To the Graduate Council:

I am submitting herewith a dissertation written by Louise Patricia Grant entitled "Nutrition Education Intervention and Substance Abuse Treatment Outcomes". I have examined the final paper copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Human Ecology.

Dileep S. Sachan, Major Professor

We have read this dissertation
and recommend its acceptance.

Accepted for the Council:

Vice Chancellor and Dean of
Graduate Studies

Nutrition Education Intervention and Substance Abuse Treatment Outcomes

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Louise Patricia Grant

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Dedication

This dissertation is dedicated to the memory of my late father, Thomas Zang, and to my stepmother, Mary Zang whose example, encouragement, and support laid the foundation for my educational pursuit and achievement.

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Abstract

The objectives of the current research were to assess the use and extent of nutrition intervention in Department of Veterans Affairs (VA) substance abuse treatment (SAT) programs and to determine an association between nutrition intervention and SAT outcomes. The research was divided into three parts. A descriptive, single, cross-sectional survey was developed and tested to measure associations with nutrition services and changes in Addiction Severity Index (ASI) domains. Nutrition services most likely to be offered included nutrition screening, nutrition assessment, nutrition education, drug-nutrient interaction instruction, meal service, individualized supplemental feedings and physician-prescribed vitamin/mineral supplementation. Positive associations between individualized and group-nutrition SAT education were noted with psychological, medical and family/social ASI domains ($P<0.05$). Vitamin/mineral supplementation per dietitian recommendation was noted to be associated with the alcohol domain and food preferences was associated with the employment domain ($P<0.05$). Programs that offered group nutrition education tended to offer significantly more nutrition services to patients ($P<0.01$).

The second phase of the current research was to determine if an association existed between patient participation in nutrition education and patient-specific SAT outcomes. For this a descriptive, retrospective, cohort review was conducted with a random sample of medical records (n=77) for patients with primary diagnoses of alcohol dependence, alcoholism, or alcohol withdrawal admitted to a VA outpatient SAT program during a two year period. Dependent measures were days abstinent, number of

days to first drink, number of drinking days, number of non-drinking days and ratio of drinking to non-drinking days. Subjects were grouped according to participation in group nutrition education, individualized nutrition education, both group and individualized nutrition education or no nutrition education. Days to first drink was significant ($P<0.05$), but this significance dissipated when controlled for length of stay. There were no significant differences among substance abuse treatment outcome measures with type of nutrition education.

Finally, substance abuse treatment outcomes of the outpatient setting were compared with those of a random sample of medical records of patients enrolled in a residential setting (n=88), again grouping subjects by group, individualized, both group and individualized or no nutrition education. Subjects in each sample were sufficiently similar to allow comparisons. Far fewer outpatients as a percentage of the population were exposed to nutrition education than were residential patients. Substance abuse behaviors were similar between programs, but outcome measures were significantly different within programs. Associations between days abstinent, days non-drinking and days drinking: non-drinking days ratio were detected with participation in nutrition education, particularly group nutrition education ($P<0.05$).

Some overall inferences may be drawn as a result of this study. Nutrition services offered to patients enrolled in SAT programs, both outpatient and residential based, tended to vary greatly between programs. Substance abuse treatment programs that offered nutrition education offered a significantly ($P<0.05$) greater depth of nutrition services overall, and tended to display more positive changes in program-based outcome indicators. Nutrition education should be included as a component in residential

substance abuse treatment programs. Greater effort to incorporate nutrition education into outpatient SAT programs may be warranted.

Key Words: Nutrition, education, substance abuse, treatment, alcohol, alcoholism.

Preface

As an aid to the reader, a description of the organization of this dissertation follows. Part I contains an introduction to the study topic, a review of the literature, and an outline of the study purposes. Parts II, III, IV, and V contain study methodology and results, written in journal style as 4 articles submitted or to be submitted for publication. Parts II and III are reports of the study involving survey methodology. Parts IV and V represent a two-stage descriptive, retrospective cohort study, the results of which have been separated for convenience of the reader. Part VI presents a theoretical framework for future research based upon results of the current research. Finally, the appendices provide copies of all materials, instruments, and questionnaires used in the study.

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Part I:

Introduction, Review of the Literature, and Study Purpose

INTRODUCTION

Chronic alcoholism is the most common cause of malnutrition in the western world (1). The multi-factorial nature of the disease has produced a wealth of research in an attempt to identify those interventions that produce best outcomes in alcohol treatment. In the past, substance abuse treatment models placed an emphasis upon psychosocial treatment for alcoholism with subsequent emphasis on pharmaceutical adjunct therapy (2). Most recently, the role genetics plays in the risk of alcoholism has been acknowledged (3). Still, only a small portion of scientific papers produced on the subject have been devoted to the role that nutrition may play in treatment (4).

Alcohol use problems are reported to cost more than 100,000 American lives and $184.6 billion each year (3). The portion of the American population that consumes alcohol on a regular basis represents more than 95% of the total alcohol consumption in the country (5, 6).

The substance alcohol has the unique ability to affect nearly every organ and system in the body. It is ingested on a regular basis by about two-thirds of the American population with more than 17.6 million reported abusing or dependent on alcohol (7). Evidence compiled over the last 30 years clearly points to the toxic effects of alcohol on organ systems with secondary malnutrition furthering the continuing physical and mental deterioration of the active alcoholic. The properties of alcohol are three-fold. As a nutrient, alcohol contains 7.1 kcal/g and is readily oxidizable by the body, accounting for 5.6% of the total kilocalories in the average American diet. For those considered "social drinkers" alcohol constitutes about 10% of the available kcal, and it represents greater than 50% of the kcal of heavy drinkers. Alcohol is the most commonly used

psychoactive drug, leading to behavioral changes, family, social and environmental problems, and ultimately to physical dependence. Finally, alcohol, with its main metabolite, acetaldehyde, is a toxic substance affecting every organ in the body (8).

The physical nature of alcohol and its effect on nutrient absorption and metabolism has been well documented (9, 10). Brain damage induced by chronic alcoholism could be a direct result of nutrition deficiencies, particularly of thiamin, vitamin B12, nicotinamide and pyridoxine (11). Nutrition status generally improves with abstinence from alcohol (12). It is known that changes in nutritional status and metabolism of nutrients are significantly associated with the development and progression of alcoholic liver disease (13). Interestingly, however, detoxification followed by abstinence and a normal nutritional intake is considered by many alcohol treatment programs to be sufficient to attain an optimal nutritional status for the alcoholic in recovery.

The main goal of alcohol treatment is to help the alcoholic maintain sobriety. Several major approaches to the treatment of alcohol now exist including motivational, disease, cognitive-behavioral, cognitive, psychodynamic and family-group therapy models (14). But there is only limited research towards the benefits of nutrition intervention during alcohol treatment. Diet modification and multi-vitamin/mineral supplements together were shown to significantly improve alcohol treatment outcomes (15, 16). Nutrition education during treatment has been shown to have some benefit (17, 18). However, these studies did not isolate treatment interventions and thus did not identify which aspect(s) of intervention had greater effect, or if the outcome was the result of the sum total of the interventions. Tempesta and others (19) demonstrated a

significant improvement of memory test performance with acetyl-L-carnitine supplementation, but no relationship with treatment outcomes was explored. Nutrition intervention can take many forms in substance abuse treatment, including nutrition supplementation, nutrition support, dietary modification, and/or nutrition education.

To date there has been no attempt to describe the scope and extent of nutrition interventions provided within substance abuse treatment, nor has there been any research that attempts to describe what relationships exist with substance abuse treatment outcome measures.

This study will be the first to assess the scope and extent of nutrition intervention within the context of alcohol-focused substance abuse treatment programs that are part of a large healthcare system, and to identify what relationships exist between standardized substance abuse treatment outcomes and the delivery of nutrition interventions. A review of the published literature relevant to the context of this study follows.

REVIEW OF THE LITERATURE

This review of literature summarizes research relevant to the direction of the current study. The review begins with an introduction of the mechanisms of alcohol metabolism. This is followed by a discussion of the nutritional implications of the metabolic consequences of alcoholism and alcohol dependence; the characteristics of alcohol treatment, and desired treatment outcomes. Finally, the role nutrition intervention may play in alcohol treatment is addressed. Following the review of literature, the purpose of the current study is discussed, and specific research questions are outlined.

Alcohol metabolism. Following ingestion alcohol (ethanol) is readily absorbed by passive diffusion, primarily through the small intestine. The rate of absorption depends on genetic and environmental factors that are highly variable and include volume, concentration, type of alcoholic beverage, drinking rate, fed or fasted state, nature of food consumed, rate of gastric emptying and gender differences.

Metabolism of alcohol occurs through of multiple pathways. The "first-pass" metabolism occurs when alcohol is oxidized in the gastrointestinal tract. Alcohol is oxidized in the liver and it is also peroxidized by catalase. Finally, there is a non-alcohol dehydrogenase pathway known as the microsomal ethanol oxidizing system (MEOS) (20).

First pass metabolism is accomplished by several different forms of alcohol dehydrogenase (ADH) existing in the stomach and lining of the gastric mucosa. One of these, the σ ADH is thought to account for nearly 50% of ADH activity in the stomach and is primarily responsible for the gastric first pass metabolism (21). By far, the majority of alcohol dehydrogenase activity occurs hepatically, primarily in the cytosol of liver parenchymal cells. The first metabolite of alcohol metabolism, acetaldehyde crosses the mitochondrial inner membrane where it is oxidized by a mitosolic aldehyde dehydrogenase to form acetate (Figure 1). Acetate is further oxidized to carbon dioxide and water by extra hepatic tissues. Sixteen mols of ATP are generated per mol alcohol in the ADH pathway.

Seven ADH genes have been identified to date, which are divided into five major gene classes (I through V). Class I, Class II and Class IV isoforms are considered the most important for human alcohol metabolism. The types of alcohols these ADH isozymes

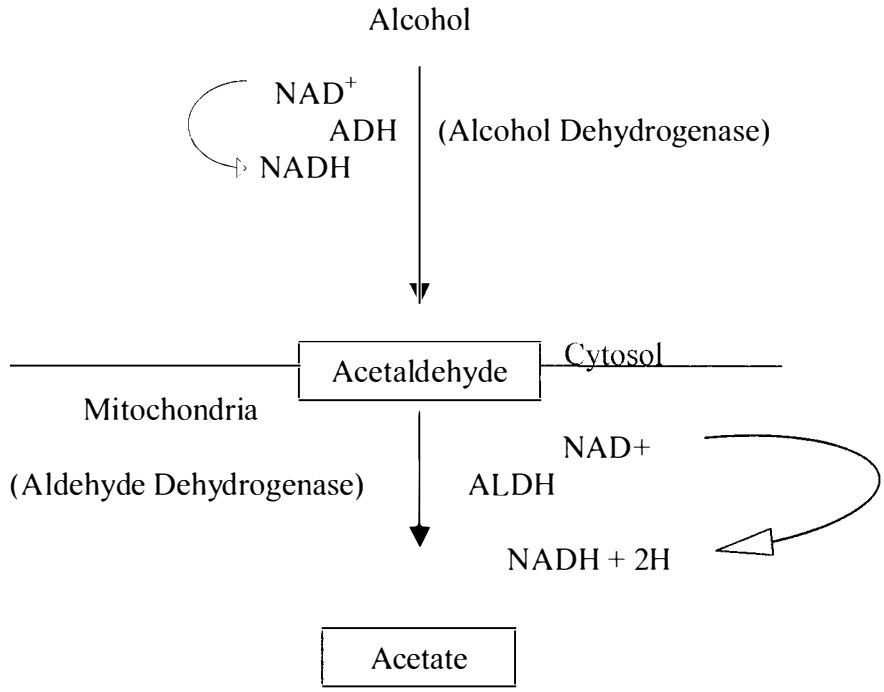

Figure 1 Alcohol dehydrogenase (ADH) pathway

preferentially metabolize vary, as does the alcohol oxidation rate of each, thus contributing to the large variance (three to fourfold) in alcohol elimination rates observed in humans. A genetic polymorphism of the ALDH gene that significantly alters the rate of acetaldehyde oxidation has been observed in about half of East Asian populations. Individuals possessing the ALDH2*2 allelic variant typically have practically no acetaldehyde oxidizing activity and are greatly sensitive to alcohol intake. Alcohol ingestion will result in facial flushing, increased skin temperature and heart rate (22). Fasting significantly reduces the liver content of ADH. It also reduces activity of gastric ADH. Individuals drinking after fasting can be expected to have much higher blood levels of alcohol as a result (23).

The rate of alcohol peroxidation by catalase, a cytosolic and peroxisomal enzyme, is limited by the supply of hydrogen peroxide and represents about five percent of all alcohol oxidation (24). It has been suggested that catalase may be important in the production of brain acetaldehyde (25).

The microsomal ethanol-oxidizing system (MEOS) is located in the endoplasmic reticulum of the mitochondria. MEOS utilizes cytochrome P-450, NADPH and O_2. The activity of MEOS appears to increase after high levels of alcohol consumption and involves CYP2E1(2E1). This cytochrome P-450 is known to act as a catalyst for the metabolism of alcohol, but is also a catalyst for other drug detoxification activities (20).

As alcohol and acetaldehyde are oxidized, both cytosolic and mitochondrial NADH/NAD ratios increase. Cytosolic NADH/NAD increases result in increases in lactate/pyruvate ratios. Impairments in gluconeogensis, hyperuricemia and collagen deposition result. The increasing NADH/NAD mitochondrial ratio results in an increased B-hydroxybutyrate/acetoacetate ratios and subsequent ketoacidosis, decreased fatty acid oxidation and an impaired citric acid cycle (24, 26). The abnormally high mitochondrial NADH/NAD ratio results in the suppression of other oxidation reactions that normally transfer hydrogen molecules to NAD. Instead these reactions continue by transferring hydrogen to oxygen. This reduction of oxygen produces reactive oxygen species (ROS) and leads to oxidative stress (27). Hypertension, a state of heightened oxidative stress, may result from the pro-oxidant effects of alcohol.

Metabolic consequences of alcohol abuse and alcohol dependence.

Alcoholism is defined as "a primary, chronic disease with genetic, psychosocial, and environmental factors influencing its development and manifestations. The disease is

often progressive and fatal. It is characterized by impaired control over drinking, preoccupation with the drug alcohol, use of alcohol despite adverse consequences, and distortions in thinking, most notably denial. Each of these symptoms may be continuous or periodic" (28).

A dose response relationship has been established between alcohol intake and increased risk for mouth and oropharyngeal, oesophageal, liver and breast cancer, unipolar major depression, epilepsy, hypertension, hemorrhagic stroke, cirrhosis of liver (29). In a study of the effects of the ingestion of oral alcohol with food on the function of the upper digestive tract, Jian and others (30) observed a marked delay of gastric emptying of solid foods, a delay of lipase secretion, a reduced bile salt secretion from the second postprandial hour onwards, and a significantly great postcibal gastrin release. The production of acetaldehyde by the first pass metabolism of alcohol in portions of the gastrointestinal tract, specifically the esophagus, stomach and colon, may lead to tissue injury and may contribute to carcinogenesis in the alcoholic (21). Heavy alcohol intake can cause a toxic action on the small intestine. Disaccaridase deficiency can induce lactose intolerance and impair water and electrolyte absorption. Cramping, abdominal pain and diarrhea are usually the result (31). A reduced secretion of gastric acid in alcoholics could contribute to the overgrowth of jejunal bacteria and an increased susceptibility to endotoxins (10).

Given that the major portion of alcohol metabolism occurs hepatically, liver disease is the leading physical complication due to alcoholism. Three phases of liver disease include fatty liver, inflammation of the liver or alcoholic hepatitis, and cirrhosis, or scarring of the liver. Fatty liver develops in 90% of all alcohol abusers resulting from

excess accumulation of acetylaldehyde, which forms covalent bonds with proteins. This leads to the formation of acetylaldehyde-protein adducts, which occurs with collagen and with phospholipids (32). However, fatty liver is usually reversible with abstinence. Cirrhosis of the liver develops in 15%-20% of all chronic alcoholics and is the 7th leading cause of death among young and middle-age adults in the United States (33). It's not uncommon to see patients have more than one type of liver disease simultaneously. The death rate of those with both alcoholic hepatitis and cirrhosis is more than 60% over a four-year period. Most recently investigators have focused on the potential for cytokine imbalances to affect the course of alcoholic liver disease (3).

Bone protein metabolism is also altered in alcoholics. Chronic alcohol consumption appears to induce osteoporosis and osteopenia, suggesting an imbalance occurs between deposition rates of bone matrix and its resorption (34). The fluidity of cell membranes is adversely affected by constant exposure to high levels of ethanol. Intrinsic membrane proteins affected include enzymes, receptors and cytoskeletal elements. The membrane attempts to compensate by increasing cholesterol content and the proportion of saturated fatty acids (35). Alcohol readily crosses the blood-brain barrier, and in non-alcoholics intoxication occurs at blood alcohol levels of 10-35 mmol/l. Alcoholics have been known to remain sober at blood alcohol levels of 90-110 mmol/l (36).

It has been observed that alcohol dependent individuals tend to crave sweets, particularly when the craving for alcohol is at its greatest (37). Alcohol becomes the preferred food as a result of its ability to produce immediate signals that nutrients are being provided. There is an immediate release of insulin that promptly makes circulating

nutrients available to cells. There is positive feedback to the brain that key nutrients are being provided through an increased availability of calories, and alcohol directly stimulates neurons that convey the status of glucose and other nutrients to the brain

Essentially, no organ or body system is left untouched by the adverse effects of chronic alcohol abuse. Its effects are realized at the cellular level with broad ramifications on the physical, psychological and nutritional status of the individual.

Effect of alcohol on nutritional status and nutrient metabolism. Alcoholism is generally associated with poor nutrition status, especially among hospitalized alcoholics (38). While frank nutritional deficiencies are rare among middle class alcoholics, selective nutritional deficiencies are observed among lower class, particularly homeless alcoholics (39).

In a sample of 250 alcoholics Estruch and others (40) observed that 10% of the subjects had calorie malnutrition, 6% had protein malnutrition and 2% had protein-calorie malnutrition. In an effort to define the specific influence of malnutrition on the cellular damage caused by alcoholism Palencia and others (12) studied the effect of reinstituting proper nutrition after alcohol withdrawal in rats. Results of hematological and histological findings showed that chronic alcoholism induced a mean 31% deviation and malnutrition induced a 17% deviation as compared to well-fed non-alcoholic controls. The combination of both alcoholism and malnutrition resulted in a 52% deviation. Withdrawal of alcohol resulted in a 13% improvement and institution of proper nutrition resulted in a 5% improvement. In animals with both alcohol and malnutrition a 26% improvement was noted with both withdrawal of alcohol and proper nutrition. Discontinuing the alcohol, but maintaining the malnutrition, resulted in a 10%

improvement. Continuing the alcohol but providing proper nutrition resulted in a further decline of 8% already noted from the alcohol and malnutrition. These results suggest that malnutrition has an independent and somewhat difficult to reverse effect on the damage caused by alcoholism.

There are two types of malnutrition associated with alcohol: primary and secondary. Primary malnutrition is directly related to the shift in nutrient intake that occurs when calories from alcohol displace caloric intake from other nutrients. Secondary malnutrition arises when alcohol related diagnoses interfere with nutrient intake, absorption or metabolism. An eighteen percent malnutrition rate has been observed in chronic alcoholics who have no evidence of liver disease. These same subjects exhibited low body weight in 24% of the cases. A substantial portion also exhibited specific vitamin deficiencies directly related to alcohol consumption (1, 41). Other studies have demonstrated that generally alcoholics tend to consume the same number of calories as non-alcoholics, but that the amount of calories contributed by food tends to decrease substantially. Alcohol constitutes nearly half of the daily caloric intake for alcoholic liver disease patients, and the heavy drinker tends to obtain more than half of his/her daily calories from alcohol (42). Moderate drinkers appear to add the alcohol-derived calories to their normal dietary intake (43, 44).

Whenever alcohol represents a majority of the individual's daily nutritional intake, anthropometrics are shown to be significantly lower than normal (45). Weight loss is observed at when alcohol represents 50% or more of caloric intake. This appears to be related to the calorie wastage that occurs when a larger percent of ingested alcohol is metabolized through the MEOS pathway. Instead of the 16 mol ATP/mol alcohol

produced in the ADH pathway, the MEOS pathway yields only 10 mol ATP/mol alcohol. Mitochondrial damage caused by chronic excessive alcohol use tends to increase catecholamine secretion and uncouple oxidative phosphorylation resulting in greater inefficiencies in energy generation (8).

Alcohol's affinity for water affects the hydration status of the individual. With more alcohol consumption water is drawn from the cells into the interstitial spaces, causing dehydration and increased thirst (46). Addolorato and others (47) evaluated total body water content and the distribution of water in the intra- and extra-cellular compartments. A significantly higher extra-cellular/total body water ratio was found in alcoholics. It is thought these two factors could be associated with an increased risk for liver disease, hypertension and cardiovascular disease.

Alcohol increases nutrient requirements as a result of greater metabolic demands and tissue repair needs from the damage the toxin, alcohol, and its main metabolite, acetaldehyde, cause. The sensitivity or insensitivity of biochemical tests commonly used for assessing vitamin status in alcoholics requires care in the interpretation of results. Interpretation of biochemical measures must bear in mind what the test actually measures, particularly whether the metabolically inactive forms or analogues are determined in the assay. For example, methods now exist to accurately measure the circulating levels of the active forms of thiamine and pyridoxine as compared to previous methods that used indirect measures of red cell enzyme activities. This does not hold true for a number of other nutrients adversely affected by alcohol consumption. Alcoholics frequently exhibit normal circulating levels of vitamin A, yet their hepatic reserves are

severely depleted. Thus plasma and serum levels provide a false indication of vitamin A status (11).

