39

The subjects were predominantly white (83%), female (61%), and between the ages of 60 to 65 years (45%). However, 63% of the sample were between 50 and 65 years. There was a wide variance of age (range = 46) with a mean of 50.78 (SD = 15.62). The majority (65%) of the subjects were medical patients.

In order to assess patients' nutritional status, serum albumin levels were obtained from admission SMA-12 laboratory reports, and the total lymphocyte counts were calculated from the admission Complete Blood Count laboratory report. Serum albumin levels less than 3.5 gm/dl and/or total lymphocyte counts less than 1,800/mm^3 were considered to be indicators of some degree of protein-calorie malnutrition. Computations for classification according to the protein-calorie malnutrition index (see Appendix B) were carried out. Data in Table 2 present a frequency distribution of serum albumin values classified according to the protein-calorie malnutrition index scores.

Table 2

Frequency Distribution of Serum Albumin According to Protein-Calorie Malnutrition Index Scores (n = 100)

Score	0	1	2	3
Serum Albumin (gm/dl)	≥ =3.5	< 3.5-3.0	< 3.0-2.5	< 2.5
Frequency	85	12	2	1
Relative frequency	(85)	(12)	(2)	(1)
Cumulative frequency	(85)	(97)	(99)	(100)

Serum albumin values equal to or greater than 3.5 gm/dl were considered to be within normal limits and were assigned a value of 0 (Blair et al., 1980; Jones et al., 1985). Data in the table reveal that serum albumin values were within normal limits for the largest majority (85%) of the subjects.

Total lymphocyte counts were calculated (Blair et al., 1980) as the second method of assessing nutritional status. Data in Table 3 present a frequency distribution of total lymphocyte counts according to protein-calorie malnutrition index scores.

Table 3

Frequency Distribution of Total Lymphocyte Counts According to Protein-Calorie Malnutrition Scores (n = 100)

Score	0	1	2	3
Total Lymphocyte Count (/mm^3)	> =1,800	<1,800-1,500	<1,500-900	<900
Frequency	43	11	29	17
Relative frequency	(43)	(11)	(29)	(71)
Cumulative frequency	(43)	(54)	(83)	(100)

Total lymphocyte counts equal to or greater than 1,800/mm^3 were considered to be within normal lines (Blair et al., 1980; Jones et al., 1985) and assigned a value of 0. Subjects predominantly (57%) exhibited less than normal total lymphocyte counts on admission.

Assessment of nutritional status was derived from the sum of the two scores each for serum albumin and total lymphocyte count, classified

according to the protein-calorie malnutrition index (Jones et al., 1985). A frequency distribution according to the index is presented in Table 4.

Table 4

Frequency Distribution of Classification According to a Protein-Calorie Malnutrition Index (n = 100)

Index Category	0 Normal	1-2 Mild	3-4 Moderate	5-6 Severe
Frequency	37	38	24	1
Relative frequency	(37)	(38)	(24)	(1)
Cumulative frequency	(37)	(75)	(99)	(100)

Of the 100 patients studied, 63 (63%) achieved an index indicating mild, moderate, or severe protein-calorie malnutrition at time of admission to the hospital. More than one third (38%) of the subjects exhibited values indicating mild protein-calorie malnutrition, while almost one fourth (24%) had values classified as moderate protein-calorie malnutrition on admission. One patient (1%) rated an index of severe protein-calorie malnutrition at time of admission to the hospital.

Complications Sustained by Patients

Complications sustained by patients with protein-calorie malnutrition classified according to a protein-calorie malnutrition index were derived from documented occurrences in the patients' records. Of the 100 patients classified according to a protein-calorie malnutrition index, 37 sustained 1 or more of 52 recorded complications. A frequency distribution of complications according to a protein-calorie malnutrition index is presented in Table 5.

Table 5

Frequency Distribution of Complications According to a Protein-Calorie Malnutrition Index (n = 52)

Index Category	0 Normal	1-2 Mild	3-4 Moderate	5-6 Severe
Frequency	11	20	20	1
Relative frequency	(21)	(38.5)	(38.5)	(2)
Cumulative frequency	(11)	(59.5)	(98)	(100)

The largest predominance for incidence of complications (79%) occurred in subjects with less than normal nutrition at admission according to a protein-calorie malnutrition index. The majority (77%) of complications, when classified according to the protein-calorie malnutrition index, occurred in subjects whose index ranged between 1 and 4, indicating mild to moderate protein-calorie malnutrition at time of admission. Death occurred in the one patient whose index indicated severe malnutrition on admission.