Alcoholics tend to demonstrate decreased levels of pyridoxal-phosphate (PLP) and red cell folate. Mean serum homocysteine concentrations in chronic alcoholics have been observed to be double that of nondrinkers (48). Alcohol consumption decreases thiamine levels by 30-80%. Pyridoxine levels decrease by 50% and the availability of niacin is reduced by 30%. Alcohol interferes with dietary folate absorption and utilization and is reflected in elevated mean corpuscle volume (MCV) indicative of megaloblastic anemia. Deficient folate and pyridoxine levels are evidenced in siderblastic anemia (5). Inadequate thiamine intake accompanied by long-term alcohol exposure can result in the neurologic disorder known as Wernicke's encephalopathy (WE). Wernicke's encephalopathy has a known mortality rate of 10-20% in those not receiving treatment. Four enzymes, pyruvate dehydrogenase, α-ketoglutarate dehydrogenase, transketolase and branched-chain α-ketoacid dehydrogenase involved in the intermediary metabolism of alcohol, require thiamine pyrophosphate as a cofactor. Of those treated for WE about 25% never recover and need extended long-term care. About 20% recover completely. But almost all that survive appear unable to learn new information (36).

Alcohol affects the neurotransmitter production process in the brain. This is particularly true for the production of the neurotransmitter serotonin, which is produced from tryptophan. In order to enter the brain tryptophan requires the presence of carbohydrates. Alcohol initially increases, and then decreases brain serotonin levels. There is evidence that some alcoholics have naturally low serotonin levels predisposing

them to increasing alcohol consumption. Tryptophan supplements and controlled carbohydrate intake have been suggested as a component of alcohol treatment (49).

Urinary excretion of magnesium and zinc increase in alcoholics. Secondary malnutrition may be present due to maldigestion or malabsorption. Zinc is the most common mineral deficiency among alcoholics. Its bioavailability can decrease 60% without liver disease and 70% when alcoholic liver disease is present. In its mild form zinc deficiency presents with oligospermia, slight weight loss and hyperammonemia. More severe zinc deficiency is characterized by weight loss, alopecia, diarrhea, intercurrent infections, dermatitis, hypogonadism in males, and even death (39).

Iron and copper play an important role in the generation of a number of free radicals observed in both humans and animals after alcohol consumption. Reduced serum potassium levels are frequently observed. Vitamin E is thought to counteract hepatic lipid peroxidation and possibly protect the liver from alcohol-induced injury. Bjorneboe and others (50) observed that alcoholics with subnormal serum α-tocopherol demonstrated neurological scores indicative of cerebellar atrophy. The authors suggest anti-oxidants may play a protective role against central nervous tissue damage. Decreased plasma β-carotene levels have been found in alcoholics and are attributed to malnutrition and malabsorption. A balanced diet and abstinence from alcohol increases carotenoid absorption. While there is some value of β-carotene supplementation for liver disease the authors noted alcohol intake must be controlled because of possible hepatotoxic alcohol-β-carotene interactions (47).

Alcohol has a neurotoxic effect on the brain and results in central nervous system (CNS) disturbance or injury in 75% of alcoholics. Neurological impairment most

frequently observed includes those on tasks measuring abstract thinking, on memory capacity and on visuospatial processes. Poor health and/or additional CNS injuries appear to increase the presentation of these deficits (51). It has been recognized that an individual in substance abuse treatment must be capable of receiving new information and process it in such a way that it becomes integrated with existing knowledge and manifested in behavior changes

It is recommended that correction of nutritional deficiencies associated with alcoholism should be a component of immediate alcohol treatment (withdrawal and detoxification) and of sustained alcohol treatment for long-term maintenance of abstinence (52). Dietitians can play an important role to address the nutritional needs at different stages of the disease (53).

Achieving normal nutritional status and nutrient sufficiency in the recovering alcoholic. Typically alcohol withdrawal symptoms are a consequence of over activity of the autonomic nervous system. Severity of alcohol withdrawal symptoms increases with each episode of withdrawal. Alcohol withdrawal symptoms may commence between 6-48 hours after alcohol consumption ceases. Symptoms may include headache, tremor, sweating, agitation, anxiety and irritability, nausea, vomiting, increased sensitivity to light and sounds, disorientation and occasionally transient hallucinations. Symptoms may intensify and then diminish over the next 24 to 48 hours. About 5% of patients experience delirium tremens (DT's), which is characterized by severe agitation; tremor; disorientation; persistent hallucinations and increases in heart rate, breathing rate, pulse and blood pressure. Delirium tremens usually emerge 2-4 days after last alcohol use and may last for 3-7 days (54). If the withdrawing alcoholic is

likely to experience severe symptoms, withdrawal should take place in a hospital setting where pharmacotherapy for example, benzodiazepines, can be used to reduce the risk of seizure and control withdrawal symptoms (55).

Medical disorders may be present that complicate alcohol withdrawal for example, development of severe dehydration resulting from vomiting, diarrhea, sweating and fever. These patients may require intravenous fluids to correct fluid insufficiency. Others may experience excess water retention in blood and tissues where IV fluid administration may cause cardiac failure. Care during alcohol withdrawal is required to treat these disorders and to address nutritional deficiencies. Individuals undergoing alcohol withdrawal are often deficient in electrolytes, such as magnesium, phosphate and sodium, resulting in electrolyte disturbances leading to severe metabolic abnormalities. Electrolyte solutions containing these minerals are beneficial. Because low magnesium levels may lead to seizure or delirium, magnesium supplementation may help improve withdrawal symptomotology.

Patients in alcohol withdrawal may not be able to tolerate oral nutrition; therefore intravenous glucose may be administered for energy needs. Prior to such infusion, patients should have thiamine administered to prevent onset of Wernicke's syndrome resulting from depletion of thiamine reserves. Patients in withdrawal and in recovery will benefit with a 100 mg/d regiment of thiamine. Bridges and others (56) recommend thiamin IV dosages of 100-1500 mg/d divided as a bolus for 3-5 days followed with lower doses of 50-100 mg/d for three months or more.

Replacing the usual hypocaloric diet with an isocaloric diet (35 kcal/kg/d) together with alcohol withdrawal has been observed to stimulate insulin, inhibit glucagon

release and lower glycogenolysis much more than the effect of the hypocaloric diet alone (57). Supplementation with L-tryptophan to reduce sleep disturbance and depression in recovering alcoholics has been explored, but not demonstrated (58).

Nutrition assessment of alcoholics can be compromised by the unreliability of self-reports of alcohol consumption. It is estimated that 10%-15% under-report alcohol use (39). A study of self-reports of alcohol use upon admission (59) had a 97.1% agreement rate with collateral reports as compared to a 39.7% serum g-glutamyltranspeptidate (GGTP) sensitivity. At treatment follow-up of 15 months, correspondence between client self-report and collateral report decreased to 84.7% while agreement with blood chemistry values increased to 51.6%. Individuals who had more severe drinking problems, more previous treatments for substance abuse, higher levels of pretreatment drinking and significantly greater levels of cognitive impairment were more likely to have disparate results.

The presence of ascites and/or edema in the recovering alcoholic interferes with assessment of lean body mass. Three consecutive 24 h creatinine excretions have been found to be a useful measure of nutritional status. To achieve a positive nitrogen balance protein intake above 1.2 g/kg/d appears to be necessary along with supplementation of thiamine, folic acid, vitamin D, vitamin E, magnesium and zinc, particularly for patients with alcoholic liver cirrhosis. The use of diet recalls, body weight measurements (without ascites or edema), or in combination with a determination of lean body mass by three consecutive 24-h creatinine collections has been recommended (59).

Markowitz and others (61) suggest that the ease, safety and inexpense of multiple vitamin therapy indicate that it is sound medicine to administer to recovering alcoholics.

They suggest using a comprehensive multivitamin with minerals, that contains at a minimum, B-complex vitamins with 100 mg riboflavin, 100 mg thiamine, 1 mg folic acid, 1-3 mg pyridoxine, 6-12 mg vitamin B-12, 10-50 mg ascorbic acid containing 175-500 mg cholecalciferol (vitamin D), 100-400 mg for mild hypomagnesemia, 5-50 ug selenium and standard amounts of oral zinc. Antioxidant factor supplementation is recommended for patients with alcohol-related chronic pancreatitis (62). Oral administration of S-Adenosyl Methionine (SAMe) has been found to restore normal hepatic function in the presence of alcoholic chirrhosis (63). Lu (64) has noted that 1.2 g/d oral SAMe supplementation resulted in a significant improvement in the 2-year survival rate of those with less advanced alcohol liver disease.

In a study where an amino acid combination, SAAVE, consisting of DL-phenylalanine, L-glutamine, L-tryptophan, and pyridoxal-5-phosphate per 515 mg capsule dose was administered to patients entering a residential substance abuse treatment program, Blum and others (65) observed a reduction in withdrawal/detoxification symptoms and craving. SAAVE patients also tended to stay in treatment for longer periods of time. Results from a study where driving-under-the-influence (DUI) offenders were administered SAAVE over a 10-week period showed the SAAVE group exhibiting a significantly improved rate of sustained abstinence over a 10-month period (66). The authors concluded SAAVE acted to inhibit enkephalinase and to load precursor amino acids, thus restoring neurochemical balances altered by alcohol and drug abuse.

Patients with severe alcoholic hepatitis have shown improvement with parenteral amino acid administration for one month. This combined with a balanced oral diet

resulted in an improved nitrogen balance, greater improvements in retinal binding protein and serum transferrin. Greater improvements in serum bilirubin, Type III aminoterminal procollagen peptide and aminopyrine clearance were shown in the treatment group. Serum AST and prothrombin time improved in the treatment group but were unchanged in the control group. While mortality rates in the first 2 years following cessation of alcohol and treatment entry for the patient with alcoholic hepatitis were unchanged, greater improvements in biochemical, metabolic and nutritional parameters were observed during and following parenteral amino acid supplementation (67).

Obesity is a risk factor for the development of alcoholic liver disease, particularly for those who have been overweight ten years or more. Animal studies have shown that the diets high in saturated fats appeared to protect rats against liver injury, whereas diets high in polyunsaturated fats from fish oil increased severity of liver injury (3). A study of recovering alcoholic patients with liver disease revealed that even with abstinence the dietary habits of these patients did not easily change (68). Intake of protein and lipid containing foods were significantly lower than in non-alcoholic patients with cirrhotic liver disease suggesting that dietary education is a vital component of recovery treatment and should be aggressively applied. In any event, co-occurring obesity requires a comprehensive nutritional approach during treatment that includes diagnostic studies to assess the patient's readiness to make significant lifestyle changes. Immediate therapy should include diet education and exercise instruction appropriate to the patient's medical condition (69).

Food choices by recovering alcoholics were studied using the 24-h dietary recall method (70). Nutrients analyzed included energy, carbohydrates, sucrose, protein, fats,

vitamins and minerals. The amount of sugar added to beverages was also calculated. Using sustained number of days abstinent as the dependent variable, it was observed that those patients with longer periods of abstinence tended to select diets that contained twice as much sugar added to beverages and more carbohydrates overall. The study's authors were unable to conclude if the longer sobriety increased the appetite for sugar and carbohydrates, or if the choice of sugar in the diet influenced the length of sobriety. In long-term studies of recovering alcoholics Vaillant and Hiller-Sturmhofel (71) observed that two-thirds of stable abstinent alcoholics tended to develop some form of alternate dependency including overeating, chain smoking, tranquilizer use, compulsive working or excessive dependence upon individuals or organizations. Nutrition counseling is recommended at all stages of recovery, particularly to provide guidance towards appropriate nutritional intake and to prevent substance substitution.

Alcohol treatment. The treatment of substance abuse, particularly alcohol abuse, has its foundation in methods prevalent in the late eighteenth century. One method provided an environment "asylum" isolated from alcohol and drinkers. A second method was comprised of "moral treatment" and emphasized a respect and civility to the recovering alcoholic. Poor success rates led to other approaches in the following centuries. Other drugs, such as laudanum, morphine or heroin were substituted for alcohol. As recently as the 1970's marijuana was recommended as a substitute for alcohol. Alcohol detoxification programs became widespread in the 1900's. In the 1950's and 1960's the Minnesota model of treatment emerged and persisted through the 1990's. Characteristics of this treatment model included residential or inpatient care, ranging from a few weeks to several months; a treatment focus on psychoactive

substance abuse as a disorder with no attempt to diagnose or treat any co-morbid psychiatric conditions; heavy use of Alcoholics Anonymous (AA) self-help concepts including the "Twelve Step" recovery model; little or no family counseling; and a negative attitude toward pharmacological therapies and/or psychotherapy (72).

At present most alcohol treatment models ascribe to a long-term three-stage recovery model that consists of detoxification, rehabilitation and aftercare (73). The detoxification phase is required following the withdrawal of alcohol consumption and can be life threatening. While more and more patients undergo detoxification in an outpatient setting, many patients require medication management and observation as an inpatient to facilitate the withdrawal process. The rehabilitation phase is the most intensive portion of the recovery model. It is usually less than one month in duration and concentrates on attaining abstinence. Nearly all rehabilitation programs are now conducted on an outpatient basis. The aftercare period is less intense, but is an extended period of treatment that is designed to help the patient focus on resolve and to address life problems. Aftercare may consist of a one to two hour per week group or individual therapy sessions lasting up to one year.

Alcohol use disorders have been viewed as costly to treat with relatively poor outcomes. Managed healthcare has placed pressure upon providers to limit benefits for treatment programs. Yet research comparing the use of healthcare services noted that patients treated for alcohol dependence had significantly fewer outpatient visits than patients treated for either depression or diabetes (74). Comorbid alcoholism did increase the number of inpatient days for depression or diabetes and increased the number of

outpatient visits for patients with depression. The number of outpatient visits for patients with both diabetes and alcoholism decreased.

The sooner treatment is entered and the longer the treatment lasts have been observed to be associated with treatment outcomes and with improved short-term functioning (75). Patients in treatment the prior 12 months have higher abstinence rates and non-problematic alcohol use outcomes than those who have not participated in treatment (76). Patients who continue in aftercare after treatment experience a higher rate of sustained and complete abstinence (77).

Psychosocial treatment models have dominated substance abuse treatment programs. A nationwide study (Project MATCH) compared the efficacy and efficiency of three distinctive treatment models: motivational enhancement therapy (MET), twelve-step facilitation (TSF) and cognitive-behavioral coping skills therapy (CBT) (73). MET is a brief treatment model that attempts to utilize the patient's own resources to facilitate change. TSF requires the patient be fully engaged in AA recovery steps within the setting of a rehabilitation program. The emphasis in CBT is placed on overcoming skills deficits and improving the client's ability to cope with relapse-promoting situations. Outcomes, measured as percent days abstinent and drinks per drinking day during one-year post treatment, were essentially similar for all three treatment models. Additional studies matching patients to treatment models that either emphasized 12-Step or CBT were not supportive of the hypothesis that certain patient characteristics would predict better outcomes based upon treatment model selected (78). In fact, the 12-Step treatment model was more likely to produce slightly better outcomes after one year when compared to CBT or eclectic treatment models, but these results were not statistically significant

(79). It is suggested that the theories upon which these individual treatment models have been based are not sufficiently comprehensive, and that other factors must contribute towards achieving positive outcomes (80,81).

Pharmocological therapy has also been examined as both a primary and adjunct treatment for substance abuse rehabilitation. Five major categories of pharmocotherapies have been used or identified for treatment of patients with alcoholism. These include: disulfiram, naltrexone, acamprosate, serotonergic agents and lithium (82).

Disulfiram (Anta-buse®), which has been in use for more than 50 years, acts as an alcohol-sensitizing agent. It inhibits aldehyde dehydrogenase thus causing acetaldehyde levels to increase in the plasma when alcohol is consumed. The resulting unpleasant physiological side effects that include flushing, changes in blood pressure and nausea are expected to provide a deterrent to the individual from drinking. Disulfiram has been shown to be effective in reducing drinking days, but does not appear to enhance overall abstinence.

Naltrexone is an opioid antagonist approved for treatment of alcohol-dependent patients in the United States in 1994. It binds to opioid receptors in the central nervous system. It is believed naltrexone may reduce craving for alcohol, the reward produced by alcohol, and/or the intensity of intoxication resulting from alcohol. Reviews show reasonable evidence that naltrexone may reduce relapse rates and the frequency and quantity of drinking in alcohol-dependent persons.

The mechanism by which acamprosate (calcium acetyl homotaurinate) acts is not quite clear. Approved for use with European populations, it is thought that acamprosate may interact with N-methyl D-Aspartate (NDMA), an excitatory amino acid receptor ion

channel complex. When used in persons with alcohol-dependence there is evidence that acamprosate enhances abstinence and reduces drinking rates.

The efficacy of serotonergic agents, known as selective serotonin reuptake inhibitors (SSRI's), to treat individuals with primary alcoholism has not been demonstrated. There is some evidence that SSRI's may have efficacy in treatment of alcohol-dependences in patients with comorbid mood or anxiety disorders. Lastly, the drug lithium has not been found efficacious in the treatment of primary alcohol dependence, but may have some efficacy for treatment of alcohol dependence systems in patients with comorbid depression.

At present there simply does not exist any one model of substance abuse treatment, psychosocial, medical or pharmacological that is truly efficacious in the treatment of primary alcohol dependence.

Treatment outcomes and measurement. The ultimate goal for all substance abuse treatment is the complete and total cessation of substance abuse. Consequently, research outcome measures for substance abuse treatment have generally looked first to obtaining complete abstinence during and following treatment. Complete cessation of substance abuse, however, is only occasionally achieved and generally the goal of treatment is to reduce or eliminate drinking and drinking-related problems (83).

It has been observed that increased rates of subsequent abstinence are associated with the involvement of any kind of substance abuse treatment (81). It has also been noted that the speed with which treatment is entered and the duration of that treatment appear to be associated with both short and long-term alcohol related outcomes (77). Weisner and others report that being in treatment during the previous 12 months is

predictive of higher abstinence rates and non-problem alcohol use compared with those who have not participated in treatment during that time period. It would appear therefore, that intermediate measures of treatment success or failure are required. Intermediate outcomes measured have included percent days abstinent, drinking days per year, moderate non-problem drinking, heavy non-problem drinking or heavy problem drinking (73, 76, 84).

The ability to predict and evaluate treatment success is essential in planning treatment and justifying its costs. Nationally, trends in substance abuse treatment have been tracked through the use of the Drug Evaluation Network System (DENS). The DENS collects information on patients entering adult treatment programs while protecting the patients' privacy rights. Besides demographic information the DENS collects information about the severity of addiction. This is done through the use of the Addiction Severity Index (ASI) that is administered at the point of treatment entry, and then repeated at a designated follow-up period. The ASI characterizes the severity of various aspects of patient problems and represents seven separate domains of measurement: medical, employment, alcohol, drugs, legal, family/social and psychiatric problems. All seven problem areas are reported to demonstrate good internal consistency and validity. Because the severity scores have been found to be predictive of treatment outcomes, admission severity indices are considered useful for treatment planning (85-87). Changes in the ASI composite scores from first entering treatment to specific follow-up periods have been utilized as markers of improvement in addiction severity in some or all of the ASI domains, and can provide guidance for further treatment decisions.

Thus, the ASI has utility for the measurement of intermediate substance abuse treatment outcomes.

The role of nutrition intervention in substance abuse treatment. Aside from addressing frank nutritional deficiencies during detoxification, or specific medical nutrition therapies to address the concurrent malnutrition contributing and/or related to the presence of alcoholic liver disease, nutrition therapy generally has not been identified within the description of substance abuse treatment. Most alcohol-nutrition related research has focused on the effect of alcohol on nutrient processes rather than the effect of nutrition intervention on rehabilitation and treatment outcomes.

Few studies have explored the relationship between nutrition intervention and substance abuse treatment outcomes. A pilot study by Biery and others (88) assessed the effects of nutrition therapy in conjunction with a traditionally designed substance abuse treatment program based on the 12-step AA program. One group received traditional therapy only and the other group received the traditional therapy and nutrition therapy consisting of menu modification and three individualized nutrition counseling sessions. Four months after treatment the intervention group reported fewer hypoglycemic symptoms ($P<0.03$) and craving for alcohol (decreased from 80% to 17%, $P<0.03$) and consumed less sugar. Respondents at four months represented only one-third of the original sample, thus precluding a thorough statistical analysis.

A nutritional intervention designed to moderate biochemical imbalances associated with alcoholism was performed with a group of twenty-nine multiple offense drunk drivers by DesMaisons (18). Subjects met the DSM IV criteria for alcohol dependence and attended a four-month outpatient intervention that included weekly

group and individual counseling. Compliance to a ten-point dietary protocol and alcohol consumption behavior improved significantly ($P<0.0001$) from start to completion of treatment. Control subjects who did not enter the nutritional intervention program demonstrated a significantly higher rate of recidivism and new driving-under-the-influence (DUI) charges than did intervention group. This study provided a basis for the use of nutrition counseling during DUI intervention and substance abuse treatment.

A study by Schafer and others (89) examined the cognitive performance of alcoholics in treatment, at discharge from a 28-day residential program, and three months afterwards relative to folic acid status. Results indicated that while folic acid increased from admission to discharge from the program, folic acid levels decreased significantly from discharge to follow-up. Other nutritional indices were not examined, nor were standard outcomes of substance abuse treatment.

Drees (90) conducted a pilot study to assess associations among nutritional status and addiction severity as measured by the Alcohol Dependence Scale. Subjects were assessed following one week of detoxification and again upon 90 days of substance abuse treatment. Liver enzymes were altered at baseline, but improved significantly at follow-up. Diet recalls at baseline indicated deficient intakes of several vitamins and minerals, which improved at follow-up. Few significant correlations were noted between dietary intake and addiction severity with implications for the need for nutrition intervention during substance abuse treatment.

Some evidence does exist to support that nutrition intervention during substance abuse treatment can contribute to improved treatment outcomes. Specifically, which

nutrition intervention during treatment can provide added value to substance abuse treatment in a cost effective manner should be determined.

STUDY PURPOSE

The main purpose of this study was to address the effect of nutrition intervention on outcomes of substance abuse treatment and to compare substance abuse treatment outcomes between those treatment programs that contain a functional nutrition intervention component and those programs that do not. Specific objectives were to assess:

1) the extent and scope of nutrition intervention services provided to patients enrolled within substance abuse treatment programs;
2) those nutrition intervention(s) offered to patients during substance abuse treatment that are most significantly associated with program treatment outcomes; and
3) the relationship between nutrition interventions and patient substance abuse treatment outcomes.

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Part II:

Development of a Nutrition Intervention Model for Substance Abuse Treatment Programs

ABSTRACT

The objectives of the study were to assess the use and extent of nutrition intervention in Department of Veterans Affairs (VA) substance abuse treatment (SAT) programs and to determine an association between nutrition intervention and SAT outcome measures defined as changes in Addiction Severity Index (ASI) domain pre- and post-composite scores. Nutrition services provided clustered into four groups: basic nutrition services, individualized nutrition services, complex nutrition services and group nutrition education services. Programs offering group nutrition education tended to offer significantly more nutrition services to patients ($P<0.001$). A composite profile of single-SAT program facilities revealed that an average of 11 ± 5 different nutrition services were offered per program to $27\% \pm 23\%$ of SAT patients enrolled. Services were more likely to be offered within the first week of the program and were provided at low to moderate levels of complexity. Positive associations ($P<0.05$) between individualized and group nutrition education were noted with psychological, medical and family/social ASI domains affecting 50 percent or more of the sample. Vitamin/mineral supplementation per dietitian recommendation was positively associated with the alcohol domain ($P<0.05$) and food preferences was positively associated with the employment domain ($P<0.05$). These results provide a model for the delivery of nutrition services to substance abuse treatment patients and provide justification for further research to compare participation in nutrition education with patient specific substance abuse treatment outcomes.

Key words: Nutrition, education, substance abuse, treatment, alcohol, alcoholism.

INTRODUCTION

Alcohol is the single most abused drug and the treatment for its abuse has been widely studied. The failure in meeting the basic needs such as food, shelter and employment of patients within detoxification and substance abuse treatment programs has been linked with lack of success of these programs (1). Woodruff (2) suggested that, at a minimum, services such as nutrition screening and correction of malnutrition should be provided to patients in treatment for alcoholism. There is limited insight in the literature as to how well nutrition intervention has been incorporated into existing substance abuse treatment programs. While nutrition intervention models do exist, they rarely address substance abuse, nor do they link the provision of nutrition services to substance abuse-related outcomes.

Nutrition intervention models. The American Dietetic Association (3) has identified the essential components of a generalized nutrition care model that should be present to produce positive outcomes for most patients. The model is predicated on certain conditions that include a dietitian with adequate skill, the development of a nutrition care plan and follow-up that incorporates practice guidelines or best practices for the condition or disease, and nutrition care that focuses on the individual circumstances of the patient. This model has three components: the trigger event, the nutrition care process and nutrition-related outcomes.

The trigger event identifies where and how the patient is identified as a candidate for nutrition care. It is the access point for referral to nutrition care. It may include nutrition screening done by dietetic professionals, by physicians; nurses or other health

care workers. Entry, timing and access to nutrition care are all determined by the trigger event.

The nutrition care process incorporates the clinical aspects of medical nutrition therapy, and includes establishment of nutrition goals, development of the nutrition intervention plan, its implementation and evaluation and when appropriate, reassessment. Nutrition care process includes a wide variety of nutrition intervention services including modification of macro- or micronutrient composition, flavor or consistency; food and nutrient intake prescription; nutrient supplementation through food or enteral or parenteral formula; transformation of nutrition prescriptions into meal plans, food choices, preparation techniques; and referrals to other providers. Nutrition-related outcomes are focused upon results produced by nutrition care. These outcomes may be disease-specific or generally described health status goals (3).

Another nutrition care model has been proposed by Strychar and others (4) who describe a non-linear six-step framework for nutrition intervention that includes: determining the reason for the consultation; collection of data and identification of the patient's readiness to change; identification of the patients' problems and needs which may influence adoption of new behaviors and outcomes; setting short and long-term goals; planning intervention and evaluation of the counseling process with follow-up.

These nutrition care models are generally used across a broad spectrum of disease and/or health-related states, and have not been specifically applied to substance abuse treatment programs. Generally, studies that evaluate services provided within substance abuse treatment programs do not include any mention of nutrition services (5). Attempts

to describe nutrition services within the context of substance abuse treatment have been limited.

Use of surveys to assess provision of services. Substance abuse treatment programs have been successfully surveyed to assess a variety of treatment aspects. In a survey of addiction services to disabled persons Tyas and Rush (6) successfully utilized retrospective estimates by program respondents to obtain statistical data on patient demographics, services provided and caseload. Results differentiated treatment facilities by the type of treatment-related service(s) offered and identified the variety of services and resources provided based on clients' disabilities. Respondents indicated that related services included behavior modification and life skills coaching, but results did not specify if nutrition services were included.

A mail survey of Indian Health Service and tribal dietitians and nutritionists was conducted to assess the extent and type of nutrition services provided to substance abuse clients and programs (7). Results indicated that about 50% of those responding offered some type of nutrition service: for example, nutrition assessment, nutrition counseling, nutrition education or menu reviews. Only 25% of the respondents had received training related to nutrition and substance abuse. This study did not examine substance abuse treatment outcomes nor did it attempt to relate nutrition services provided with substance abuse treatment outcomes.

Measurement of substance abuse treatment outcomes. Non-compliance to a prescribed treatment regimen is the single most important index in the treatment's success. This is true in any aspect of healthcare but is particularly true in medical nutrition therapy and even more so in alcohol treatment. According to Block (8) no

single method has been found to be universally successful in the treatment of alcoholic patients. However, certain problems and issues among the substance abuse patient population have been shown to predict response to treatment. These include family, criminal, employment, and psychological and medical problems. The Addiction Severity Index (ASI) is a valid and reliable instrument that measures these domains so that treatment plans can be individualized to meet patients' needs, and changes in addiction severity can be measured (9). Department of Veterans Affairs substance abuse treatment programs have administered the ASI to patients at pre- and post-treatment time periods. ASI domain scores have been aggregated by substance abuse treatment program with a resulting VA-wide database. It is thus feasible to assess addiction severity changes in substance abuse treatment programs by changes in ASI pre- and post-treatment score changes.

The limited nature of research towards the benefits of nutrition intervention during alcohol treatment and subsequent outcomes should be addressed. Identifying the relationship of nutrition intervention during treatment using established severity measures as well as overall alcohol treatment outcomes has the further benefit of providing a base of comparison regardless of the type of treatment model utilized, and can facilitate the development of a nutrition intervention service model for substance abuse treatment programs.

The purpose of this study was to compare alcohol treatment outcomes between those treatment programs containing nutrition intervention and those that did not. Specific objectives of this research were to assess:

1) the types of nutrition services provided to patients enrolled in VA substance abuse treatment programs;
2) the extent to which nutrition services were offered within the context of substance abuse treatment programs;
3) an association between the provision of nutrition services and substance abuse treatment outcome measures, specifically changes in the Addiction Severity Index; and
4) the nutrition care model that emerges as a result of these associations.

MATERIALS AND METHODS

Approvals. This study was reviewed and approved by the James H. Quillen VA Medical Center's and The University of Tennessee's Institutional Review Boards for research involving human subjects. Approval was granted prior to commencing survey development and administration.

Approval to utilize the VA Addiction Severity Index database from fiscal years 1998 and 1999 (October 1, 1997 through September 30, 1999) was received from the Veterans Health Administration (VHA) Associate Chief of Addictive Disorders.

Human study subjects. Study participants were Registered Dietitians with clinical nutrition program management responsibility at each of 166 Department of Veterans Affairs (VA) medical center facilities. The number of facilities determined the final sample size, which excluded only those facilities whose clinical nutrition managers were exposed to the survey instrument during its development (n=14). Thus, the final sample was composed of 152 facilities. Respondents were categorized by their facility's

number of distinct substance abuse treatment programs reporting ASI data to the national database (Single-Program = 1); Multiple-Program = 2 or more programs).

Survey Development. A descriptive, single, cross-sectional survey design was used. Survey development included five stages: identification of nutrition services, expert panel evaluations, two pilot studies and final draft preparation. Questionnaire format was based upon guidelines developed by Dillman (10). Questions were designed to elicit program information about nutrition screening and assessment; delivery of nutrition services; substance abuse treatment program parameters; facility and respondent demographics.

Face validity. Agreement that the tool adequately assessed the subject, face validity was determined by a group of clinical dietitians, substance abuse treatment specialists and graduate students.

Content validity. Content validity, the extent to which the instrument reflects all aspects of a particular domain was assessed by an independent panel of dietitians, clinical nutrition program managers located at government and community-based medical centers and university-based dietetic educators. Panel members completed a content validity questionnaire designed to elicit feedback regarding the instrument and question design, and quality of directions (Appendix A).

Questionnaire. The questionnaire was composed of four sections. Part IA of the questionnaire addressed the types and timeframes for nutrition services provided to patients admitted to the substance treatment program at the facility and general questions about the disciplines that provided those services. Part IB addressed the dimensions of the specific nutrition services offered, such as whether or not the service was provided, to

whom, when and at what level of complexity. Part II was designed to elicit information about the substance abuse treatment program and required input from the coordinator of the program. Part III asked for some simple demographic information about the facility.

Pilot test. Revisions to the questionnaire reflecting the comments of the panels were made and the instrument was pilot tested by clinical nutrition program managers at eight medical centers representative of the study population. Substance abuse treatment program coordinators at each site contributed to pilot test completion. Those facilities participating in the pilot test were not included in the final survey sample. Pilot test participants received a copy of the questionnaire; a single-page pilot test questionnaire (Appendix B) and a cover letter meeting IRB-approved criteria for survey participants. The return of the completed survey and pilot test questionnaire was indication of the respondent's informed consent to participate in the pilot test.

All eight pilot test questionnaires were returned. Using responses to the pilot test questionnaires, comments written on the survey instrument and information from follow-up questions posed to pilot participants, necessary revisions to Part 1B. "Nutrition Services" were identified. Pilot test participants indicated the instrument took an average of 42 minutes to complete. Three participants noted difficulty with questions. This included the length of time to obtain responses from the SATP coordinator. One participant expressed difficulty with the Part 1B question for "number of calendar days after admission." It was noted by that participant that many nutrition services at her facility were provided "prior to admission."

Pilot-test participants provided comments and notations directly on the pilot survey instrument. Questions providing the greatest difficulties were almost all located

in Part 1B. From the pilot survey responses it was observed that for the question asking "when after admission a nutrition service was provided", two out of eight participants required response choices that included "prior to admission." Six out of eight pilot-test survey participants did not correctly complete all or some of the same column, either with a non-response or with a response that included a range of days, or simply stating "varies." Inconsistency in responses was noted of participants who indicated a service was not provided, yet completed the columns for time, percent of patients and complexity of service. In some instances, the participant responded that the nutrition service was provided yet failed to complete the time, percent and complexity portions of the question.

Part 1B was reformatted to provide greater direction to the participant. Definitions to which the participant could refer were reprinted prior to each of the two pages of the section, thus allowing easier access to the definitions. Directions for completing the section were also reprinted at the top of each page of Part 1B. The first question was altered to reflect that the nutrition service listed was provided to any SAT program patient with directions to move onto the next three questions (columns) if the response was "yes."

These revisions were evaluated in a second limited pilot re-test that included only section Part 1B, a pilot re-test questionnaire (Appendix C) and a copy of the cover letter meeting IRB-criteria for informed consent. Six additional clinical nutrition program managers completed the second pilot test. Results of this second pilot test indicated only minor changes were indicated and the instrument was prepared for printing and mailing to all clinical nutrition program managers not previously exposed to the survey (Appendix D).

Internal consistency reliability. Four sets of paired questions contained in Part 1A and Part 1B were tested using Chronbach's Alpha for internal consistency reliability, the extent to which all items for a specific component of the questionnaire measure a single concept each time it was administered. An alpha coefficient of $\geq .70$ is considered indicative of internal consistency (11). Results were sufficient to demonstrate reliability (Table 1).

Identification of nutrition services. A list of 23 distinct nutrition services that could be provided in substance abuse treatment programs resulted from survey development. Of these, 7 were nutrition education related (Nutrition Education Series); 9 were related to nutritional intake (Nutrition Intake Series) i.e. enteral, parenteral nutrition, meal services, and nutritional supplementation; and 7 services addressed nutrition evaluation processes (Nutrition Evaluation Series), i.e. nutrition screening, nutrition assessment, nutrient analysis. Dimensions of nutrition services measured were: provision of the service (nominal as yes/no), percent of patients to whom the service was usually provided (interval), time period during which the service was usually administered (Likert-like scale specifying date ranges), and level of complexity at which the service

TABLE 1

Cronbach's alpha scores for matched question (Q) pairs [a]

Q-2 & Q-18a	Q-2 & Q-18b	Q-8 & Q-11	Q-9 & Q-10
.73	.70	.79	.79

[a] See Appendix D for question pairs.

was delivered (low, moderate, high or dietetic). The effort, time and skill level required to perform the nutrition service defined complexity.

Data Collection. Participants were mailed a survey instrument, a letter explaining the purpose of the research, risks and benefits of participation, and a postage-paid self-addressed return envelope (Appendix E). Return of the completed survey indicated the respondents' informed consent to participate. Non-respondents were sent post card reminders at two three-week intervals. Independent measures included types and extent of different nutrition services provided in substance abuse treatment programs.

Outcome measures were composed of the calculated change (pre-score minus post-score) in composite scores of the seven ASI domains and were used to compare those facilities providing nutrition services with those that did not. Data were aggregated and grouped according to the number of distinct substance abuse treatment programs per facility providing ASI data to the national ASI database.

Statistics. Statistical analyses were conducted using SPSS© for Windows (Version 10.0.7, 1999). Descriptive statistics described the sample. Relationships were described with Spearman's correlation. To determine if the entire sample could be aggregated for analysis of the ASI change-score outcomes, or if only single-programs could be tested, t-tests for equality of means of each domain's ASI composite change-score were conducted. Answer Tree ™ 2.0 (©SPSS, 1998), a type of nonlinear discriminant function analysis, was used to reveal associations between variables. Answer Tree ™ works by recursively partitioning data into one or more subgroups (i.e. nodes) that are as different from each other and as internally homogeneous as possible.

The resulting nonparametric classification tree makes no assumptions about underlying distribution, minimizes the effects of outliers and is robust (12).

Because ASI values at baseline (pre-scores) best predict the post-score and change-score, Answer Tree ™ analyses were controlled for ASI pre-scores when testing for possible associations with nutrition services offered. Hierarchical cluster analysis was used to develop nutrition service models. The primary reason for using cluster analysis is to find similar (homogeneous) groups of cases in a data set. Hierarchical cluster analysis has the added benefit where the number of groups do not need to be known in advance, and the analysis can reveal situations in which clusters may have subclasses within them, subclasses within the subclasses, and so on (13). A 66% response rate from a population sampling of n=152 was deemed necessary to achieve a 95% confidence rate (14). Significance was established at $P \leq 0.05$.

RESULTS

Of the 152 surveys, 101 responses (68%) were received. Twenty-four facilities (27%) provided single substance abuse treatment programs (Single-Programs) and 66 facilities (73%) provided 2 or more treatment programs. Eleven facilities did not provide substance abuse treatment programs. Thus, a total of 90 facilities reported substance abuse treatment programs. There were no demographic differences between responders and non-responders.

Scope and extent of nutrition services offered by substance abuse treatment programs. All 23 nutrition services established during the pilot test were identified by one or more facilities in the sample, although the percent of patients receiving any one

service varied widely by facility (Table 2). Fourteen nutrition services were identified by at least half of the respondents. Facilities offered an average of 11 different nutrition services. *Nutrition Screening* (n=73), *Meal Service* (n=71), *Nutrition Assessment* (n=69) and *Individualized Supplemental Feedings* (n=66) were the nutrition services facilities most frequently offered. Nutrition services received by the greatest percentage of patients included *Meal Service* (77%), *Nutrition Screening* (76%) and *Group Normal-Nutrition Education* (60%). Certain nutrition services were offered immediately upon admission to the substance abuse treatment program and included *Meal Service*, *Vitamin/Mineral per MD* (physician), *Bulk Snacks* and *Nutrition Screening*. Generally, however most nutrition services were provided in the first to third weeks following admission. *Meal Service* and *Bulk Snacks* were considered to be routine dietetic services performed without a physician order or prior nutrition intervention. Most of the nutrition services that were provided were considered to be of low or moderate complexity with the exception of *Vitamin/Mineral Supplementation per RD* (dietitian) recommendation and *Enteral Nutrition*. These two nutrition services were rated at a high complexity, taking forty minutes or more and requiring the expertise of a registered dietitian to deliver.

Nutrition services model. Nutrition services clustered into four domains (Table 3). The first domain contained basic nutrition services, such as *Bulk Snacks*, *Individualized Supplemental Feedings*, *Meal Service*, *Meal Rounds*, *Food Preferences* and *Nutrition Screening*. More individualized nutrition services were found in the second cluster domain. These included *Vitamin/Mineral Supplementation per RD* and *Individualized Nutrition Education*, both normal nutrition and substance abuse-

TABLE 2

Nutrition services provided to substance abuse treatment programs profiled by number of facilities offering the service, percent of patients offered the service, time period in which service was usually provided and level of complexity at which service was offered

Nutrition Service [1] (n=90)	Facilities providing service		Percent of patents usually receiving service	Time Period [2] when service usually first offered to patients	Complexity Rating [3] of service provided
	Number (n)	Percent (%)	Mean ± SD	Mean	Mode
Nutrition Education Series					
Drug Nutrient Interaction Education	64	71	19 ± 31	Day 8-14	Low
Group Normal-Nutrition Education	62	69	60 ± 46	Day 8-14	Moderate
Individual Normal-Nutrition Education	58	64	25 ± 34	Day 8-14	Moderate
Nutrition Education, Other	53	60	17 ± 28	Day 8-14	Moderate
Group Nutrition-Substance Abuse Education	50	56	51 ± 49	Day 8-14	Moderate
Individual Nutrition-Substance Abuse Education	50	56	18 ± 32	Day 8-14	Moderate
Discharge Nutrition Education	36	40	16 ± 33	Day 15-21	Moderate

TABLE 2 CONTINUED

Nutrition Service [1] (n=90)	Facilities providing service		Percent of patents usually receiving service	Time Period [2] when service usually first offered to patients	Complexity Rating [3] of service provided
	Number (n)	Percent (%)	Mean ± SD	Mean	Mode
Nutrition Intake Series					
Meal Service	71	79	77 ± 42	Day 1	Dietetic
Food Preferences	65	72	59 ± 46	Day 2-7	Low
Vitamin/Mineral per Physician Order	59	66	50 ± 44	Day 1	Low
Vitamin/Mineral per Dietitian Recommendation	36	40	9 ± 22	Day 2-7	High
Enteral Nutrition	14	16	1 ± 2[4]	Day 2-7	High
Parenteral Nutrition	2	2	0 ± 1[5]	Day 15-21	Low
Nutrition Evaluation Series					
Nutrition Screening	73	81	76 ± 42	Day 1	Low
Nutrition Assessment	69	77	34 ± 41	Day 2-7	Moderate
Nutrition Assessment Follow-up	58	64	18 ± 32	Day 15-21	Moderate
RD as Treatment Team member	31	34	29 ± 44	Day 8-14	Low

TABLE 2 CONTINUED

Nutrition Service [1] (n=90)	Facilities providing service		Percent of patents usually receiving service	Time Period [2] when service usually first offered to patients	Complexity Rating [3] of service provided
	Number (n)	Percent (%)	Mean ± SD	Mean	Mode
Nutrient Intake Analysis	26	29	2 ± 5[6]	Day 8-14	Moderate
Anthropometrics	13	14	7 ± 24	Day 8-14	Low
Other Nutrition Services	7	8	4 ± 16	Day 22+	Low

[1] Nutrition services are aggregated according to main function: Nutrition Education Series = services providing group or individualized nutrition education; Nutrition Intake Series = services related to nutritional intake; Nutrition Evaluation Series = services addressing nutrition evaluation processes.

[2] Time periods from which to select included: Prior to Admission, Day 1 (within 24 hrs of admission), Day 2-7, Day 8-14, Day 15-21, Day 22+ (22 days and beyond following admission..

[3] Complexity Definitions:

- Dietetic = Nutrition/food-related service performed routinely without direct or prior nutrition intervention, e.g. established diet order or physician's standing order.
- Low = Nutrition service with minimum time of <20 minutes, minimum effort and/or basic nutrition skills to deliver.
- Moderate = Nutrition service taking 20-40 minutes and requires formal nutrition training to deliver.
- High = Nutrition service taking >40 minutes with expertise of registered dietitian to deliver.
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[4] Range = 0 – 17%

[5] Range = 0 – 10%

[6] Range = 0 – 30%

TABLE 3

Hierarchical cluster analysis of nutrition services offered to substance abuse treatment program patients signifies a progressive model of nutrition services.