Eight categories of complications were identified in 100 patients studied. A frequency distribution of categories of complications sustained by 37 patients is presented in Table 6.

Extended hospitalization accounted for the majority (54%) of complications sustained. Infections were the second most frequent (21%) complication.

As the protein-calorie malnutrition index increased, so did the severity of complications sustained by subjects. A frequency

Table 6

Frequency Distribution of Categories of Complications Sustained by Subjects (n = 52)

Types of Complications	f
Extended hospitalization	28
Infections[a]	11
Hematological disorders[b]	4
Temperature greater than 101° F	4
Decubiti	2
Atelectasis	1
Pleural Effusion	1
Death	1

Note. These types of complications include: [a] urinary tract infection, cystitis, pyelonephritis, cellulitis, pneumonitis; [b] pulmonary embolus, hemorrhage requiring blood transfusion, and hemothorax.

distribution of complications sustained by subjects classified according to a protein-calorie malnutrition index is presented in Table 7.

Extended hospitalization was found to occur in patients with normal nutritional status as well as patients with mild and moderate malnutrition, according to the protein-calorie malnutrition index. This complication accounted for almost three fourths (73%) of the complications sustained by patients with normal nutritional status, more than one half (60%) of the complications sustained by patients with mild malnutrition, and greater than one third (40%) of complications sustained by patients with moderate malnutrition at time of admission. The one patient (1%) with severe malnutrition died on the day of admission.

Table 7

Frequency Distribution of Complications According to a Protein-Calorie Malnutrition Index (n = 52)

Index	Category	Complication	f	n by Index
0	Normal	Extended hospitalization	8	11
		Temperature > 101° F	1	
		Atelectasis	1	
		Cystitis	1	
1-2	Mild	Extended hospitalization	12	20
		Temperature > 101° F	3	
		Urinary tract infection	2	
		Cellulitis	1	
		Decubitus	1	
		Pulmonary embolus	1	
3-4	Moderate	Extended hospitalization	8	20
		Urinary tract infection	5	
		Hemorrhage with transfusion	2	
		Decubitus	1	
		Hemothorax	1	
		Pleural effusion	1	
		Pyelonephritis	1	
		Pneumonitis	1	
5-6	Severe	Death	1	1

Infections were common for patients in each of the categories. Urinary tract infections were sustained by patients in three of four categories and accounted for the majority (75%) of infections. As the protein-calorie malnutrition index increased so did the severity of the infection. Infections ranged from cystitis in a patient with an index of 0 to pyelonephritis and pneumonitis in patients with an index of 3 to 4.

Hemorrhage requiring transfusion was a complication sustained only by patients with a protein-calorie malnutrition index of 3 to 4 indicating moderate malnutrition. Decubiti were sustained by patients with mild malnutrition as well as patients with moderate malnutrition.

Prehospital occurrence of conditions identified as complications was recorded for almost one fourth (24%) of the 100 subjects. Each of those patient records contained a recorded infection as part of the admission diagnosis. Of those 24 patients with infections at time of admission, 18 (75%) had less than normal nutritional status indicated by a protein-calorie malnutrition index of 1 to 5. Death occurred in the one (100%) severely malnourished patient admitted with sepsis pneumonia.

The majority (63%) of subjects had no reported complication. Thirty-seven of the 100 subjects sustained one or more of a total of 52 complications.

The mean length of hospitalization recorded in days for the 100 subjects studied was 6.02 ($\underline{SD}$ = 4.23). The mean length of hospitalization among all patients, patients with complications (excluding extended hospitalization), and patients without complications is presented in Table 8.

Table 8

Mean Length of Hospitalization, in Days, Among All Patients, Patients Without Complications, and Patients With Complications, Excluding Extended Hospitalization (n = 100)

Patients	M	SD
All	6.02	4.23
Without Complications	5.31	2.98
With Complications	9.41	7.06

There was a significant difference (t = 2.35, df = 17.02, p = 0.031) between length of hospitalization for patients who sustained complications, excluding extended hospitalization (M = 9.41, SD = 7.061), and for patients who sustained no complications (M = 5.31, SD = 2.98). No significant difference (F = 0.32, p = 0.72) was found, however, among the indices and length of hospitalization in patients who sustained complications. There was no significant difference (F = 1.30, p = 0.27) among the indices and length of hospitalization in patients who sustained no complications.