Basic Nutrition Service Cluster	Individualized Nutrition Service Cluster	Complex Nutrition Service Cluster	Group Nutrition Education Cluster
Meal Service	Vitamin/Mineral/RD	Interdisciplinary Team Membership	Nutrition Education-Substance Abuse, Group
Meal Rounds	Nutrition Education-Substance Abuse, Individual	Discharge Nutrition Instructions	Nutrition Education-Normal, Group
Individualized Nutrition Supplements	Nutrition Education-Normal, Individual	Anthropometric Measurements	
Bulk Nutrition Supplements		Nutrient Intake Analysis	
Nutrition Screen		Enteral Nutrition	
Nutrition Assessment		Parenteral Nutrition	
Nutrition Assessment, Follow-up		Other Nutrition Services	
Nutrition Education, Other			
Drug Nutrient Interaction Education			
Food Preferences			
Vitamin Mineral Supplement/MD			

related. More complex nutrition services were clustered in the third domain and included *Interdisciplinary Team Membership*, *Nutrient Intake Analysis*, *Enteral Nutrition* and *Parenteral Nutrition*, as well as *Other Nutrition Services* predominantly identified by cluster participants as "modified diet counseling". Lastly, the fourth was exclusive to group nutrition education services.

Relationship to substance abuse treatment outcomes. Equality of means testing of the ASI change-scores was conducted and revealed significant differences in the Drug (F=.33, df=82, *P*=0.014) and Psychiatric (F=1.031, df=82, *P*=0.043) domains. Thus, to limit potential confounders inherent in program variances within multiple substance abuse treatment programs remaining results were based upon analysis of Single-Programs (Table 4.)

When *Vitamin/Mineral per Dietitian* was provided a positive direct association ($P<0.05$) was detected with changes in the alcohol domain composite score. This means that among all the nutrition services in the model, and controlling for the domain's ASI composite pre-score, *Vitamin/Mineral per Dietitian* best predicted the alcohol domain's ASI change-score. The provision of the nutrition service *Food Preferences* was directly associated with the Employment domain ($P<0.05$) with a positive 180% degree change when provided, and a negative114% degree change when not provided.

Positive ($P<0.05$) associations between nutrition services and ASI domain change-scores were detected within the Nutrition Education Series, specifically between *Group Nutrition-Substance Abuse Education* and both the Psychiatric and Medical ASI change-

TABLE 4

Relationship of nutrition services with mean ASI[1] change-score and degree of change (%) in ASI change-score with or without provision of the nutrition service.

		With Nutrition Service		Without Nutrition Service	
	ASI Domain	ASI Change Score[2]	Degree Change[3]	ASI Change Score	Degree Change
		Mean	%	Mean	%
Nutrition Intake Series					
Food Preference [4]	Employment[5]	0.0237	180	-0.0150	-114
Nutrient Evaluation Series					
Vitamin/Mineral per Dietitian [4]	Alcohol[5]	0.2375	36	0.1379	-27
Nutrition Education Series					
Group Nutrition-SA Education [4]	Medical [5]	0.0375	56	-0.1410	-67
Group Nutrition-SA Education [4]	Psychiatric [5]	0.0167	68	-0.0950	-82
Individual Nutrition-SA Education	Family/Social[5]	0.0127	99	-0.0350	-104
Nutrition Education, Other	Drug [5]	-0.0200	-115	0.0014	100

[1] ASI = Addiction Severity Index

TABLE 4 CONTINUED

[2] ASI Change-Score = ASI composite pre-score minus ASI composite post-score.

[3] % Change = Degree of change noted in mean ASI change-score expressed as percent change. This has been calculated from the results data base (not included to maintain brevity).

[4] Nutrition service appears on first level of tree, before the ASI composite pre-score.

[5] $P < 0.05$

Education and the Family/Social ASI change-score. A negative association ($P<0.05$) was detected between the Drug ASI change-score and *Other Nutrition Education.*

The association between *Group Nutrition-Substance Abuse Education* and other nutrition services was examined. Significant correlations (Spearman r) were observed with *Individual Nutrition-Substance Abuse Education* ($r=0.51$, $P<0.05$); *Group Normal Nutrition Education* ($r = 0.64$; $P<0.001$); and *Individual Normal-Nutrition Education* ($r = 0.46$, $P<0.05$). Single-Program facilities that offered *Group Nutrition-Substance Abuse Education* (n=12) provided significantly ($P<0.05$) more nutrition services (n=14 verses n=8) than those facilities without a *Group Nutrition-Substance Abuse Education* component.

DISCUSSION

A comprehensive list of nutrition services provided to substance abuse treatment program patients was identified during development of the survey instrument. The model that emerged reflects other nutrition care models previously described. Using the nutrition care model by Splett the patient's entry into substance abuse treatment can be considered the "trigger event" generating a variety of basic nutrition services including those related to nutrient intake, such as meal services, meal rounds, and food preferences. These core nutrition interventions serve to meet the basic social needs of the patient and serve as a basis for the development of a nutrition care plan that is predicated upon nutrition screening and nutrition assessment services (3). This may then lead to more targeted nutritional supplementation or individualized nutrition education, thus addressing patient-specific nutrition needs that are substance abuse-related or due to other

disease-related conditions. More complex nutrition services may then be provided and could include enteral or parenteral nutrition, nutrient intake studies, or anthropometric measurements. It is interesting to note that complex nutrition services clustered along with identification of the dietitian as a member of the interdisciplinary care team. Recognition of the dietitian as a member of the treatment team may promote a broader scope of services provided by the dietitian. It has been suggested that there is a need for the dietitian to be an active member of the substance abuse treatment team so that nutrition care can be incorporated throughout the treatment process (15).

Finally, nutrition education in group settings, both *Group Nutrition-Substance Abuse Education* and *Group Normal-Nutrition Education* comprised the final cluster of the nutrition service model for SAT programs. Programs that offered group nutrition education tended to offer significantly more nutrition services overall. It is this fourth cluster of nutrition services that appears to be most related to the overall provision of nutrition services within substance abuse treatment programs. Those facilities that provided nutrition education in group settings significantly ($p<.05$) exceeded the average number of services provided by those programs without a group nutrition education component. It is these programs that displayed stronger gains in ASI domain change-score improvements.

Nutrition educators can take advantage of the opportunity to promote strategies that emphasize diet and health providing clients with effective tools to reduce substance use (16). The opportunity exists to educate or re-educate patients on best meeting one's nutritional needs, and can set the stage for meaningful behavior modification by the patient thus enhancing positive substance abuse treatment outcomes.

The wide variability of the number and types and combination of nutrition services provided within substance abuse treatment programs demonstrates that no one nutrition intervention model is consistently utilized. Preliminary research has suggested that in some settings substance abuse programs that include group and individual counseling and education appear to have more linkages with other service providers and have significantly improved outcomes (17,18).

Limitations exist in using the ASI change-scores as outcome measures. Only about 44% of the substance abuse population tends to complete both the pre- and post-ASI instrument, due to recidivism or loss to follow-up (19,20). There is a high degree of variability among and within responding substance abuse treatment programs, and other than grouping respondents by the number of substance abuse treatment programs for which each facility reported ASI data, no other effort was made to adjust for variability.

These findings reveal the scope and extent of nutrition services provided within VA substance abuse treatment programs. They identify those nutrition services most directly associated with positive substance abuse treatment outcomes and provide guidance to nutrition professionals for the development of a nutrition service model for substance abuse treatment programs.

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Part III:

Nutrition Education in Substance Abuse Treatment is Positively Associated with Improvements in Addiction Severity Measures

ABSTRACT

The objectives of this study were to assess the provision (use and extent) of nutrition education in substance abuse treatment programs in facilities that provide a single or two or more substance abuse treatment programs, and to determine the possible association between nutrition intervention and substance abuse treatment program outcome measures (defined as changes in Addiction Severity Index [ASI] composite scores). A descriptive, single, cross-sectional survey of registered dietitians with clinical nutrition program management responsibility (n=152) was used to define the use and extent of nutrition services in substance abuse treatment programs. Positive associations between nutrition services provided, particularly nutrition education services and substance abuse treatment program measures, were detected. When group nutrition/substance abuse education was offered, ASI psychological and medical domain scores improved by 68% and 56% respectively ($P<0.05$). Individual nutrition-substance abuse education was a predictor of ASI family/social domain change scores improving by 99% ($P<0.05$). In those programs where group nutrition-substance abuse education was offered, moderate to strong correlations with various nutrition education services were observed, specifically in individual nutrition-substance abuse education ($r=0.51$; $P<0.05$), group normal-nutrition education ($r=0.64$; $P<0.01$), and individual normal-nutrition education ($r=0.46$; $P<0.05$). Substance abuse treatment programs offering group nutrition-substance abuse education offered significantly ($P<0.05$) more nutrition services overall. Findings support the position that nutrition education is an essential component of substance abuse treatment programs and can enhance substance abuse treatment outcomes.

Dietitians should promote and encourage the inclusion of nutrition education into substance abuse treatment programs.

Key Words: Nutrition, education, addiction, substance abuse, treatment, alcohol, alcoholism.

This part is a slightly revised version of a paper by the same name published in The Journal of the American Dietetic Association in 2004 by Louise P. Grant, Betsy Haughton, and Dileep S. Sachan:

Grant, L.P., Haughton, B., Sachan, D.S. (2004) Nutrition education is positively associated with substance abuse treatment program outcomes. J. Am. Diet. Assoc.104: 604-610.

My primary contributions to this paper include (1) selection of the topic and development of the problem into a work relevant to my study of nutrition intervention in substance abuse treatment programs, (2) most of the development and testing of the survey instrument, (3) data collection and analysis (4) gathering and interpretation of the literature (5) most of the writing and preparation of the manuscript.

INTRODUCTION

Substance abusers, particularly those with alcoholism have nutritional deficits prior to commencing treatment. It is recognized that improvement in diet and nutrition during treatment can prevent resumption of substance abuse in many patients (1-5).

Researchers acknowledge current psychosocial treatment model emphasis in substance abuse treatment is insufficient to achieve the degree of treatment success desired and other aspects of treatment must be identified (6). Dual-diagnosed substance abuse patients have been found to receive nutrition and exercise counseling at a lower rate than other patients (7). A study of counseling and education rated nutrition

education an important support activity for substance abuse treatment programs, but did not differentiate the type of nutrition services received or relate services to outcomes (8). Individualized nutrition counseling within comprehensive nutrition education programs was found to significantly improve the 3-month success rate in substance abuse treatment units (9-11). Dietary interventions have been shown to reduce recidivism experienced by multiple driving-under-the-influence (DUI) subjects (12).

Nutrition education studies have not used a single recognized substance abuse treatment outcome measure nor has substance abuse research used a consistent treatment outcome measure (13). The Addiction Severity Index (ASI), a free public domain instrument supported by grants from the Department of Veterans Affairs (VA) and the National Institute on Drug Abuse, was developed to enhance consistency in the measurement of baseline and post-treatment variables (14,15). Severity scores have been found to be predictive of treatment outcomes, thus severity indices at admission have been considered useful for treatment planning (16).

The Addiction Severity Index numerically quantifies severity of seven problem areas that include alcohol, drug, medical, legal, employment, family/social and psychiatric problems, which have been reported to demonstrate good internal consistency, reliability and validity (17,18). Used by private, public and government healthcare facilities providing substance abuse treatment, the ASI is administered to patients at admission and can be repeated at a designated follow-up period. ASI pre-scores are directly correlated with ASI post-scores. ASI scores are reported to national databases, which then provide aggregated current clinical and administrative information on patients entering into substance abuse treatment throughout the nation (14,16). The

changes noted in a patient's ASI post-treatment scores from his/her ASI pre-treatment scores (ASI change-scores) provide a measure of degree of change, or outcomes in each domain as a result of treatment. The ASI provides a viable outcome measure with which to retrospectively compare the use and extent of nutrition services, including nutrition education within substance abuse treatment programs.

Study objectives were to determine the extent and use of nutrition education in substance abuse treatment programs in facilities that provide a single, or two or more substance abuse treatment programs, and to determine the possible association between the provisions of nutrition interventions and substance abuse treatment outcome measures, defined as changes in Addiction Severity Index change-scores.

MATERIALS AND METHODS

Survey Development. A descriptive, single, cross-sectional survey design was used. Survey development included five stages: identification of nutrition services, expert panel evaluations, two pilot studies and final draft preparation. Questionnaire format was based upon guidelines developed by Dillman (19). Questions were designed to elicit program information about nutrition screening and assessment; delivery of nutrition services; substance abuse treatment program parameters; facility and respondent demographics. Face validity was determined by a group of clinical dietitians, substance abuse treatment specialists and graduate students. Content validity was assessed by an independent panel of dietitians, clinical nutrition program managers located at government and community-based medical centers and university-based dietetic educators. The instrument was pilot tested by clinical nutrition program managers at eight

medical centers representative of the study population. Substance abuse treatment program coordinators at each site contributed to pilot test completion. Internal consistency was demonstrated by Cronbach's alpha coefficients ranging from 0.70 to 0.79. Non-response problem questions were redesigned and subjected to additional pilot testing using another six clinical nutrition program managers from the study population. Once testing indicated the modifications were adequate, the final instrument was prepared (Appendix D).

A list of 23 distinct nutrition services that could be provided in substance abuse treatment programs resulted from survey development. Of those, 7 were nutrition education related (Nutrition Education Series), 9 were related to nutritional intake (Nutrition Intake Series) i.e. enteral, parenteral nutrition, meal services, and supplementation, and 7 services addressed nutrition evaluation processes (Nutrition Evaluation Series) i.e. screening, assessment, nutrient analysis. Dimensions of nutrition services measured were: provision of the service (nominal as yes/no), percent of patients to which the service was usually provided (interval), time period during which the service was usually administered (Likert-like scale specifying date ranges), and level of complexity the service was delivered (low, moderate, high or dietetic). The effort, time and skill level required to perform the nutrition service defined complexity.

Study Sample. Participants were Registered Dietitians with clinical nutrition program management responsibilities at medical centers (n = 152) within the Department of Veterans Affairs. The number of facilities determined the sample size excluding only those facilities whose clinical nutrition managers were exposed to the survey instrument during its development (n = 14). The study protocol was Institutional Review Board-

approved. Permission to use the VA Addiction Severity Index Database of 1997 – 1999 was granted by the Mental Health Strategic Health Group, Department of Veterans Affairs. Respondents were categorized by their facility's number of distinct substance abuse treatment programs reporting ASI data to the national database (Single-Program = 1 program; Multiple-Program = 2 or more programs).

Data Collection. Participants were mailed a survey instrument, a letter explaining the purpose of the research, risks and benefits of participation, and a postage-paid self-addressed return envelope. Return of the completed survey indicated the respondents' informed consent to participate. Non-respondents were sent post card reminders at two three-week intervals. Independent measures included types and extent of different nutrition services provided in substance abuse treatment programs.

Outcome measures were composed of the calculated change (pre-score minus post-score) in composite scores of the seven ASI domains and were used to compare those facilities providing nutrition services with those that did not. Data were aggregated and grouped according to the number of distinct substance abuse treatment programs per facility providing ASI data to the national ASI database.

Statistics. Statistical analyses were conducted using SPSS© for Windows (Version 10.0.7, 1999). Relationships were described with Spearman's correlation. Descriptive statistics described the sample. To determine if the entire sample could be aggregated for analysis of the ASI change-score outcomes or if only single-programs could be tested, t-tests for equality of means of each domain's ASI composite change-score were conducted. Answer Tree ™ 2.0 (SPSS©, 1998), a type of nonlinear discriminant function analysis, was used to reveal associations between variables.

Answer Tree ™ works by recursively partitioning data into one or more subgroups (i.e. nodes) that are as different from each other and as internally homogeneous as possible. The resulting nonparametric classification tree makes no assumptions about underlying distribution, minimizes the effects of outliers and is robust (20). Since ASI values at baseline (pre-scores) best predict the post-score and change-score, Answer Tree ™ analyses were controlled for ASI pre-scores when testing for possible associations with nutrition services offered (21). Significance was established at $P \leq 0.05$.

RESULTS

Characteristics of Nutrition Services Offered by Substance Abuse Treatment Programs. One hundred one (68%) survey responses were received with 90 facilities reporting substance abuse treatment programs. Sixty-six facilities (73%) had 2 or more distinct programs (Multiple-Programs) and 24 (27%) facilities provided a single substance abuse treatment program (Single-Programs). There were no demographic differences between responding and non-responding facilities.

The scope and extent of nutrition services provided by all the respondents is displayed in Table 1. Each nutrition service was provided by one or more facilities in the sample, although percent of patients receiving each service varied widely. Fourteen services were identified by at least half of the 90 facility respondents. Facilities offered an average of 11 different nutrition services. Fifty percent or more enrolled patients received *Group Normal-Nutrition Education* and/or *Group Nutrition-Substance Abuse Education.* Nutrition education was individualized to 25% or less of patients enrolled in substance abuse treatment, including *Drug Nutrient Interaction Education* and *Discharge*

TABLE 1

Nutrition services provided to substance abuse treatment programs profiled by number of facilities offering the service, percent of patients offered the service, time period in which service was usually provided and level of complexity at which service was offered.

Nutrition Service [1] (n=90)	Facilities providing service		Percent of patents usually receiving service	Time Period [2] when service usually first offered to patients	Complexity Rating [3] of service provided
	Number (n)	Percent (%)	Mean ± SD	Mean	Mode
Nutrition Education Series					
Drug Nutrient Interaction Education	64	71	19 ± 31	Day 8-14	Low
Group Normal-Nutrition Education	62	69	60 ± 46	Day 8-14	Moderate
Individual Normal-Nutrition Education	58	64	25 ± 34	Day 8-14	Moderate
Nutrition Education, Other	53	60	17 ± 28	Day 8-14	Moderate
Group Nutrition-Substance Abuse Education	50	56	51 ± 49	Day 8-14	Moderate
Individual Nutrition-Substance Abuse Education	50	56	18 ± 32	Day 8-14	Moderate
Discharge Nutrition Education	36	40	16 ± 33	Day 15-21	Moderate

TABLE 1 CONTINUED

Nutrition Service [1] (n=90)	Facilities providing service		Percent of patents usually receiving service	Time Period [2] when service usually first offered to patients	Complexity Rating [3] of service provided
	Number (n)	Percent (%)	Mean ± SD	Mean	Mode
Nutrition Intake Series					
Meal Service	71	79	77 ± 42	Day 1	Dietetic
Individual Supplement Feedings	66	73	23 ± 33	Day 2-7	Low
Food Preferences	65	72	59 ± 46	Day 2-7	Low
Vitamin/Mineral per Physician Order	59	66	50 ± 44	Day 1	Low
Meal Rounds	46	51	41 ± 46	Day 2-7	Low
Bulk Snacks	40	44	41 ± 49	Day 1	Dietetic
Vitamin/Mineral per Dietitian Recommendation	36	40	9 ± 22	Day 2-7	High
Enteral Nutrition	14	16	1 ± 2[4]	Day 2-7	High
Parenteral Nutrition	2	2	0 ± 1[5]	Day 15-21	Low
Nutrition Evaluation Series					
Nutrition Screening	73	81	76 ± 42	Day 1	Low
Nutrition Assessment	69	77	34 ± 41	Day 2-7	Moderate

TABLE 1 CONTINUED

Nutrition Service [1] (n=90)	Facilities providing service		Percent of patents usually receiving service	Time Period [2] when service usually first offered to patients	Complexity Rating [3] of service provided
	Number (n)	Percent (%)	Mean ± SD	Mean	Mode
Nutrient Intake Analysis	26	29	2 ± 5[6]	Day 8-14	Moderate
Anthropometrics	13	14	7 ± 24	Day 8-14	Low
Other Nutrition Services	7	8	4 ± 16	Day 22+	Low

[1] Nutrition services are aggregated according to main function: Nutrition Education Series = services providing group or individualized nutrition education; Nutrition Intake Series = services related to nutritional intake; Nutrition Evaluation Series = services addressing nutrition evaluation processes.

[2] Time periods from which to select included: Prior to Admission, Day 1 (within 24 hrs of admission), Day 2-7, Day 8-14, Day 15-21, Day 22+ (22 days and beyond following admission.

[3] Complexity Definitions:

- Dietetic = Nutrition/food-related service performed routinely without direct or prior nutrition intervention, e.g. established diet order or physician's standing order.
- Low = Nutrition service with minimum time of <20 minutes, minimum effort and/or basic nutrition skills to deliver.
- Moderate = Nutrition service taking 20-40 minutes and requires formal nutrition training to deliver.
- High = Nutrition service taking >40 minutes with expertise of registered dietitian to deliver.

[4] Range = 0 – 17%

[5] Range = 0 – 10%

[6] Range = 0 – 30%

Nutrition Education. The greatest percent of patients received non-nutrition education services such as *Meal Service* (77%), *Nutrition Screening,* (76%) *Food Preferences* (59%). Generally, only about one-third (34%) of patients were provided *Nutrition Assessment* (n=69). *Vitamin/Mineral per Physician* (nutrition supplements routinely ordered by a physician) was identified by 50% of facility respondents and was provided to about 50% of patients in those facilities.

Generally, nutrition education services were provided within the first to third weeks of program enrollment while nutritional intake services were normally provided upon admission or within the first week of enrollment. Nutrition evaluation services were provided throughout the enrollment period.

Substance Abuse Treatment Program Outcomes for Single-Group Programs. Equality of means testing of the ASI change-scores revealed significant differences in the Drug (F=. 33, df=82, *P=0.014)* and Psychiatric (F=1.031, df=82, *P*=0.043) domains. To limit potential confounders inherent in program variances within multiple substance abuse treatment programs all of the following results are based upon analysis of Single-Programs (Table 2).

When *Group Nutrition-Substance Abuse Education* was provided, a positive, direct association (*P*<0.05*)* was detected with both Psychiatric and Medical ASI change-scores (*P*<0.05). This means that among all the nutrition services in the model, and controlling for the each domain's ASI composite pre-score, *Group Nutrition-Substance Abuse Education* best predicted these domain ASI change-scores.

A positive association (*P*<0.05) with *Individualized Nutrition-Substance Abuse Education* was detected after a direct relationship with the domain composite pre-score

TABLE 2

Relationship of nutrition education services with mean ASI[1] change-score and degree of change (%) in ASI change-score with or without provision of the nutrition education service.

		With Nutrition Service		Without Nutrition Service	
Nutrition Education Service	ASI Domain	ASI Change Score[2]	Degree Change[3]	ASI Change Score	Degree Change
		Mean	%	Mean	%
Group Nutrition-SA Education	Medical[4]	0.0375	56	-0.1410	-67
Group Nutrition-SA Education	Psychiatric[4]	0.0167	68	-0.0950	-82
Individual Nutrition-SA Education[5]	Family/Social[4]	0.0127	99	-0.0350	-104
Nutrition Education, Other[5]	Drug[4]	-0.0200	-115	0.0014	100

[1] ASI = Addiction Severity Index

[2] ASI Change-Score = ASI composite pre-score minus ASI composite post-score.

[3] % Change = Degree of change noted in mean ASI change-score expressed as percent change. This has been calculated from the results data base (not included to maintain brevity).

[4] $P < 0.05$

[5] Association detected after ASI-pre score.

was established in the Family/Social ASI domain. This means the best predictor of the ASI change-score was the ASI composite pre-score. However, classification analysis then identified the next best predictor as *Individualized Nutrition-Substance Abuse Education.* After the Drug ASI domain pre-score an indirect association ($P<0.05$) was detected with *Other Nutrition Education*, defined by responders as "modified diet education."

The association between *Group Nutrition-Substance Abuse Education* and other nutrition services was examined. Significant correlations (Spearman *r*) were observed with *Individual Nutrition Substance Abuse Education,* ($r=0.51$, $P<0.05$); *Group Normal Nutrition Education* ($r = 0.64$, $P<0.001$); and *Individual Normal-Nutrition Education* ($r = 0.46$, $P<0.05$). Single-Program facilities that offered *Group Nutrition-Substance Abuse Education* (n=12) provided significantly ($P<0.05$) more nutrition services (n=14 vice n=8) than those facilities without a *Group Nutrition-Substance Abuse Education* component.

DISCUSSION

Findings indicate 50% of programs responding provided nutrition education services in group settings. Group education is generally considered more cost effective and labor-efficient to provide, especially for patients with chronic illnesses and may be favored by facilities that provide two or more types of substance abuse treatment. Providing nutrition education in a group setting suggests pre-planning that may include lesson planning, development of nutrition education materials, and advance scheduling of patients and may be an indication that there has been a management decision to dedicate

resources for medical nutrition therapy services to substance abuse treatment patients. Provision of G*roup Nutrition-Substance Abuse Education* was associated with the provision of other nutrition education services as well, including *Group Normal-Nutrition Education* and *Individual Nutrition-Substance Abuse Education.* These facilities appeared to provide a wide variety of other nutrition services and significantly ($P < 0.05$) exceeded the average number of services provided by those programs without a *Group Nutrition-Substance Abuse Education* component (mean = 14 verses mean = 8). Thus, it would appear that group nutrition education is a differentiating factor in the depth and scope of nutrition programs provided within substance abuse treatment programs.

The ASI change-scores provided substance abuse treatment program outcome measures that permitted comparisons between programs and the nutrition services they provided. Significant ($P < 0.05$) positive relationships between nutrition education services and improvements in the Psychiatric, Medical and Family/Social ASI domains were noted with score improvements ranging from 55 - 99% over those programs where the service was not provided. In fact, when the nutrition education service was not provided, these ASI change-scores worsened by a range of 67 - 104%. The extent of score change provides evidence of the importance of including a nutrition education component within the framework of substance abuse treatment programs.

The value of individualized and group nutrition education programs has been demonstrated in research related to other disease states, particularly lipid and/or cardiovascular interventions (22-25). Nutrition education improved metabolic control among older adults $\geq$ 65 years with greater improvements in fasting plasma glucose and glycosated hemoglobin than in controls (26).

Group nutrition education classes were found to be an effective means for transmitting nutrition information to alcoholic treatment patients (27). Shuman (28) suggested that nutrition and exercise therapies significantly increase the possibility of addiction recovery. The role of nutrition education in substance abuse treatment and its relationship to the treatment outcomes measured in such treatment merit closer examination.

The wide variability of the number and types and combination of nutrition services provided within substance abuse treatment programs demonstrates that no one nutrition intervention model is consistently utilized. However, when nutrition education services were included there was a significantly greater number of nutrition services provided overall. Preliminary research has suggested that in some settings substance abuse programs that include group and individual counseling and education appear to have more linkages with other service providers and have significantly improved outcomes (29, 30).

It has been suggested that substance abuse treatment patients should have the same benefits of education as do patients with other chronic diseases such as diabetes or congestive heart disease and that substance abuse-related nutrition education should target the specific risk factors of these patients (31). Findings of this survey reveal that nutrition education, particularly nutrition education with a substance abuse treatment focus provided within a group setting, is associated with treatment outcomes and should be included as a treatment component. The specific content of group nutrition-substance abuse education was not a subject of this study but merits further research.

There are limits to using the ASI change-scores as outcome measures. Only about 44% of the substance abuse population tends to complete both the pre and post-ASI instrument, due to recidivism or follow-up loss (17, 32). A high degree of variability within responding substance abuse treatment programs and between programs is understood (34), and other than grouping respondents by the number of substance abuse treatment programs for which each facility reported ASI data, no other effort was made to adjust for variability. Further analysis of the relationship of nutrition services to ASI change scores could be performed comparing treatment programs grouped by the dominant treatment model in use. However, within and between treatment program variability would still exist.

These findings reveal that nutrition education, particularly group nutrition education with a substance abuse treatment focus, is associated with positive substance abuse treatment outcomes and should be included as a component within substance abuse treatment settings.

There is opportunity for dietitians to promote and deliver nutrition services, especially nutrition education services to patients enrolled in substance abuse treatment programs. Dietitians should work to develop viable nutrition education services to residential and outpatient substance abuse treatment programs in private, public and government healthcare settings.

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Part IV:

Nutrition Education Provided in Residential Treatment is Positively Associated with Improved Substance Abuse Treatment Outcomes

ABSTRACT

The objective of the study was to determine if an association existed between patient participation in nutrition education while enrolled in residential-based substance abuse treatment. Specific objectives included comparing substance abuse treatment outcomes of those patients participating in the group nutrition education, in individualized nutrition education or in both group and individualized nutrition education with those patients receiving no nutrition education. The investigation was a descriptive, retrospective, cohort review of a random sample (n=88) of medical records for patients with Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) defined primary diagnoses of alcohol dependence, alcoholism, or alcohol withdrawal admitted to the residential substance abuse program. Subjects were patient medical records of patients admitted to the Substance Abuse Residential Rehabilitation Program at the VA Medical Center, Miami, FL during the period of October 1, 1999 through April 30, 2002. Subjects were grouped according to the type(s) of nutrition education received or not received during treatment. Dependent variables were treatment outcomes measured from the first day of admission to treatment for a period that did not exceed 365 days and included: number of days abstinent, days to first drink, drinking days, non-drinking days and ratio of drinking days to non-drinking days. Group comparisons were performed using Kruskal-Wallis or Pearson Chi-square statistical analysis. There were significant ($P<0.01$) associations between group nutrition education with days abstinent and days non-drinking. Nutrition education participants also tended to have longer periods to first drink and lower ratios of drinking days to non-drinking days. It is concluded that

nutrition education is beneficial as a component in residential substance abuse treatment programs.

Key Words: Nutrition, education, substance abuse, treatment, alcohol, alcoholism.

INTRODUCTION

While there is recognition that the prevailing psychosocial emphasis in treatment is insufficient to achieve the degree of treatment success desired, other aspects of treatment have yet to be fully acknowledged by the substance abuse community (1). Recently, counseling and education, including nutrition education, were rated as primary support activities within substance abuse treatment programs (2).

Nutrition issues during substance abuse treatment. Alcoholics may have serious nutritional deficits prior to commencing alcohol abuse treatment and improvement in diet and nutrition during treatment can prevent resumption of drinking in many patients (3). Continuing nutrition education for abstinent patients with alcoholic cirrhosis has been recommended to improve the diminished nutritional intakes observed among this portion of the alcoholic population (4). Following an epidemiological assessment of the relationship between alcohol and nutrition, Quartini and others (5) suggested that health education campaigns are required to promote corrected eating habits and to reduce alcohol consumption. Individuals who have a specific health condition, who are motivated or have an increased awareness of healthy diets are more likely to make successful dietary changes in response to nutrition education (6, 7). Few studies have assessed nutrition education and/or nutrition counseling interventions, but those that have, have observed improved success rates at a three or four month post-

treatment periods (8-10). Planned nutrition programs within residential alcohol rehabilitation programs have been associated with reported improvements in "attitude" and "well-being" (11).

Results of a survey of nutrition intervention in VA substance abuse treatment programs indicated that nutrition education was a discriminating factor in the extent and scope of nutrition intervention available to patients in substance abuse treatment. Programs offering group nutrition education with a substance abuse treatment focus tended to offer significantly ($P<0.05$) more nutrition services (12). Additionally, these programs demonstrated significantly ($P<0.05$) improved changes in Addiction Severity Index (ASI) composite scores. In fact, when nutrition services were not provided it was noted that ASI composite scores worsened by a range of 67 to 104 percent. Survey results strongly suggested that nutrition education did play a role in substance abuse treatment.

Substance abuse treatment outcome measures. While the Addiction Severity Index was useful as an outcome measure in the VA (12) survey it limited the applicability of the results to about 44% of the population that complete both the pre-ASI and post-ASI instruments (13). Normally administered about six months following treatment participation, the post-ASI was not completed by patients who did not fully complete treatment programs or who were lost to follow-up (14). Reviews have suggested that studies of treatment effectiveness, particularly for alcohol abuse, should assess more widely used standardized treatment outcome indices such as: number or percent of drinking days/non-drinking days, time to first drink, number of episodes of heavy drinking or the number of standard (defined) drinks of alcohol (15-17). These measures

are considered among the most robust measures of change following treatment and appear to be useful for comparing alcohol treatment outcomes across studies (18).

The recommendations towards the use of more easily obtained outcome measures, and the fact that the VA survey results were program and not patient-based, suggested that an examination of patient specific treatment outcomes should be conducted to assess if patient participation in nutrition education during treatment was associated with those outcomes.

This study was designed to compare residential substance abuse treatment outcomes of patients participating in substance abuse-related nutrition education with those substance abuse treatment outcomes of patients who did not participate in substance abuse-related nutrition education. Treatment outcomes measured from date of program admission were defined as number of days abstinent, number of days to first drink, drinking days, non-drinking days and the drinking days to non-drinking days ratio. The specific objective was to assess the difference in substance abuse treatment outcomes between those patients participating in nutrition education during treatment and those patients who do not participate in treatment.

MATERIALS AND METHODS

Approval. The study was reviewed and approved by the Institutional Review Boards of the VA Medical Center, Miami, FL, and of The University of Tennessee.

Research Design. The study design was a descriptive, retrospective, cohort review of a random sample (n=88) of medical records for patients with DSM-IV criteria defined primary diagnosis of alcohol dependence, alcoholism, or alcohol withdrawal

admitted to a residential substance abuse treatment program (RSAT) during the period of October 1, 1999 through May 30, 2002 (admission dates of not less than 365 days prior to commencing data extraction). Data collection was completed using both electronic and paper patient medical records. Subjects were grouped according to participation in the group nutrition education (NE) program provided by a Registered Dietitian or clinical dietetic technician or no nutrition education (NNE). Records reviewed were randomly selected using a computerized sampling program and assigned to a group according to nutrition education received. Primary outcome measures included number of days to first drink, number of days abstinent, drinking days, non-drinking days and drinking days to non-drinking days ratio. Subject descriptive data collected included: gender (male), age, marital status (married, divorced, widowed, single-never married), ethnicity (Caucasian, African American, Asian, Hispanic, Other); employment status (employed, not employed), SES/occupation (professional, non-professional, laborer, no occupation), highest education achieved (less than 8^{th} grade, some high-school, high-school/GED, college); co-morbid diagnoses (polydrug abuse, psychiatric disorders as (defined by DSM-IV criteria), Hepatitis C or HIV-positive status, Post Traumatic Stress Syndrome (PTSD), hypertension (HTN) or diabetes).

Nutrition variables included nutrition status classification (regular or normal, mildly compromised, moderately compromised, severely compromised) assessed by trained clinical Registered Dietitians and/or clinical dietetic technicians using a standardized instrument (19); and for the NNE group, the time period in which nutrition education was delivered ordinally grouped as pre-admission and from date of admission to include: day 1, days 2-7, days 8-14, days 15-21, and day 22+. Substance abuse

behavior variables included age at first drink, years drinking, number of times in treatment, number of residential treatment attempts and number of days tracked, an indication of total treatment exposure.

Data Collection. Data were manually transferred from the patient medical record to an electronic database using a data collection form (Appendix F). Patient medical record identifiers were removed so that subjects could not be associated with their medical record. Only aggregated data were reported.

Human Study Subjects. Participants were selected by a computerized random sample of 100 patient medical records representing approximately 30% of the population admitted to a residential substance abuse treatment program during the study period. Twelve medical records were excluded from the final sample due to unavailability of a companion paper medical record, i.e. patient medical record transferred to another medical center, or a length of stay less than 48 hours due to intoxication at time of admission to the treatment program. Females were underrepresented (n=5) in the population, thus only males were included in the sample. The final sample (n=88) represented 26% of the total population and was still considered sufficient to detect differences in outcome measures at a p value of 0.05 with a power of 0.80 (20).

Statistics. The sample was described using descriptive statistics. Comparisons of independent sample means were analyzed using Kruskal-Wallis test, Mann-Whitney U test, Pearson Chi-Square, or independent t-test. The Kruskal-Wallis test assumes that k samples are independently and randomly drawn from the source populations and is an appropriate non-parametric alternative to one-way ANOVA for independent samples (21). It tests for the significance of the difference among the distributions of several

independent samples. Also a non-parametric test, the Mann-Whitney U test compares the means of 2 independent samples. It is a suitable alternative to the Student's t-test. ©SPSS for Windows (Version 11.5, 2003) was used to perform the analyses.

RESULTS

Subject Demographics. Subject demographics were not significantly different between nutrition education groups and are summarized in Table 1.

Ninety-seven percent (86 out of 88) of the subjects were assessed for nutrition status but there was no significant difference between the NE and NNE groups for the level of nutritional status at which subjects were evaluated (Table 2).

Substance Abuse Behavior Demographics. There were no significant differences noted between the groups in substance abuse treatment behaviors displayed in Table 3. There was no significant (P <0.373) difference between the groups for total of days tracked, indicating comparable exposure to treatment.

Nutrition Education and Substance Abuse Outcome Indicators. NE and NNE group comparisons are displayed in Table 4. NE group subjects appeared to have significantly (P<0.01) more days abstinent and non-drinking days than did the NNE group. Drinking days and days to first drink outcome measures did not differ significantly but the NE group had a much smaller (1.8 ± 5.0) ratio than did the NNE group (6.5 ± 17.9) The time period in which nutrition education was offered to the NE group had no significant association with substance abuse treatment outcomes.

TABLE 1

Comparison of subject demographics by nutrition education (NE) group and no-nutrition education (NNE) group

Subject Demographics	NE Group N=63 %	NNE Group N=25 %	Pearson Chi-Square	*P*-value
Age (mean, SD)	52.0 (8.2)	50.7 (9.1)		0.505
Ethnicity (n, %)	61	27	4.56	0.336
Caucasian	47 (77)	18 (67)		
African American	6 (10)	7 (26)		
Hispanic	6 (10)	2 (7)		
Other	2 (3)	0 (0)		
Education Level (n, %)			4.348	0.226
College	6 (10)	5 (19)		
High School/GED	38 (60)	18 (66)		
Greater than 8th grade	7 (11)	1 (4)		
8th grade or less	0 (0)	1 (4)		
Missing	12 (19)	2 (7)		
Marital Status (n, %)			4.991	0.288
Married	8 (13)	3 (11)		
Separated/Divorced/Single	46 (73)	21 (78)		
Widowed	4 (6)	2 (7)		
Missing	5 (8)	1 (4)		

TABLE 1 CONTINUED

Subject Demographics	NE Group N=63 %	NNE Group N=25 %	Pearson Chi-Square	*P*-value
Employed (n, %)	10 (16)	3 (12)	0.415	0.520
SES (Occupation)			2.105	0.551
Professional	12 (19)	4 (15)		
Non-professional	28 (44)	11 (40)		
Laborer	5 (8)	5 (19)		
None	15 (24)	4 (15)		
Missing	3 (5)	3 (11)		
Co-morbid Diagnosis (n, %)			665.5[1]	.066
Polydrug Abuse	27 (43)	16 (59	1.685	0.194
Psychiatric	28 (44)	15 (24)	0.698	0.403
Hepatitis C	19 (30)	8 (30)	0.020	0.887
PTSD	16 (25)	7 (26)	0.001	0.976
Diabetes	7 (11)	1 (4)	1.368	0.242
Hypertension	15 (24)	9 (33)	5.856	0.440
Legal Reason for Treatment	12 (19)	1 (4)	3.592	0.058

[1] Mann-Whitney U test.

TABLE 2

Nutritional status evaluation of nutrition education (NE) group and no-nutrition education group (NNE) [1]

Nutritional Status (%)	NE Group N=61 N (%)	NNE Group N=27 N (%)
Normal	39 (64)	14 (52)
Mildly Compromised	22 (36)	10 (37)
Moderately Compromised	0 (0)	1 (4)
Severely Compromised	0 (0)	0 (0)
Missing	0 (0)	2 (7)

[1] Kruskal-Wallis test. $P<0.162$.

TABLE 3

Substance abuse behaviors by nutrition education (NE) and no-nutrition education (NNE) group [1]

Substance Abuse Behavior	NE Group n = 61 Mean ± SD	NNE Group n = 27 Mean ± SD	*P*-value
Age at first drink	17.6 ± 5.6	18.1 ± 7.4	0.139
Years problem drinking	28.1 ± 10.5	25.1 ± 7.4	0.348
Number of Treatment Attempts	2.4 ± 5.0	3.4 ± 6.0	0.265
Number of Residential Treatment Attempts	1.5 ± 3.4	1.4 ± 2.1	0.746
Days Tracked	302.2 ± 116.9	283.3 ± 139.5	0.373

[1] Kruskal-Wallis test.

TABLE 4

Comparison of substance abuse treatment outcomes by nutrition education (NE) group and no-nutrition education (NNE) group [1,2]

Substance Abuse Treatment Outcome Variable	NE Group [3] n = 61 Mean ± SD	NNE Group n = 27 Mean ± SD
Days Abstinent [4]	213 ±142.7	129.4 ± 144.3
Drinking Days	85.25 ± 120.5	122.7 ± 149.0
Non-Drinking Days [4]	215.8 ± 143.7	133.5 ± 142.9
Days to First Drink	60.4 ± 90.3	47.7 ± 84.4
Drinking: Non-Drinking Days Ratio	1.8 ± 5.0	6.5 ± 17.9

[1] Kruskal-Wallis test.

[2] Both groups were assessed over 365 days from date of admission to treatment program.

[3] There was no significant difference in substance abuse treatment outcomes compared each of the nutrition education time periods within the NE Group.

[4] Significant at $P < 0.01$.

DISCUSSION

There was sufficient demographic comparability between the NE and NNE groups with respect to drawing an inference about the effect of nutrition education. Patient characteristics are considered an important component of study design to ensure comparability of results within and between studies (22).

NE group subjects receiving nutrition education tended to have significantly more non-drinking days and periods of abstinence than did subjects who received no nutrition education (NNE Group). While not significant, the NE Group subjects tended to prolong days to first drink on the average by nearly two weeks. By increasing substance abuse-free days it is possible there was greater overall exposure to treatment thus increasing the opportunity to replace abusive behaviors with healthy behaviors. When comparing one-year outcomes of treatment with untreated alcohol-dependent individuals it was noted by Weisner and others (23) that treated individuals had higher abstinence rates and non-problematic use outcomes than those in the untreated group.

Clinical dietetic staff SAT program assessed the nutrition status of nearly all enrolled patients. Nutrition education was generally delivered during or shortly after the third week of treatment (day 22+), with no differences in substance abuse outcomes detected for the time period in which the education was received. Subjects generally stayed in residence about 48 $\pm$ 25 days without significant differences between the NE and NNE groups. Given the long-term goal of therapy for substance abusers, which is to replace self-abusive behaviors with health-seeking behaviors, a rigorous program of patient education, including nutrition education could greatly facilitate overall rehabilitation (24).

There was no attempt to evaluate other education components within the substance abuse treatment program, which may also have had an association with substance abuse treatment outcomes. Results of a study that examined the effect of services provided in substance abuse treatment indicated that a greater number of inpatient services, particularly group services such as vocational education, were positively associated with completing treatment and decreases in post discharge arrest (25). Services included in the analysis were individual treatment, group treatment, medical contact, medicine administration, recreational activities, vocational education, self-help group, HIV education/counseling, and outside medical referral. Conversely, results of research that examined duration and intensity of treatment indicated that individuals who participated in treatment for longer periods of time had better 1-year and 8-year outcomes (26). Important predictors of response to treatment are categorized within the context of the Addiction Severity Index (ASI), an instrument designed to measure seven domains of these predictors. Increased severity in family, medical, criminal, employment, and psychological problems along with the level of alcohol and drug severity are associated with poor during-treatment response and early relapse among patients with psychiatric comorbidities regardless of the treatment setting (27). However, the purpose of the study was to examine nutrition education, a service that has been shown to be provided in only half of programs previously surveyed (12).