Nurse Reported Nutritional Referrals

For 100 subjects, 63% of whom had some degree of malnutrition on admission, no nurse referrals were recorded in the patients' records throughout the hospitalization. Referral data were not available from the dietary department.

Additional Data

Additional information was sought regarding recorded height and weight, nutritional assessment, nutritional history, nutrition intake, and nutritional status. The subjects' records predominately contained estimated rather than actual admission height (59%) and weight (54%). Less than the majority of records contained actual admission height (19%) and weight (31%). Many records contained no note of admission height (22%) or weight (15%). Serial weights were recorded in few (10%) patients' records. Records containing serial weights predominately (90%) contained written physicians' orders for daily weights. Usual weights were recorded in few (22%) patient records at time of admission.

Nutritional assessments predominantly (83%) were not recorded in the patient's records. The majority (94%) of nutritional assessments which were recorded were in the form of nursing admission assessment checklists. One (6%) nutritional assessment was recorded by a dietitian.

No nutritional histories were recorded for the 100 subjects studied. Comments regarding nutrition intake were predominantly (92%) recorded in the nurses' notes. Few records contained calorie counts (1%) or comments regarding tube feeding (1%). The patients' records predominantly (94%) contained comments in the nurses' notes regarding nutrition intake.

Comments regarding nutritional status were recorded in less than the majority (45%) of the patients' records and when recorded, the comments were predominantly (75%) instructions for special diets. Less than the majority (25%) of dietitians' comments were in response to physicians' orders.

Among patients with admitting diagnoses that included malnutrition, actual weights were recorded on two of three (67%) patients at time of admission. Usual weights at admission and serial weights during

hospitalization were not recorded for either of the three patients; neither were nutritional histories. Nutritional assessment, recorded on an admission standardized form, consisted of a one word comment for each patient: "inadequate," "dentures," and "adequate," respectively. The only other comment regarding nutritional status was the physician's notation in one patient's progress notes that the patient was "losing weight." Records of nutrition intake consisted of comments in the nurses' notes such as "ate all" and "took one half of diet."

Four patients' records contained diagnoses including weight loss. Of those four, one (25%) had actual height and weight recorded at time of admission. The other three patients had estimated weight only recorded, with no usual weight or serial weights during hospitalization. Neither nutritional assessments nor nutritional histories were recorded for any of the four patients. Calorie counts were recorded on one patient's record in response to the physician's order. Nutrition intake in the other three records was indicated by comments such as "ate one fourth," ate all," or "refused diet" in the nurses' notes. The only other comments regarding nutritional status were recorded in the progress notes by the physician and consisted of statements such as "51 pound weight loss over 2 to 3 months," "50 pound weight loss in 3 to 4 months," "50 pound weight loss in 3 years," and "history of weight loss."

Summary

Of 100 patients studied, 63% achieved protein-calorie malnutrition indices indicating mild, moderate, or severe protein-calorie malnutrition at time of admission to the hospital. While 63 had no reported complications, 37 of the 100 subjects sustained 1 or more of 52 complications in eight categories. Of the patients sustaining complications, 79% had

less than normal nutritional status on admission when classified according to a protein-calorie malnutrition index. No nurse referrals were recorded in the patient's records.

CHAPTER V

Summary, Findings, Discussion, Conclusions, and Recommendations

Summary of the Study

A descriptive ex post facto design was utilized to study two problem questions: (a) what are the complications sustained by patients with protein-calorie malnutrition classified according to a protein-calorie malnutrition index, and (b) of patients classified by a protein-calorie malnutrition index, how many have nurse reported nutritional referrals? The conceptual framework for the study was derived from constructs of Orem's (1985) self-care deficit theory of nursing and from the physiological events of malnutrition (Weinsier & Butterworth, 1981). The random sample consisted of 100 medical and surgical patients between the ages of 20 and 65 years with no record of immunosuppressive drug intake. Demographic and biochemical data were recorded on the study worksheet. Biochemical data were later organized according to a protein-calorie malnutrition index. Descriptive statistics were used to analyze the data.

Presentation of the Findings

The findings of the study are presented in relation to the problem questions. Findings were as follows:

1. No reported complications were sustained by 63 (63%) subjects; however, of 37 subjects sustaining 1 or more of 52 complications across eight categories, 41 (79%) complications were sustained by

patients with some degree of malnutrition when classified according to a protein-calorie malnutrition index.