The results of this study are limited to residential substance abuse treatment programs. This study did not focus on substance abuse treatment delivered solely in an outpatient setting. However, there is basis for a future comparative analysis of residential and outpatient program nutrition education.

While there was no difference between the groups in the presence of co-morbidities there was no analysis of the combination of those co-morbidities. Higher degrees of psychiatric comorbidity have been linked to decreased rates of abstinence and higher rates of problematic use (23). Additional analysis of the effect of combinations of co-morbidities, particularly psychiatric co-morbidities with other co-morbidities, may provide guidance as to their predictive nature with the benefit of nutrition education in treatment.

Finnell (28) suggests that patients with substance abuse addictions should have the same benefits of education, as do patients with other chronic diseases, such as diabetes and coronary heart disease with goals to empower patients, decrease their defenses and reduce the stigma they experience. This research provides evidence to support the benefit of nutrition education as a component of residential substance abuse treatment programs. The results indicate that participation in nutrition education while in treatment is associated with improved substance abuse treatment outcomes, specifically days abstinent and non-drinking days.

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Part V:

Comparison of Outcomes in Residential and Outpatient Substance Abuse Treatment Patients Receiving Nutrition Education

ABSTRACT

Objective of this descriptive, retrospective, cohort review study was to compare substance abuse treatment outcomes of a random sample of patients receiving or not receiving nutrition education in a residential treatment (RSAT) setting (n=88) with outcomes of a random sample of patients receiving or not receiving nutrition education in an outpatient (OSAT) setting (n=77). Outcome measures were defined as number of days abstinent, days to first drink, and ratio of days drinking to days non-drinking as measured from date of admission. Group comparisons within and between programs were performed. Comparisons of independent sample means were analyzed using Mann-Whitney U or Pearson Chi-square. RSAT program patients appeared to be more likely unemployed, ($P<0.01$), have a professional occupation, ($P<0.05$), a higher incidence of hepatitis C, ($P<0.05$) and hypertension, ($P<0.01$). OSAT program patients had significantly ($P<0.01$) more legal reasons for being in treatment. Far fewer OSAT patients, as a percentage of the population, were exposed to nutrition education than RSAT patients. Substance abuse behaviors were similar between programs but outcome measures were significantly different within programs. RSAT patients displayed longer periods of abstinence ($P<0.01$), particularly beyond 180 days, and non-drinking days ($P<0.001$) as well as longer periods of days to first drink ($P<0.05$). An association between substance abuse outcome measures with nutrition education was not detected within the OSAT program, but significant ($P<0.05$) associations in the RSAT program were detected for days abstinent, days non-drinking, and drinking days: non-drinking days ratio. Residential substance abuse treatment patients benefit from nutrition

education. Greater effort to incorporate nutrition education into outpatient substance abuse treatment programs maybe warranted.

Key words: Nutrition, education, substance abuse, treatment, alcohol, alcoholism.

INTRODUCTION

Alcohol dependence has an adverse effect upon nutrition status and nutrient utilization, including specifically a reduced or imbalanced dietary intake, decreased uptake of ingested nutrients, decreased utilization of absorbed nutrients, and derangements of metabolism. This has been well described (1, 2). The malnutrition associated with alcohol misuse is related to the intensity of alcohol intake, irregular feeding habits, social or family problems and cirrhosis with ascites (3). Alcohol has been noted to inhibit glucose-stimulated insulin secretion, induce protein loss, inhibit protein absorption and increase the excretion of urinary nitrogen (4). It has been recognized that alcoholics have nutritional deficits prior to commencing alcohol abuse and that improvement in diet and nutrition during treatment can prevent resumption of drinking in many patients (5).

Current substance abuse treatment models generally have a psychosocial emphasis. Researchers acknowledge that this emphasis is insufficient to achieve the degree of treatment success desired and that other aspects of treatment must be identified (6). Counseling and education, including nutrition education, were rated as the most important support activities for substance abuse treatment programs (7).

A retrospective review of a small sample of medical records for patients participating in a comprehensive nutrition education program that featured individualized

instruction was found to significantly improve the 3-month success rate in an alcohol rehabilitation unit (8). A planned nutrition program as a component of a holistic health program improved attitude and reported well-being in a residential alcohol rehab program (9). Nutrition consultation, which included individualized instruction, was noted to improve the three-month success rate in an alcohol treatment program (10). The recidivism experienced by multiple DUI subjects was shown to decrease through participation in a four-month outpatient dietary intervention. (11). Upon review these studies either did not isolate the treatment effect of nutrition education or they did not utilize an experimental design to identify the degree of treatment effect.

An epidemiological study used discriminant analysis to classify chronic alcoholics in relation to their alcohol-related diseases (12). Results indicated that alcoholics with the richest diets included those with cardiovascular and digestive diseases. Their diets consisted mainly of saturated fats and animal proteins, together with lower daily alcohol intake, higher total alcohol intake and the longest period of alcohol abuse before alcohol-related disease diagnosis. The poorest dietary intake was observed in those abusers with neurological and psychiatric diseases. Their diets had less protein and fats. Substance abusers who have a high preference for sweets were noted to have less favorable treatment outcomes for alcohol problems at 6-month follow-up (13). These studies demonstrate that the overall nutritional intake of alcoholics may be associated with co-morbidities and outcomes. The opportunity to impact nutritional behaviors during substance abuse treatment with counseling and education is present.

Following an epidemiological assessment of the relationship between alcohol and nutrition, Quartini and others (14) suggested that health education campaigns are required

to promote correct eating habits and reduce alcohol consumption. Continuing nutrition education for abstinent alcoholic cirrhotics has been recommended to improve the diminished nutritional intakes observed in this portion of the alcoholic population (15).

A survey conducted by this investigator examined the extent and scope of nutrition intervention in VA substance abuse programs (16). Results indicated that improvements in Addiction Severity Index (ASI) composite scores were positively ($P<0.05$) associated with programs that offered group nutrition education and/or individualized nutrition education. These associations were observed in the medical, psychological, and family/social ASI domains. Moderate to strong correlations with various nutrition education services was observed in those programs where group nutrition-SAT education was offered. Substance abuse treatment programs offering group nutrition-SAT education offered significantly more nutrition services overall.

While the Addiction Severity Index was useful as an outcome measure in this survey it limited the applicability of the results to that portion of the population completing both the pre and post-ASI instrument, estimated at only 44% (17). The post-ASI is normally administered at a six-month follow-up to the completion of substance abuse treatment. Many patients either do not fully complete treatment programs or are lost to follow-up (18). Reviews suggest that studies of treatment effectiveness, particularly for alcohol abuse, should assess standardized outcome factors such as: the number or percent of drinking days/non-drinking days, time to first drink, number of episodes of heavy drinking or the number of standard (defined) drinks of alcohol (19). Thus using those outcomes most frequently suggested in recent literature and reviews, i.e.

days to first drink, days abstinent, days drinking as a percent of total non-drinking days, will be beneficial in providing a basis for comparison in future studies (20-22).

The recommendations towards the use of more easily obtained outcome measures, and the fact that the recent VA study results were program, not patient-based, suggested that an examination of patient specific treatment outcomes should be conducted to assess if patient participation in nutrition education during treatment was associated with those outcomes.

Patient specific results aggregated from the residential VA substance abuse treatment programs located at the VA Medical Center of Miami, FL were compared with aggregated results of the outpatient VA substance abuse treatment program located at the VA Medical Center, West Palm Beach. Both medical centers' substance abuse treatment programs offered group and/or individualized nutrition education within the context of treatment.

The main purpose of this study was to expand the results of the program-focused survey of nutrition intervention in VA substance abuse treatment programs and provide patient-focused outcome results prior to the development of a nutrition education model for clinical trial within VA. Specific objectives were to assess:

1) the within program differences of the standardized substance abuse treatment outcome measures of patients receiving nutrition education and of patients who do not receive nutrition education in the residential treatment program, and of the outpatient treatment program; and
2) the between program differences of the nutrition education-participating residential program patients' and the nutrition education-participating

outpatient program patients' standardized substance abuse treatment outcome measures.

MATERIALS AND METHODS

Approvals. The study was reviewed and approved by the Institutional Review Boards of the Miami and West Palm Beach VA Medical Centers, and by the Institutional Review Board of The University of Tennessee.

Research Design. The study design was a descriptive, retrospective, cohort review of a random sample (n = 88) of medical records for patients with Diagnostic and Statistical Manual of Mental Diseases (DSM-IV) defined primary diagnosis of alcohol dependence, alcoholism, or alcohol withdrawal admitted to the residential substance abuse treatment (RSAT) program at the VA Medical Center, Miami, FL during the period of October 1, 1999 through May 30, 2002 (admission dates of not less than one-year prior to commencing data extraction) with comparative analysis to a similar cohort review of a random sample (n=77) of medical records for patients admitted to the outpatient substance abuse treatment (OSAT) program at the VA Medical Center, West Palm Beach, FL during the period of October 1, 1999 through November 1, 2001. This approach permitted most of the data extraction to be completed using electronic patient medical records using the VA Computerized Patient Record System (CPRS) at a desktop station readily available to the investigator. For the time period in question, some of the RSAT patient education was not included in the electronic portion of the patient medical record requiring an additional review of the paper patient medical record on file in the hospital medical records room.

Human Study Subjects. Subjects were selected by two separate computerized random samples of 100 patient medical records from each program representing approximately 30% of the population admitted to the OSAT and RSAT programs respectively during the period. Twelve medical records from the RSAT sample and 23 medical records from the OSAT sample were excluded due to unavailability of a companion paper medical record, i.e. patient medical record transferred to another medical center, or a length of stay less than 48 hours due to intoxication at time of admission to the substance abuse treatment program. Only males were included in the sample due to under representation of females in the populations. The final samples represented about 26% of the total population and was still considered sufficient to detect differences in outcome measures at a P value of 0.05 with power of 0.80 with $u_1 = 20$; $u_2 = 25$, $s = 6$ (22).

Subjects were grouped according to participation in the group nutrition education program provided by a Registered Dietitian or clinical dietetic technician, individualized nutrition education or both group and individualized nutrition education (independent variables). Records reviewed were randomly selected using a computerized sampling program (©SPSS, 2003) assigned to group according to nutrition education received. Primary outcome measures included number of drinking days/non-drinking days, number of days to first drink, and days abstinent. Time period in which nutrition education was delivered was ordinally grouped as pre-admission and from date of admission to include: day 1, days 2-7, days 8-14, days 15-21, and day 22+. Descriptive data collected included: gender (male), age, marital status (married, divorced, widowed, single-never married), ethnicity (Caucasian, African American, Asian, Hispanic, Other), employment status

(employed, not employed), SES/occupation (professional, non-professional, laborer, no occupation), educational achievement (less than 8th grade, some high-school, high-school/GED, college), co-morbid diagnoses, and number of times in treatment, drinking history (years drinking). Co-morbid diagnoses included: polydrug abuse, psychiatric disorders as defined by DSM IV, Hepatitis C, HIV positive status, Post Traumatic Stress Syndrome (PTSD), or diabetes. Hypertension, an additional co-morbidity noted in greater than five or more of the patient sample was also included. VA nutrition status classification, the result of nutrition screening performed on patients admitted to the substance abuse treatment programs was recorded. Nutrition status was classified as normal -1, mildly compromised - 2, moderately compromised - 3 or severely compromised – 4, and was based upon a standardized instrument utilized by trained clinical Registered Dietitians and/or clinical dietetic technicians (23).

Data Collection. Data collection utilized the Computerized Patient Record System (CPRS), and paper medical records with data manually transferred to an electronic database. Unique patient medical record identifiers were removed once individual record data input was completed so that they could not be connected to their unique medical patient record. Only aggregated data were reported.

Statistics. The sample was described using descriptive statistics. Group comparisons within and between programs were performed. Comparisons of independent sample means were analyzed using Mann-Whitney U, or Pearson Chi-square. ©SPSS for Windows (Version 11.5, 2003) was used to perform the analyses.

RESULTS

Subject Demographics. Patients in the RSAT program were tracked for an average of 287 (± 130) days and patients in the OSAT program were tracked for an average of 148 days (± 141). Subject demographics are summarized and compared by treatment program in Table 1. There were no significant differences between treatment groups in age, marital status, race, and education, co-morbid diagnoses of polydrug, psychiatric, PTSD or diabetes (Mann-Whitney U). Those in the RSAT program appeared to be more likely unemployed (P=0.007), have a professional occupation (P=0.031), with a higher incidence of hepatitis C (P=0.031) and hypertension (P=0.006) that the outpatient program. The enrollees in the OSAT program had significantly more positive responses to legal reason for being in treatment (P=0.002) than those in the RSAT program.

Nutrition Education. There were no significant differences in the proportion of patients participating in nutrition education in either program (Table 2). Significantly (P=0.021) more patients received group nutrition education in the RSAT program. There was a significantly (P=0.000) greater number of patients receiving individualized nutrition education in the OSAY program. There was no difference in the time period that group nutrition education was received, but there was a significant difference in the time that individualized nutrition education was delivered. OSAT patients tended to receive individual nutrition education pre-admission (30 days or less prior to program admission). This was usually observed while the patient was undergoing a detoxification program shortly before admission to the OSAT program. Only two patients in the RSAT program received both group and individualized nutrition education. Therefore group

TABLE 1

Comparison of characteristics of residential substance abuse treatment (RSAT) program and outpatient substance abuse treatment (OSAT) program subjects.

Subject Demographics	RSAT Program N=88	OSAT Program N=77	Pearson Chi-Square	*P*-value
Age (mean, SD)	51.6 (8.5)	49.8 (9.5)	2871.0[1]	0.091
Ethnicity (n, %)			5.053	0.282
Caucasian	65 (73.9)	61 (79.3)		
African American	13 (14.8)	14 (18.2)		
Hispanic	8 (9.1)	2 (2.5)		
Other	1 (2.2)	0 (0.0)		
Education Level (n, %)			2.112	0.550
College	12 (16)	10 (14)		
High School/GED	56 (74)	60 (81)		
Some High School	7 (9)	4 (5)		
8th grade or less	1 (1)	0 (0)		
Marital Status (n, %)			4.411	0.353
Married	11 (13)	16 (20.7)		
Separated/Divorced/Single	67 (80)	57 (74.1)		
Widowed	6 (7)	4 (5.2)		
Missing	6	0		

TABLE 1 CONTINUED

Subject Demographics	RSAT Program N=88	OSAT Program N=77	Pearson Chi-Square	*P*-value
Employed (n, %) [3]	13 (15%)	25 (32.5)	7.254	0.007
SES (n, %) [2]			8.893	0.031
Professional	16 (18)	5 (6.5)		
Non-professional	39 (45)	31 (40.3)		
Laborer	10 (12)	19 (24.7)		
None	22 (25)	22 (28.5)		
Co-morbid Diagnosis				
Polydrug Abuse	43 (49)	34 (44)	0.366	0.545
Psychiatric	43 (49)	27 (35)	3.201	0.074
Hepatitis C [2]	27 (31)	11 (14)	6.228	0.013
PTSD	23 (26)	14 (18)	1.494	0.222
Diabetes	8 (9.0)	7 (9)	0.000	1.000
Hypertension [3]	24 (27)	8 (10)	7.488	0.006
Legal Reason for Treatment [3]	13 (15)	27 (35)	9.208	0.002

[1] Mann-Whitney U test.

[2] Significantly different at $P<0.05$.

[3] Significantly different at $P<0.01$.

TABLE 2

Comparison of participation in nutrition education and subject nutritional status by residential (RSAT) and outpatient (OSAT) nutrition education group.

Nutrition Variables	RSAT Program N=63 N %	OSAT Program N=52 N %	Pearson Chi-Square	*P*-value
Nutrition Education Provided	63 (69)[1]	52 (68)[1]	0.061	0.805
Group Nutrition Education Provided [2]	58 (92)	25 (48)	5.361	0.021
Individual Nutrition Education [3]	5 (8)	16 (31)	25.069	0.000
Group & Individual Nutrition Education	2 (3)[4]	11 (21)	[5]	[5]
1st Time Group Nutrition Education Provided	N=58	N=25	11.287	0.080
Pre-admission	1 (2)	3 (12)		
Day 1	1 (2)	1 (4)		
Day 2-7	9 (15)	5 (20)		
Day 8-14	12 (20)	3 (12)		
Day 15-21	9 (16)	3 (12)		
Day 22+	26 (45)	10 (40)		
1st Time Individual Nutrition Education Provided [2]	N=5	N=16	32.743	0.000
Pre-admission	2 (40)	7 (44)		
Day 1	0 (0)	1 (6)		
Day 2-7	3 (60)	0 (0)		
Day 8-14	0 (0)	0 (0)		

TABLE 2 CONTINUED

Nutrition Variables	RSAT Program N=63 N %	OSAT Program N=25 N %	Pearson Chi-Square	P-value
Day 15-21	0 (0)	0 (0)		
Day 22+	0 (0)	8 (50)		

[1] RSAT: 63 out of 88 (69%) patients received nutrition education. OSAT: 52 out of 77 (68%) patients received nutrition education.

[2] Significant at $P<0.05$.

[3] Significant at $P<0.001$.

[4] Excluded from analysis due to inadequate sub-sample size.

[5] Comparisons not made due to inadequacy of RSAT group sub-sample size.

differences were not computed for patients receiving both group and individualized nutrition education.

Nutrition status. Ninety-seven percent (86 out of 88) of RSAT program patients were assessed for nutrition status, while 42 out of 77 (55%) of the OSAT program were assessed (Table 3). A review of the entire 300 plus population of the OSAT program revealed that less than 25% of the total population was actually assessed for nutrition status. There was a significant difference (p=.000) in nutrition status between the programs with 60% of RSAT patients assessed as normal nutrition status verses 2% of the OSAT program patients assessed as normal nutrition status.

Substance Abuse Outcome Indicators. As shown in Table 4 substance abuse behaviors, i.e. years problem drinking, age at first drink, previous inpatient and total substance abuse treatment attempts, were not significantly different between programs. The length of the OSAT program tended to be significantly (P=0.000), longer (154 days vs. 50 days) than the RSAT program. However, all substance abuse treatment outcome measures were significantly different between treatment groups (days to first drink: P<0.05; days abstinent, days drinking, drinking to non-drinking days ratio: P<0.01; days non-drinking: P<.001). RSAT group patients displayed longer periods of abstinence and non-drinking days as well as a longer period of days to first drink.

An association between substance abuse outcome measures with nutrition education was not detected in the OSAT program, but significant (P<0.05) differences were detected within the RSAT program for days abstinent, days non-drinking and drinking to non-drinking days ratio, (Table 5).

TABLE 3

Comparison of nutrition status screening of residential (RSAT) program with outpatient (OSAT) program group.[1]

Nutrition Demographics	RSAT Program N=88 N %	OSAT Program N=77 N %
Nutritional Status		
Normal	53 (60)	2 (2)
Mildly Compromised	33 (38)	37 (48)
Moderately Compromised	0 (0)	3 (4)
Severely Compromised	0 (0)	0 (0)
Missing	2 (2)	35 (46)

[1] Pearson Chi-Square. Significant at $P<0.000$.

TABLE 4

Comparison of substance abuse behavior and indicators by residential (RSAT) and outpatient (OSAT) treatment program.

Variable	RSAT Program Mean ± SD	OSAT Program Mean ± SD	Mann-Whitney U	*P*-value
Years Problem Drinking	27.8 (11.1)	26.7 (9.8)	2532.0	0.343
Age at First Drink	17.9 (6.0)	17.2 (7.0)	4612.5	0.477
Previous Treatment Attempts	2.7 (5.2)	3.1 (3.9)	2612.5	0.100
Residential Treatments	1.7 (3.6)	2.3 (5.2)	3093.5	0.850
Days Enrolled in Treatment Program [3]	50 (25.3)	154.3 (139.1)	2192.5	0.000
Average Days Tracked through 365 Days	287 (151)	148 (141)	1698.5	0.000
Outcome Measures				
Days Abstinent [2]	187.8 (147.6)	124.5 (133.7)	2421.0	0.002
Days Drinking [2]	96.8 (130.2)	31.1 (77.5)	2625.0	0.008
Days Non-drinking [3]	190.6 (147.6)	117.2 (131.9)	2280.0	0.000
Days to First Drink [1]	56.5 (88.3)	25.5 (46.3)	2784.0	0.039
Drinking:Non-drinking Days [2]	3.3 (10.8)	.55 (2.2)	2097.5	0.002

[1] Significant at $P<0.05$.

[2] Significant at $P<0.01$.

[3] Significant at $P<0.001$.

TABLE 5

Comparison of substance abuse outcome indicators with nutrition education by residential (RSAT) and outpatient (OSAT) treatment program. [1]

Variable	RSAT Program N=63		OSAT Program N=52	
	Mean, SD	*P*-value	Mean, SD	*P*-value
Days Abstinent	187.8 (147.6)	0.026 [2]	130.5 (140.5)	0.723
Days Drinking	96.8 (130.2)	0.055	30.15 (80.8)	0.901
Days Non-drinking	190.6 (147.6)	0.038 [2]	123.7 (137.7)	0.597
Days to First Drink	56.5 (88.3)	0.810	28.9 (47.3)	0.389
Drinking:Non-drinking Days	3.3 (10.8)	0.049 [2]	0.34 (1.28)	0.839

[1] Mann-Whitney U test.

[2] Significant at $P<0.05$.

DISCUSSION

There was sufficient demographic comparability between the RSAT and OSAT programs with respect to drawing an inference regarding the effect of nutrition education. RSAT program patients receiving nutrition education tended to have improved outcomes compared with OSAT program patients, particularly at 6-months (180-days) post treatment admission. This is consistent with a recent study by Doyle and others (24) where it was observed that more residential patients maintained abstinence at 6-months (75%) than did the community-based group (36%). Results of a study by Kedia and others (25) found six-month treatment outcomes to be significantly predicted by a broad range of in-treatment and post-treatment variables that included a comprehensive education program.

Basic differences were observed by the author in the means by which patients were exposed to nutrition intervention in the populations from which the samples were drawn. RSAT program patients were scheduled and expected to attend nutrition education. This was not the case with the OSAT program, where patients received group nutrition education only if they attended a specific group addiction therapy session on the third Thursday of the month. The RSAT program assessed the nutrition status of nearly all patients while the OSAT program assessed about one-half of those sampled. The author observed that only one-fourth of the entire RSAT population was actually assessed for nutrition status. All RSAT patients were screened for nutritional status within 24 hours of admission by a clinical dietetic technician who tended to assess most patients as normal or mildly compromised, whereas OSAT program patients were screened only when a period of inpatient detoxification immediately preceded admission to the

substance abuse treatment program. The OSAT nutrition screening was also completed by a clinical dietetic technician who tended to screen patients as mildly compromised. The same nutrition screening instrument was used in both treatment settings. This may indicate that the nutrition screening protocol was approached differently between the two programs.

There were significantly more patients with co-morbid diagnoses of Hepatitis C (P=0.013) and hypertension (P=0.002) in the RSAT program than in the OSAT program. It is reasonable to expect that these patients would be subject to greater individualized nutrition education, but this was not the case. Substance abuse, particularly alcohol abuse, is associated with many harmful nutritional consequences; therefore substance abuse patients should be considered nutritionally compromised and assessed. The long-term goal of therapy for substance abusers is to replace self-abusive behaviors with health-seeking behaviors. Rigorous patient education in nutrition can greatly facilitate rehabilitation (26).

Substance abuse treatment outcome measures were significantly different when compared by program. Patients in the OSAT program tended to experience drinking episodes more quickly than patients in the RSAT program. RSAT program patients significantly (P<0.05) exhibited longer periods of abstinence and more days non-drinking that the OSAT program patients. But they also experienced a higher ratio of drinking:non-drinking days. It was observed that a significantly (P<0.001) greater number of OSAT patients were employed. Because of the need for the individual to function in a work environment this may have been a motivating factor towards limiting the drinking days that did occur. There was a greater incidence (P=0.002) of legal issues

leading to substance abuse treatment in the OSAT program (35.1%) than in the RSAT program (15%). The most prevalent legal reason for entering treatment was the consequences of driving under the influence (DUI) and/or the desire to regain a driver's license, neither of which required a residential course of treatment. This factor may have also contributed to limiting the drinking days:non-drinking days ratio in the OSAT group.

RSAT program patients were tracked for a longer periods of time post-residential treatment program (287 $\pm$ 151 days) than were the OSAT program patients(148 $\pm$ 141). It would appear that RSAT program patients tended to take advantage of substance abuse treatment services for longer periods of time and in doing so obtained a longer duration of treatment exposure.

In the two programs studied RSAT program patients appeared to derive more benefit from nutrition education than did OSAT program patients. However, the inconsistency in delivery of nutrition education demonstrated in the OSAT program limited the comparability of the nutrition education component. RSAT patients were required to participate in nutrition education or risk discharge from the program. There was no such requirement for the OSAT group. Thus, the consequences of a missed session were less for an OSAT program participant than for a RSAT program participant. It has been shown that a standard treatment outpatient program that includes group therapy, various education sessions, community meetings and AA in an on-going weekly therapeutic program was more effective than a minimal treatment program that was composed of weekly education films (27).

Among patients that participated in nutrition education, RSAT program patients demonstrated more sustained abstinence from alcohol than did OSAT program patients.

There were no differences detected for the time period in which nutrition education was received. There was no evaluation of other education components, which may also have had an association with substance abuse treatment outcomes. Results of a study where treatment outcomes of inpatients and outpatients were compared based upon the services received it was revealed that the level of vocational education and group treatment services were positively associated with completion of treatment and inversely associated with decreases in post discharge arrest (28). Timko and others (29) described residential substance abuse programs (compared to psychiatric programs) as having higher demands for patient functioning and responsibility, as well as more resident control. Thus, it was observed that patients in these "high-demand" programs participated more in treatment services offered. However, Moos and Moos (30) observed that individuals who sought treatment quickly, and who participated in outpatient-based treatment for longer periods of time tended to have better alcohol-related outcomes than did individuals who ceased to participate, or did so less frequently. Thus, it would appear that regardless of the treatment setting, patients who take advantage of as many services as possible tend to have improved outcomes. While it appeared that the programs reviewed in the current research offered a wide array of various services to patients, the total depth of services utilized by each patient was not examined.

Additional analysis of the presence of co-morbid diagnosis may provide guidance as to their predictive nature of the benefit of nutrition education in treatment. Finnell and others (31) suggest that patients with substance abuse addictions should have the same benefits of education as patients with other chronic diseases, such as diabetes and

coronary heart disease with goals to empower patients, decrease their defensiveness and reduce the stigma they experience.

This study is limited by the inherent differences in substance abuse treatment between the RSAT and OSAT programs, although for both programs there was a definite individualized approach to overall substance abuse treatment. Results are limited to the specific substance abuse treatment programs at the VA Medical Centers of Miami, FL and West Palm Beach, FL.

There is evidence to support the benefit of nutrition education as a component of substance abuse treatment in a residential program setting with improved substance abuse treatment outcomes. This may be the result of the overall frequency and duration of various services, including nutrition education, that were provided to the patients in the residential program. It is also possible that the residential setting itself, one that addressed, for the short-term at least, the social needs of the patients made it feasible for patients to focus more intently on overall treatment goals. It was also apparent that residential patients even after discharge tended to maintain a longer therapeutic association with the treatment program, thus improving the chances of sustaining abstinence.

However, within the residential program there was an environment that facilitated the patients' participation in nutrition education. This environment was not as prominent in the outpatient treatment program. Thus there remains the question as to whether or not the outpatient population can and would benefit from broader exposure to nutrition education within the framework of the outpatient substance abuse treatment program.

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Part VI:

Future Studies: Theoretical Framework

ABSTRACT

It is apparent from the research that nutrition education is positively associated with outcomes of substance abuse treatment. However, a number of important questions for practical and effective nutrition education remain unanswered. For example, how and in what manner should nutrition education be delivered to the target population for it to be effective? In order to answer these questions in a meaningful manner it is useful to have an understanding of the complexities of the target population, e.g. confounding factors, such as co-morbity and medical interventions, and how these may be integrated with educational models. With this concern in mind a framework for future research is presented in context of a review of nutrition education strategies and learning theories that may provide better instruments for the application of nutrition education affecting substance abuse treatment outcomes.

Key Words: Nutrition, education, substance abuse, treatment, patient education.

INTRODUCTION

Results presented in the preceding sections have indicated that there is an association between provision of nutrition education and improved substance abuse treatment outcomes. When outcomes were examined from a program perspective, it was noted that certain nutrition services, particularly nutrition education, tended to be significantly associated with improved Addiction Severity Index composite scores. It was also observed that those programs that offered group nutrition education tended to offer significantly more nutrition services overall. When outcomes were examined from a patient perspective, it was observed that residential treatment setting patients who

participated in nutrition education tended to have significantly longer periods of sustained abstinence and more non-drinking days than those who did not participate in nutrition education. However, this finding was not reflected in the group of outpatient treatment patients. While the two treatment groups displayed very similar subject demographics and drinking behaviors, there were some differences detected. Specifically, patients in the residential group had a higher degree of co-morbid hepatitis C and hypertension. A larger percentage of the outpatient group was employed, and more of this group sought treatment for legal reasons. However, while these differences were significant between treatment program groups, they were not significant when comparisons were drawn between those receiving nutrition education and those who did not.

These results give rise to the question as to why and how participation in nutrition education may be effective in promoting improved substance abuse treatment outcomes. Specific questions that have emerged from the current research are:

1) What domains of nutrition education, for example, knowledge, practice or learning styles, are effective in improving substance abuse treatment outcomes?
2) Which nutrition behaviors may be affected by participation in a nutrition education program provided during substance abuse treatment? Examples of these could be dietary choices, vitamin supplementation, food substitutions for alcohol, food purchasing or food preparation practices.
3) Changes in which nutrition behaviors are most likely to be associated with improved substance abuse treatment outcomes? Some examples might be selection of more nutrient dense foods, changing the macronutrient content of daily food intake or alteration of when or where food is consumed.

In order to answer these questions in a meaningful manner the complexities of the target population must be considered. An integration of the literature associated with nutrition education and substance abuse treatment is presented. Physical and psychological factors that may affect substance abuse treatment outcomes and have an impact on nutrition behaviors, and visa-versa must be addressed. Therefore, a discussion of education strategies must be readdressed, and a new model be developed for addressing the questions posed above. For this a brief review of relevant studies is presented, which upon further refinement may lead to development of instruments in this area.

REVIEW OF LITERATURE

Factors affecting substance abuse treatment outcomes. Services provided to patients in substance abuse treatment vary by treatment program and may include such services as: individual and/or group treatment, medical contact, prescription medications, recreational activities, vocational education, self-help groups, social/family interventions, psychological and/or psychiatry services, HIV education/counseling, and referrals to outside agencies. Messina and others (1) noted that the degree of vocational education services was positively associated with treatment completion, and that participation in group services was associated with decreases in post-discharge arrest among clients. Clients who received a greater number of inpatient services were more likely to complete treatment.

However, services are often now limited by controls imposed by healthcare maintenance organizations (HMO's) and insurance providers who focus on "medical

necessity" as the rule for treatment. Thus, certain services may not always be provided due to lack of reimbursement or funding. These may include literacy/education, nutrition, family planning, domestic violence counseling, recreational therapy or sexual abuse counseling (2).

A key factor that affects the impact of substance abuse treatment is the therapeutic relationship that is developed between the patient and the provider. Studies have shown that patients who rate the therapeutic alliance more positively tend to have higher rates of treatment attendance and percentage of days abstinent during treatment and in the twelve months that follow (3).

It has been observed that individuals who enter substance abuse treatment and remain in treatment for a longer duration tend to have better short- and long-term alcohol related outcomes (4). They also demonstrate better short-term social functioning. The intensity of treatment does not appear to be associated with outcomes. Thus it is recommended that treatment emphasize continuity and duration, rather than intensity of care.

Weisner and others (5) have shown that previous substance abuse treatment in the prior 12 months resulted in higher abstinence rates and non-problematic alcohol use outcomes, compared with those who were not in any type of substance abuse treatment. Results of this study also indicated that the presence of more drug users and heavy drinkers within the client's social network was inversely related to abstinence for both treated and untreated population samples. The presence of co-morbid psychiatric problems presented as major obstacles to treatment regardless of prior treatment status. Thus addressing social networks and psychiatric problems are essential components of

substance abuse treatment. Jones and others (6) also suggest that the diagnosis of psychiatric co-morbidity requires a period of abstinence from two to eight weeks to eliminate psychiatric symptoms directly related to substance abuse. Therefore, a period of sustained sobriety is necessary prior to making a definitive comorbid psychiatric diagnosis.

Results of a study by Foster and others (7) showed that among those variables examined, insomnia was the most significant predictor of relapse and was inversely related to treatment outcomes in an inpatient substance abuse treatment program. In this study quality of sleep was assessed by the Nottingham Health Profile (NHP) sleep subscore at baseline and again at a 12-week follow-up. Results indicated that self-reported sleep disturbance could be a useful guide for better treatment planning for substance abusers. Nutrition education topics could include guidance on those foods and beverages (i.e. sources of tryptophan, such as milk or turkey) that are considered helpful for inducing sleep (8).

The differences that may exist between treatment setting populations may have an impact on the manner in which nutrition education is delivered. In a study to determine whether inpatient or outpatient treatment was associated with higher posttreatment abstinence rates, Harrison and Asche (9) found that higher abstinence rates were seen among inpatient treatment patients only when those patients reported recent suicidal ideation or attempt. Patients enrolled in inpatient settings tended to have higher drug and alcohol severity, higher psychological distress and higher lifetime medical severity. Conversely, outpatient treatment patients tended to display higher degrees of full time employment/income level, higher lifetime psychological treatment/medications, have

more legal reasons for being in treatment, greater family stability and more lifetime polysubstance use. Thus educational and behavioral strategies used in treatment should be specific to the treatment setting and as that setting changes, strategies should alter accordingly.

Factors affecting nutrition behavioral changes. Review of the literature (10) has indicated that the two most common reasons patients make dietary changes are desire for weight loss and due to an increased awareness of healthier diets. The authors noted that a healthier diet intake resulted when new foods/dishes were introduced into the diet, when there was a need to deal with a medical problem, when there was a response to food scares, when adhering to medical advice, when there was a desire to suit others in the household, and in response to official nutritional guidelines. Older individuals most frequently reported making dietary changes in response to medical advice. In other studies, the correlates of food consumption were cost, taste, convenience and concern for health (11).

Adults with low literacy skills have been found to often lack basic information about nutrition and have poor eating behaviors. Yet, focus groups conducted at adult learning centers have shown that while these adults had misconceptions about nutrition, they displayed a strong desire to learn about good dietary practices (12). Following a nutrition education intervention, knowledge of food measurement and ability to read food labels and recipes improved significantly ($P<0.05$, $P<0.01$) but eating behaviors were essentially unchanged. The authors suggested that long-term efforts to address family and community systems may be necessary to ensure changes in nutrition behaviors

O'Halloran and others (13) analyzed results of the Eating Patterns Study (conducted in primary care clinics within a large health maintenance organization in the Puget Sound area) where a low-intensity dietary intervention was delivered to reduce fat and increase fiber intake. Intervention consisted of providing participants with a self-help booklet introduced by the primary care physician during a scheduled appointment, along with a follow up reminder letter two weeks later. The researchers assessed whether dietary outcomes for intervention versus control were different depending on participants' health lifestyle patterns at baseline. The analysis indicated that the lifestyle groups defined by alcohol intake or current smoking did not demonstrate dietary changes, or did not sustain changes made early in the intervention, as did other lifestyle groups. Thus these individuals did not respond as well as other lifestyle groups to a low-intensity self-help intervention. It is important to note that the Eating Patterns Study was not designed to test whether the effectiveness of the dietary intervention observed depended on lifestyle. The authors recommended grouping individuals by lifestyle to assess whether population subgroups need to be targeted for risk reduction and health promotion, have different motivations for participating in interventions, would choose different types of interventions and would respond differently to various education and intervention strategies. These results suggest that educational strategies for substance abuse populations require more than minimal interventions.

Information processing and cognitive function. It has been recognized that an individual in substance abuse treatment must be capable of receiving new information and processing it in such a way that it becomes integrated with existing knowledge and manifested in behavior changes (14). It is important to recognize that cognitive

functioning acts as a moderator of treatment success, not as a direct causal variable. However, if seen as a foundation upon which other treatment related factors might rest, the role of cognitive function becomes clear (15). The presence of liver disease, especially cirrhosis of the liver and accompanying nutritional deficiencies, does appear to contribute to the alcoholic's cognitive performance.

Non-compliance to a prescribed treatment regimen is the single most important index in the treatment's success. This is true in any aspect of healthcare but is particularly true in medical nutrition therapy and even more so in treatment for substance abuse. Ability to comply and participate in substance abuse treatment, particularly the educational components of treatment, may be adversely affected by cognitive functioning, which may be impaired even after alcohol consumption has been discontinued. Alcohol has a neurotoxic effect on the brain and results in central nervous system (CNS) disturbance or injury in 75% of alcoholics. Neurological impairment most frequently observed includes those on tasks measuring abstract thinking, on memory capacity and on visuospatial processes. Poorer health and/or additional CNS injuries appear to increase the presentation of these deficits (16).

These cognitive deficits are often displayed by newly abstinent alcoholics and may interfere with any benefits derived from educational and skill development sessions held very early in treatment. Sustained abstinence is necessary to recover and improve working memory, visuospatial functioning and attention, sometimes taking several months to a year (17). Thus, educational services delivered early in treatment may need to be reinforced, if not repeated.

Goldman (18) has recommended that substance abuse treatment during the first days after cessation of drinking should be confined to meeting physical, that is, medical needs. Following a period of about two weeks, new information, gradually phased, in increasing complexity may be introduced. Simple material should precede more complex information. Utilizing neuropsychological testing at this time could also be useful in guiding the pace of introducing more complex nutrition education and training.

Goals of patient education. A research meta-analysis (19) of studies evaluating patient education and counseling revealed that patient education and counseling were generally effective for increasing preventive health behaviors in people who were healthy. However, studies showed that behavior changes in smoking, alcohol abuse, and nutrition and weight control appeared to respond more favorably to self monitoring, multiple communication channels (i.e. print, video/audio, personal) and having follow-ups every thirty days or more.

Participants attending a prison-based alcohol education course were assessed for key dimensions at baseline and 3 or more months following release. Dimensions assessed included alcohol consumption, violent behavior, family relationships, general health and ability to cope. Significant ($P<0.001$ to $P<0.05$) improvements in all dimensions were observed when compared with controls. The largest differences noted were in general health and alcohol consumption (20). Results of this study demonstrated added value in providing education programs prior to release from corrections facilities.

Generally the treatment of disease and promotion of healthy behaviors and disease preventions requires a therapeutic alliance between the health care provider and patient, because the patient must assume responsibility for lifestyle changes. Nutrition

education is a process in which an educator seeks to deliberately and progressively empower learners to act on food and nutrition-related issues, such that the learner will gradually be freed from the intervention. Research on behavior must be multifaceted in order to gain any real understanding of behavior. Achterberg and Trenker (21) state that nutrition educators must recognize that clients will always have a number of problems, and nutrition may not be a major concern amongst them. Substance abuse treatment clients have a myriad of concerns to address. Nutritional intake is certainly one of those concerns but ultimately it is not the most important or pressing when treatment commences. Thus nutrition education programs for substance abuse treatment clients must take a complementary approach to the ultimate goal of treatment, which is the cessation of substance use.

Rusness (22) demonstrated the need to develop common themes and problems among participants in group nutrition programs, to turn critical thinking into action planning, and finally into action thus empowering the participants. It is recognized that behavioral change is the appropriate outcome criterion for evaluating the effectiveness of nutrition education. The goal of nutrition education interventions for free-living adults in community settings has been fairly well defined and more behaviorally focused than for some other age groups, specifically: decrease risk of chronic disease and promote healthful eating patterns through direct attempts to improve the nutritional adequacy of diets and change behaviors. Thus evaluation measures can include physiologic parameters and nutrient intakes, and may also include the end results of nutrition education, specifically food intakes and behaviors that include the intake of target foods

(23). This can be accomplished through analysis of diet records and food frequency questionnaires completed by clients.

Learning strategies for patients. Successful patient education programs require a strategic plan based on theory of instruction, design and learning. Those programs that do not are less effective and may even be counterproductive. Various learning strategies for patients have been described in the literature (24-27). These strategies include those that take advantage of group dynamics (cooperative learning strategy); that emphasize patient empowerment and self-efficacy (health belief model); goal setting strategies, and finally those that are based upon readiness to alter behavior (stages of change model).

Cooperative learning strategy has been described as effective for small group learning. The description by Johnson and Johnson (28) includes five basic elements: positive interdependence – students perceive that the goal of the group is to ensure the learning of all group members; positive reward interdependence – when all group members receive a reward based on their overall achievement; positive resource interdependence when resources are distributed so that coordination among members is required if a goal is to be achieved; positive role interdependence when members are given specific complementary roles to play in the group; positive task interdependence when a division of labor is structured so that the actions of one member have to be completed if the next group member is to complete his or her responsibilities. The authors note that nutrition education is far more complex than the teaching of other subject areas because of its emphasis on creating informed consumers who value good nutrition and consume nutritious foods throughout their lives. To achieve short- and long-term goals of nutrition education, the materials and methods used need to reflect the

social context and interpersonal interaction factors that previous theory and research have indicated to be important in influencing enduring knowledge acquisition, attitude development, and behavioral habits. Cooperative learning is an instructional strategy that utilizes group dynamics to provide opportunities for the participants to publicly commit to good nutrition and engage in social models of good eating habits. Cooperative learning also involves students in discussing and teaching each other nutrition information, and provides opportunities for arguments and controversies in which both benefit and fear appeals can be personally tailored to each student.

Wyatt (29) promotes determining those factors that motivate the individual, then implementing strategies that will empower, or permit the patient to exercise healthy behaviors, while not in conflict with the patient's values. This health belief model describes two main factors that motivate the individual to adopt preventive health behaviors or to reduce risk. First there must be a perception of personal susceptibility to the disease. Second, the disease, or the individual behaviors must have serious consequences. Additionally, the individual must perceive himself as competent to make the appropriate behavior changes. This perception is also known as "self-efficacy."

Cullen and others (30) suggest that behavioral theory-based nutrition education programs have been more successful in achieving actual food behavior change than have knowledge-based programs. The authors describe a four-step goal setting process that includes the client's recognizing the need for food behavior change; establishing a goal; adopting a goal-directed activity and self-monitoring; and finally attaining a self-rewarding goal. Encouraging patients to set goals that are challenging yet achievable and doing so participatively tends to result in sustained performance. Maintenance of daily

records and receiving verbal feedback has been found to enhance goal-directed activities, self-monitoring and attainment of goals.