2. The complications sustained by patients with malnutrition classified according to a protein-calorie malnutrition index were: (a) extended hospitalization (54%), infection (21%), hematological disorders (7.7%), temperature greater than 101 degrees Fahrenheit (7.7%), decubiti (4%), atelectasis (2%), pleural effusion (2%), and death (2%).

3. Of 100 subjects, 63% with some degree of protein-calorie malnutrition on admission according to a protein-calorie malnutrition index, none had recorded nutritional referrals by nurses.

4. An additional finding was prehospital occurrence of infection in 24% of admitting diagnoses; of those, 75% had mild to severe protein-calorie malnutrition on admission according to a protein-calorie malnutrition index.

5. Additionally, there was a significant difference (t = 2.35, df = 17.02, p = 0.031) between length of hospitalization for patients who sustained complications, excluding extended hospitalization (M - 9.41, SD = 7.06), and patients who sustained no complications (M = 5.31, SD = 2.98).

6. Additional findings of recordings relative to nutritional parameters were: actual admission height (19%), actual admission weight (31%), usual weight (22%), serial weights (10%), nutritional assessment (17%), nutritional history (0%), calorie count (1%), nutrition intake (97%), and nutritional comments (45%) recorded in patients' records.

7. Additional findings of patients with admission diagnoses of malnutrition were: actual admission weight (67%), usual weight (0%), serial weights (0%), nutritional history (0%), nutritional assessment checklists (100%), and nutrition intake (100%) recorded in patients' records.

8. Additional findings of patients with admission diagnoses of weight loss were: actual admission height and weight (25%), usual weight (0%), serial weights (0%), nutritional assessment (0%), nutritional history (0%), and nutrition intake (100%) recorded in nurses' notes and comments regarding nutritional status (100%) recorded in physicians' progress notes.

Discussion

Findings Related to the Review of Research

None of the studies cited in the review of research were concerned specifically with complications and nutritional referrals of patients classified according to a protein-calorie malnutrition index. Nevertheless, similarities and differences can be seen between the findings of the present study and the findings of previous research.

Seltzer et al. (1979) reported infection, postoperative hemorrhage, lower extremity phlebitis, pneumothorax, and death as complications identified. Similarity of nutritional measures and subjects may have accounted for the similarity between complications of the former study and those of the present study.

Anderson and Wochos (1982) reported complications in addition to similar ones reported in the present study. Different complications that were identified are perineal fistula, infected nephrolithiasis, prostatitis, hepatitis, and a viral upper respiratory infection. Differences in the reported complications are not surprising since renal failure was present in 39 of the 47 patients in the former study.

Warnold and Lundholm (1984) reported that four of five deaths occurred in a group of malnourished patients from a sample of noncancer

surgical patients. The difference between the frequency of death reported in that study and the present study may be accounted for by the dissimilarity of subjects.

In both the present study and the Jones et al. (1985) study, similar complications were reported. Sepsis, respiratory failure, and death were reported in the former study. Sepsis and respiratory failure were reported as a prehospital occurrence, with death being the ultimate complication after admission for one patient in the present study.

Complications reported in a 1987 study (Mughal & Meguid) included septicemia, pancreatitis, intraabdominal abscess, small bowel obstruction, protracted ileus, wound infection, wound dehiscence, urinary tract infection, and cardiopulmonary conditions occurring in patients undergoing major gastrointestinal surgery for benign disease. Differences in the subjects studied may have accounted for the dissimilarity between the complications reported in the former and the present study.

Warnold and Lundholm (1984), Jones et al. (1985), and Robinson et al. (1987) reported extended hospitalization in patients who were malnourished. Similarities between those studies and the present study are not surprising considering the number and severity of complications sustained by patients in all of the studies.

No studies were found in the review of research literature addressing nurse nutritional referrals. Therefore, no comparisons to the present study can be made.

Findings Related to the Conceptual Framework

Orem's Self-Care Deficit Theory of Nursing. According to Orem's self-care deficit theory of nursing (1985), health-deviation self-care requisites are associated with human structural and functional deviations such as those existing in the malnourished patient who is ill, injured,

or undergoing medical treatment. Investigating, understanding, and judging what can and should be done are necessary in order to meet self-care requisites (Orem, 1985).

Self-care deficits exist when self-care is not adequate to meet the self-care requisite. Self-care deficits signal the need for nursing service (Orem, 1985).

Nursing systems are a product of nursing agency combined with methods of helping and are formed when nurses use their ability to prescribe, design, and provide nursing for legitimate patients. Nurse and patient roles are defined by methods of helping (Orem, 1985). Nurses are required to be well grounded in pathology and medical technologies if they are to be effective in assisting patients with health-deviation self-care requisites (Orem, 1985) that exist in protein-calorie malnutrition.

The finding of no recorded nutritional referrals by nurses in 100 subjects studied may be the result of informal contact between the nurse and dietitian that was not recorded in the patients' records. On the other hand, the finding may result from the inability of nurses to identify those patients with protein-calorie malnutrition, therefore being unaware of the need to prescribe, design, and provide appropriate care. Furthermore, the absence of nutrition referrals may result from the lack of explication of the nurse's role in nutrition care of patients with actual or potential malnutrition.

The absence of nutritional histories and comments relative to nutritional status by nurses; a lack of quantity and quality of nutritional assessments; and the general omission of actual height, weight, and usual weight at admission, and serial weights throughout hospitalization, may result from inadequate knowledge of pathology and medical technologies. This paucity of recorded information reflecting a lack of investigation

may also be the result of inadequate understanding and judgment of what can and should be done to meet self-care requisites.

In view of these findings, it is proposed that a theoretical construct is missing from Orem's (1985) self-care deficit theory of nursing. Orem identified two patient variables, self-care agency and therapeutic self-care demand, and one nurse variable, nursing agency. Nursing agency is analogous to self-care agency (Orem, 1985). It is further proposed that a second nurse variable, nursing deficit (analogous to self-care deficit), exists when nursing agency is inadequate to meet the therapeutic self-care demands of individuals.

Protein-Calorie Malnutrition. The complications sustained by patients with protein-calorie malnutrition can be related to somatic and/or visceral protein depletion. The most severe complication, death, was sustained by 1 of the 100 subjects studied. This patient exhibited a protein-calorie malnutrition index of 5, indicating severe protein-calorie malnutrition at time of admission. The patient died of cardiopulmonary arrest during the day of admission. Complications such as cardiopulmonary arrest can be related to the loss of skeletal and cardiac muscle mass accompanying malnutrition (Mughal & Meguid, 1987).

Infections and fever can be related to defects in the immune system (Sauberlich, 1984). There is ample evidence that all three defense systems, mechanical, cellular, and humoral, are impaired in protein-calorie malnutrition (Weinsier & Butterworth, 1981).

Hematological complications can be related to inadequate visceral protein compartments in hematopoietic organs. Demands posed on these compartments may negate the ability to maintain hemostasis (Blair et al., 1980).

Impaired structural integrity occurring in decubiti may be related to the discrepancy between the supply of essential nutrients and calories and the tissues' specific demand for them (Stotts, 1982). Respiratory complications such as atelectasis and pleural effusion may result from the loss of skeletal muscle as well as impaired hypoxic ventilatory responses (Mughal & Meguid, 1987).

Implications

Considerations for practice and education are derived from the findings of this study. Implications are presented in the following discussion.

Patients who have sustained or are at risk for sustaining complications or protein-calorie malnutrition may be identified by standardized screening of nutritional parameters. Serum albumin levels and total lymphocyte counts are available for most patients shortly after admission to the hospital, are a simple tool to use in the identification of patients at risk for complications of protein-calorie malnutrition, and pose no additional cost to the patient.

After persons have been identified through a screening process, more comprehensive nutritional assessments can be made and nurse referrals initiated. According to the standards by which nurses practice, assessment (screening) and prescriptions (referrals) are within the legal and ethical boundaries of nursing. Screening of every patient admitted to the hospital and nutritional referral of patients with less than normal nutrition should be viewed as integral to professional nursing practice.

Identification of patients who have sustained or are at risk for sustaining complications of protein-calorie malnutrition and appropriate nurse referral offers a substantial potential for improving nutrition care in hospitals in a way that can be measured in economic as well as

clinical markers. Nutritional intervention may benefit the hospital as well as the patient in terms of incidence of complications, length of hospitalization, and the total cost of care.

Role relationships among nurses, dietitians, and physicians in regard to nutrition care should be explicated. Basic data relative to the patient's nutritional status could thus be collected, recorded, and utilized by all health care professionals.

Emphasis on nutritional concepts in schools of nursing curricula could increase nurses' awareness of nutritional needs and facilitate the identification of patients who are at risk for sustaining complications of protein-calorie malnutrition. A theoretical base could thus be established for prescribing, designing, and providing appropriate care to meet self-care requisites.

Conclusions

Conclusions of the study were derived from the findings. The conclusions were as follows:

1. The majority of patients sustained no complications; however, the predominance of complications sustained was by patients with some degree of protein-calorie malnutrition.

2. Complications existed in patients with protein-calorie malnutrition predominantly as extended hospitalization and infections. Other complications sustained by patients with protein-calorie malnutrition included hematological disorders, fever, decubiti, atelectasis, pleural effusion, and death.

3. No nurse reported nutritional referrals were recorded in the patients' records.

4. The majority of patients who sustained infections prior to admission had mild to severe malnutrition according to a protein-calorie malnutrition index.

5. Patients who sustained complications had a significantly longer hospitalization than patients who sustained no complications.

6. Nurses did not generally record data relative to nutritional status. Examples of nutritional data frequently omitted were actual height and weight at time of admission, usual weight at time of admission, serial weights during hospitalization, nutritional assessments, nutritional histories, and comments relative to nutritional status.

7. Nurses did not record data relative to nutritional status for patients whose admitting diagnoses included malnutrition.

8. Nurses did not record data relative to nutritional status for patients whose admitting diagnoses included weight loss.

Recommendations

Based on the findings, discussion, and conclusions of this study, it is recommended that:

1. This study be replicated in several different geographic locations and hospital settings to test situation-specificity and validity of the findings.

2. A study be conducted to examine the relationship between protein-calorie malnutrition indices and complications sustained by patients.

3. A study be conducted to examine the relationship between protein-calorie malnutrition indices and extent of hospitalization.

4. Further studies of factors contributing to protein-calorie malnutrition be investigated.

5. A longitudional study be conducted to examine the occurrence of protein-calorie malnutrition subsequent to admission.

6. Cost studies be conducted to examine differences in hospital costs, per day and per stay, between patients who are well nourished and patients who are malnourished.

7. A study be conducted to examine the nutritional status of patients who develop nosocomial infections.

8. A study be conducted to examine the nutritional concepts that are taught in schools of nursing.

9. A study be conducted to describe nutritional assessment techniques nurses report using and nurses' rationale for using or not using nutritional assessment techniques in practice.

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APPENDIX A

Data Collection Tool

Patient Profile

Age: _____

Race: Caucasian _____ Black _____ Other _____

Gender: Female _____ Male _____

Date of Admission: _____

Date of Discharge: _____

Diagnosis: _____

Medical _____ Surgical _____

Recorded complications: Temp. greater than 101° F _____

Other: _____

Adm. Ht: Actual _____ Est. _____ Usual _____ Not Rec. _____
Adm. Wt.: Actual _____ Est. _____ Usual _____ Not Rec. _____

Serum albumin: _____

TLC: % lymphocytes _____ WBC _____ TLC _____

Protein-calorie malnutrition index _____

Nurse reported nutrition referral: yes _____ no _____

Nutritional assessment: yes _____ no _____

If yes: nurse _____ dietitian _____ physician _____

Nutritional history: yes _____ no _____

If yes: nurse _____ dietitian _____ physician _____

Nutritional intake: yes _____ no _____

If yes: Calorie count _____ Tube feeding _____
Hyperalimentation _____ Other _____

Comments of nutritional status: yes _____ no _____

If yes: nurse _____ dietitian _____ physician _____

Dietary instruction: yes _____ no _____

If yes: nurse _____ dietitian _____ physician _____

APPENDIX B

Protein-Calorie Malnutrition Index

Protein-Calorie Malnutrition Index

Score	0	1	2	3
S-Alb. (gm/dl)	≥3.5	< 3.5-3.0	<3.0-2.5	<2.5
TLC ($/mm^3$)	≥ 1,800	<1,800-1,500	<1,500-900	<900

A sum of the two scores yields an index of 0 to 6.

An index of 0 indicates normal nutrition, 1 to 2 indicates mild protein-calorie malnutrition, 3 to 4 is indicative of moderate protein-calorie malnutrition, and 5 to 6 indicates severe protein-calorie malnutrition.

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