While the educational goal may be to give the individual the capability to make a decision to change behavior, ultimately that decision belongs to the patient. Walker and others (31) describe a set of adult learner principles that include: self-directed learning enhances autonomy; adults must have a felt need to know; problem-oriented learning is more acceptable to adults; incorporating life experiences enhances motivation; and active participation is essential for behavior change. Knowledge, skills and a problem-solving base are necessary to manage the disease. This may include learning styles, such as group versus individual, participatory learning, computer versus print versus video learning materials, didactic versus emotional appeal in the health education message and directed learning versus self-directed approaches. This suggests that nutrition education programs should contain clear goals established by the clients that can result in visible achievements during the nutrition intervention period.

Dietary change does not emerge from change in knowledge status alone, but rather requires some level of self-regulation of food intake. This was made evident in studies by Schnoll and others (32) where it was observed that self-regulation required a combination of goal setting and self-monitoring to produce significant changes in consumption of the target nutrient, in this case dietary fiber. Self-monitoring alone had no effect, but when combined with goal setting there was a 91% increase in dietary fiber intake as compared to groups that did not set goals. Goal setting entails setting short-term goals, and self-monitoring entails recording daily intake.

The "Stages of Change" model for assessing the patient's ability to engage in nutrition behavioral changes assumes that behavior change is dynamic and involves five distinct stages that include: pre-contemplation – no thought or consideration to altering one's behavior; contemplation – thought about making a change; preparation – making definitive plans to change; action – individual has changed his/her behavior; maintenance – individual works to prevent relapse and consolidate gains made or relapse (33).

Kristal and others (34) recommend using the Stages of Change construct for dietary change in such a way so that the target behavior is defined using self-rated diet. Thus Stages of Change is not so much a measure of dietary behavior, but rather is a measure of cognitive and behavioral engagement with the dietary change process. It is recommended that estimates of usual nutrient intake be used as personal feedback to help raise awareness and motivate change. Knowledge of nutrient intake, assessed through the use of dietary intake records, can be used in conjunction with stages of change to deliver a more personalized and targeted intervention. In addition, the action and maintenance stages should be interpreted as the time for developing and maintaining cognitive and behavioral vigilance about healthful food choices. Patients will undoubtedly recycle between maintenance and action thus allowing the nutritionist to introduce more challenging dietary behavior changes. This model requires frequent contact between the nutritionist and the patient.

Greene and others (35) describe specific provider goals when using the Stages of Change Model. For example, the goal with pre-contemplation is to get patients to think about the problem. When dealing with patients in the contemplation stage the nutritionist needs to focus on reducing barriers to change, continuing to use the experiential

strategies, and starting the patient with making small dietary changes. Here the goal is to get the patient to make a decision to start making small dietary changes. Preparation and action are the two busiest stages. Nutritionists should use behavioral strategies to reduce cues for maladaptive patterns and reinforce adaptive patterns. Traditional dietary change strategies may be useful. The goal of the action stage is prevention of relapse. Risk of relapse for people in maintenance is relatively low, and they need to consolidate gains from earlier stages and continue to use processes of change. They may also benefit from the dietary messages of balance, variety and moderation that the nutritionist can provide through continuing contact with the patient.

Using constructs from these learning models can provide the theoretical framework for the development of a nutrition education program for the substance abuse treatment sample of interest.

Assessment of substance abuse treatment outcomes. Use of common procedures and established assessment instruments facilitates the comparison of results across studies. Standardization of intervention will improve error variance in the study, enhance its internal validity, and assist in ruling out alternative explanations of findings and increasing confidence in the conclusions drawn. In clinical trials that used self-selected volunteers, it was observed that biochemical tests and collateral informant reports did not add sufficiently to the subject's self-report measurement accuracy to warrant their use. An existing, validated, reliable self-report instrument should be utilized to assess standardized substance abuse treatment outcomes (36).

Measurement of the effectiveness of nutrition education in substance abuse treatment should, at a minimum, be related to the proportion of days abstinent in the

preceding 90 days; proportion of abstinence, moderate or heavy drinking during the period of study, and should measure the main effect over a follow-up period that exceeds one year, i.e. 18 months (37). Valid and reliable instruments suitable for measuring these variables are available for use either through public domain or copyright sources (38).

Sahyoun and others (39) have framed evaluations of successful nutrition education interventions for older adults. Results of their research indicated that positive outcomes were more likely when nutrition messages were limited, simple, practical and directed to specific needs of the participants. Individuals who were more motivated at the outset appeared more likely to be successful in achieving dietary changes. Incentives, as part of the study design, appeared to have a positive effect upon outcomes and reduced attrition rates during the study period. The authors suggested that nutrition education interventions need to be of a length sufficient to produce outcomes, but often are not. They indicate that studies which fail to assess the health status and motivational levels and the needs of the participant are less likely to succeed. The demographic characteristics of subjects including their socioeconomic status and racial/ethnic backgrounds should be addressed in the design of the study. Actual interventions need to include those that modify the environment in which lifestyle choices are made. Research designs of nutrition education interventions should specify the unit of randomization; include adequate sample size, and minority representation. Recruitment procedures and eligibility requirements must be clearly stated. The setting, type of intervention contacts (professional, lay person, etc.), the duration and frequency of the intervention as well as measures of compliance by the subject to the intervention should be well established. Evaluation of the intervention should include the process and fidelity of whether the

intervention was delivered and was received as it was intended. Attrition rates, intervention adherence and outreach efforts to be inclusive to the population for inclusion in the study should also be addressed.

Subject eligibility for substance abuse treatment populations requires that subjects meet the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria for current alcohol abuse or dependence (40). Thus only persons with clinically significant alcohol use disorders should be included in the trial. Using standardized diagnostic criteria also facilitates the characterization of co-morbid diagnoses that may complicate treatment and affect outcome. Subject characteristics, such as age, gender, ethnicity/race, marital status, employment, diagnostic co-morbidities and education, as well as drinking behavior demographics (age at first drink, years problem drinking, prior treatment attempts), allow the determination as to the extent to which the study sample represents other populations with alcohol use disorders (41).

Exclusion criteria must out of necessity include patients in acute medical or psychiatric crisis (i.e. imminent suicide risk or acute psychosis). Additionally, subjects that have current drug dependence (except nicotine, marijuana), have had recent IV drug use, or have legal circumstances that preclude randomization to treatment must be excluded. A literacy level below 5th grade and the lack of reliable "locator" who could be contacted in case subject becomes lost to follow-up may also be reasonable exclusion criteria. A useful subject recruitment method described by Kadden (37) suggested making use of a 20-minute quick screen telephone interview to obtain demographics, alcohol, drug history, legal status, residential stability, psychological history, and transportation resources to eliminate ineligibles.

Research and healthcare ethics may require a study design that provides alternative education, such as general health education, to that portion of the sample randomized to a control group, rather than no nutrition education at all. If this is the case, a standardized general health education program must be identified in advance and tested with a representative sample of the target audience.

Materials related to the content of the nutrition education intervention should be selected or developed as appropriate. It has been observed that most dietitians tend not to use a formal evaluation tool to evaluate readability, content and format characteristics of health education materials. Since nutrition education materials are used as reinforcement to verbal instruction, it is necessary that they are clear, accurate and consistent with the original nutrition message (42). Often health education materials are frequently written at a reading level that is too difficult for the majority of the population. Writing and graphics techniques can be used that increase comprehension, memory. Buxton (43) offered "key tips" for producing materials that are effective: headlines and text should offer desired benefits; actions should be convincingly described and clearly related to desired benefits; information should be familiar and presented in a well-organized manner; important points should be highlighted in subheadings, text, pictures and in captions; information should be organized into five or fewer, well labeled groups; key points should be positioned first or last in any lists or sections, and the "take home" message should be established into five or fewer key points at the end of the material. Therefore, it is essential that any nutrition education materials used undergo a rigorous evaluation for suitability with the target population.

Need for merging nutrition education into substance abuse treatment.

Research results support an association between participation in nutrition education during substance abuse treatment and treatment outcomes. However, the limitations imposed by the multivariate nature of substance abuse treatment indicate that future research should tailor nutrition education interventions to the specific needs of the target population. The goal of alcoholism treatment is to reduce or eliminate drinking and drinking-related problems (37). The goal of nutrition education is to facilitate the informed food choices that ultimately change dietary behaviors and promote health (44). These two goals are complementary when combined and might even be synergistic. Analysis of outcomes among substance abuse treatment patients has shown that nutrition education may play a role in improved outcomes, particularly longer periods of sustained abstinence (45-46); decreased rates of recidivism and reduced incidence of legal problems (47); improvements in dietary intake (48); and reductions in addiction severity (49). Nutrition education can be a useful component in substance abuse treatment towards meeting the overall goals of that treatment but its benefits need to be measured. Measurement is directly related to establishment of the goals of nutrition education intervention and assessment of program outcomes (44). With this in mind, both the substance abuse and the nutrition education treatment communities would benefit from research trials aimed at developing and measuring effective nutrition education interventions within substance abuse treatment populations. Educational strategies that can be applied within substance abuse treatment settings have been discussed and may provide a basis to answer research questions.

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Appendices

Appendix A:

Content Validity Panel Questionnaire

Survey of Nutrition Intervention in VA Substance Abuse Treatment Programs

Content Expert Panel Questionnaire

DIRECTIONS: Please answer the following questions regarding the content of the questionnaire. Feel Free to make comments within the actual questionnaire. Use margins and free-space as desired.

C-1 Do the items address nutrition services that are likely to be provided to a substance abuse treatment program population?

C-2 What other aspects of nutrition intervention in substance abuse treatment that are of importance to this population need to be included in the questionnaire?

C-3 How appropriately are choices for each item worded? *Answer here or by any item as desired.*

C-4 Which items or answers should be worded differently?

C-5 Which items should be categorized in a different section? (*Nutrition Services, SATP, Demographics*)?

C-6 How appropriate is the questionnaire in length?

C-7 How appropriate is the questionnaire for its intended audience?

C-8 How are the directions clear? *Please make specific recommendations.*

C-9 Which definitions provide sufficient guidance?

C-10 Which definitions do not provide sufficient guidance?

C-11 What is your overall impression of the questionnaire?

Return your responses along with the questionnaire in the stamped, addressed envelope provided to:

Louise Grant, M.S., R.D., LDN
James H. Quillen VA Medical Center
Box 400
Mountain Home, TN 37684

Appendix B:

Pilot Test Questionnaire

PILOT TEST QUESTIONS

Please answer the following questions regarding the pilot test of the questionnaire.

P-1 Length of time to actually complete the survey: _____ minutes.

P-2 Were you able to obtain assistance from the SATP Coordinator for Part II questions?

1 YES

2 NO **(If NO, why not?)**

_____

_____

P-3 Indicate below any questions with which you had difficulty and state as clearly as possible what that difficulty entailed. (Feel free to mark comments within the questionnaire itself).

P-4 Any comments you wish to make that you think my help in the survey design?

Pilot Test Directions: Please return the entire survey instrument along with this page in the stamped addressed envelope provided.

Appendix C:

Pilot Re-Test Questionnaire

PILOT RE-TEST QUESTIONNAIRE

Section IB

Directions: After completing Section IB, Nutrition Services located on page 7 and page 9 of the survey instrument please respond to the questions below.

1. Can the directions be improved and if so, in what way?

2. Does it appear clear that if the response in column A is "yes" that responses are then required for columns B, C, and D?

2b. If this is not clear, please indicate how this can be improved?

3. What modifications are necessary to improve this portion of the survey instrument?

Thank you for taking the time to complete this pilot re-test and accompanying questions.

Return the completed survey (pages 7 and 9) along with this question page to:

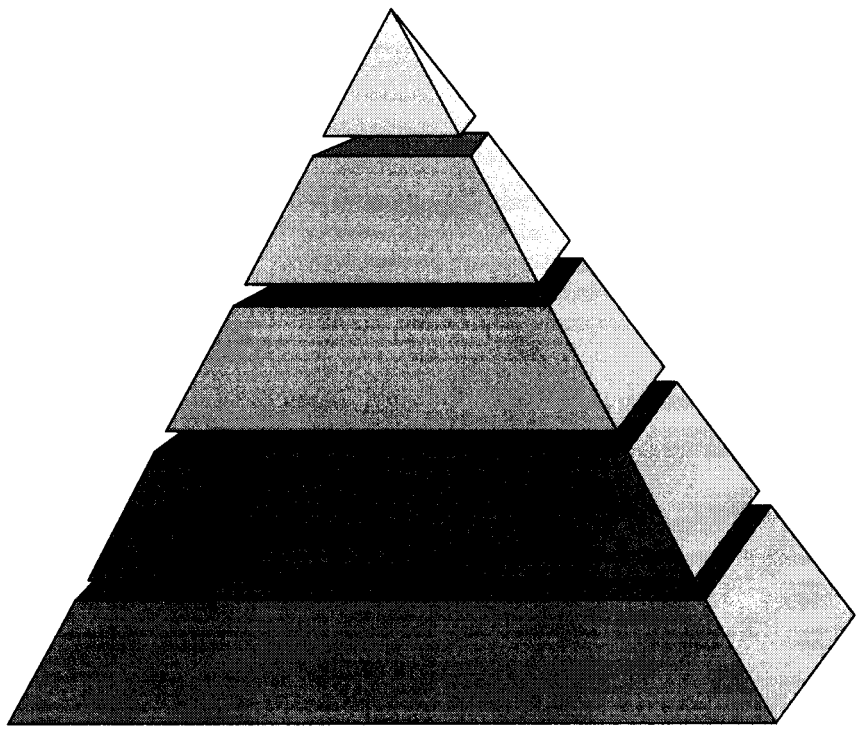
Louise Grant, M.S., R.D., LDN
James H. Quillen VA Medical Center
Box 400
Mountain Home, TN 37684

Appendix D:

Survey Instrument

NUTRITION INTERVENTION IN VA SUBSTANCE ABUSE TREATMENT PROGRAMS

A Survey of the Use of Medical Nutrition Therapy
In
Department of Veterans Affairs
Substance Abuse Treatment Programs



James H. Quillen VA Medical Center (001A)
Box 4000
Mountain Home, TN 37684

Department of Nutrition
College of Human Ecology
University of Tennessee
Knoxville, TN 37996-1900

NUTRITION INTERVENTION IN VA SUBSTANCE ABUSE TREATMENT PROGRAMS

The purpose of this questionnaire is to determine if nutrition intervention is a component of VA substance abuse treatment programs (SATP) and to what extent. A registered dietitian who has responsibility for management of the clinical nutrition program should complete the survey. Part I of the questionnaire addresses the types and timeframes for nutrition services provided to patients admitted to the substance abuse treatment program at your facility. Part II questions address the substance abuse program and will require input from the coordinator of the Substance Abuse Treatment Program. Part III asks for some simple demographic information about the participant and the facility.

Substance abuse is defined as the use of substances, especially alcohol, to the extent that it interferes with an individual's life and impairs his/her ability to function in activities of daily living.

Please NOTE: ***All questions refer to the time period of fiscal year (FY) 1998 & 1999.***

Please read each question carefully. Directions vary according to the question.

Q-1 Does your facility have a substance abuse treatment program? Blacken the appropriate box.

☐ 1 YES

☐ 2 NO → **Proceed to Part III**

(If **no**) In as much as our purpose is to assess nutrition intervention specifically provided to patients enrolled in VA substance abuse treatment programs, you need only answer questions in Part III. However, we would appreciate any comments you might like to make that could be helpful. **Please turn to page 14 and complete Part III questions numbers 51, 52 and 53. Return the survey following directions located at the end of this questionnaire.**

PART IA. NUTRITION INTERVENTION

To be completed by a registered dietitian with clinical nutrition program responsibility.

Q-2 All SATP patients are routinely screened for nutrition status prior to or upon admission to SATP. **Blacken the appropriate box.**

☐ 1 NO **If answer is 'NO' go to Q-4.**

☐ 2 YES **If answer is 'YES' go to Q-3.**

Q-3 At what point relative to admission is an initial nutrition screen performed for all SATP patients? **Blacken only one response box.**

☐ 1 PRIOR TO THE DATE OF ADMISSION

☐ 2 WITHIN THE FIRST 24 HOURS OF ADMISSION

☐ 3 WITHIN THE FIRST 48 HOURS OF ADMISSION

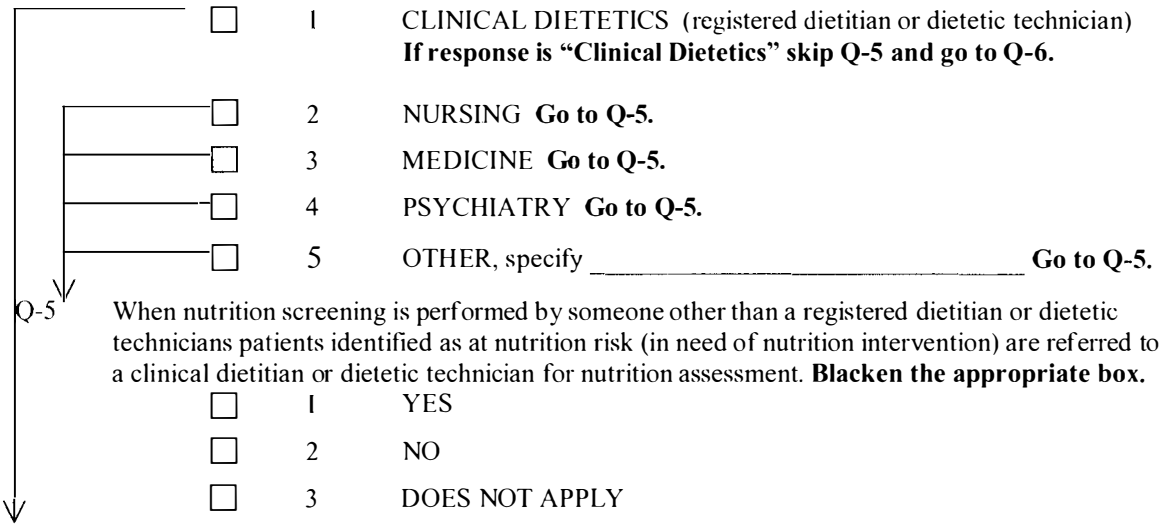
☐ 4 WITHIN THE FIRST 72 HOURS OF ADMISSION

☐ 5 AFTER 72 HOURS BUT WITHIN THE FIRST 7 DAYS OF ADMISSION

☐ 6 AFTER THE FIRST 7 DAYS OF ADMISSION

☐ 7 INITIAL NUTRITION SCREEN IS NOT PERFORMED FOR ALL SATP PATIENTS

Q-4 Which discipline is responsible for the initial nutrition screening of a SATP patient prior to or upon admission? **Blacken only one response box.**



☐ 1 CLINICAL DIETETICS (registered dietitian or dietetic technician) **If response is "Clinical Dietetics" skip Q-5 and go to Q-6.**

☐ 2 NURSING **Go to Q-5.**

☐ 3 MEDICINE **Go to Q-5.**

☐ 4 PSYCHIATRY **Go to Q-5.**

☐ 5 OTHER, specify _____ **Go to Q-5.**

Q-5 When nutrition screening is performed by someone other than a registered dietitian or dietetic technicians patients identified as at nutrition risk (in need of nutrition intervention) are referred to a clinical dietitian or dietetic technician for nutrition assessment. **Blacken the appropriate box.**

☐ 1 YES

☐ 2 NO

☐ 3 DOES NOT APPLY

Q-6 There is a planned program of nutrition intervention for patients admitted to the substance abuse treatment program. **Blacken the appropriate box.**

☐ 1 YES

☐ 2 NO

Q-7 A service or medical center policy exists that describes nutrition intervention specifically for the substance abuse treatment unit. Blacken the appropriate box.

☐ 1 YES

☐ 2 NO

Q-8 Nutrition intervention is provided to SATP patients only upon referral (Consult) by a clinical provider (MD, PA, NP). **Blacken the appropriate box.**

☐ 1 YES

☐ 2 NO

Q-9 A formal nutrition education program is provided to SATP patients by a dietitian or dietetic technician. **Blacken the appropriate box.**

☐ 1 YES

☐ 2 NO

Q-10 Is nutrition education routinely provided to all SATP patients before discharge by a registered dietitian or dietetic technician? **Blacken the appropriate box.**

☐ 1 YES

☐ 2 NO

Q-11 Is nutrition education provided by referral only to SATP patients before discharge by a dietitian or dietetic technician? **Blacken the appropriate box.**

☐ 1 YES

☐ 2 NO

Q-12 Nutrition intervention for SATP patients is delivered by which provider(s)?
Blacken the box of all responses that apply.

	Providers of nutrition intervention
☐	1 REGISTERED DIETITIAN
☐	2 DIETETIC TECHNICIAN
☐	3 CLINICAL NUTRITION PROGRAM MANAGER
☐	4 SATP COORDINATOR
☐	5 PHYSICIAN
☐	6 REGISTERED NURSE (RN, BSN, MSN)
☐	7 PHYSICIAN ASSISTANT
☐	8 LICENSED PRACTICAL NURSE (LPN)
☐	9 OTHER, Specify:

IB. NUTRITION SERVICES

To be completed by a registered dietitian with clinical nutrition program management responsibility.

The questions that follow concern various nutrition services that may be provided to patients enrolled in a VA substance abuse treatment program. The following definitions for nutrition services are used in this part of the questionnaire. Please review these definitions and complete the questionnaire with these definitions in mind.

Nutrition Screening The gathering of data from the medical record, computer, or by brief client interview followed by an evaluation of the collected data to determine if the client is nutritionally compromised or at risk for malnutrition based upon pre-established criteria.

Nutrition Assessment Evaluation of the nutrition needs of individuals based on appropriate laboratory results, anthropometric, physical, and dietary data to determine the nutrient and calorie needs; formulating/updating nutrition status level; and confirming or reassigning a nutrition status. At completion of this activity the need for nutrition therapy interventions or further assessment is identified.

Nutrition Status The condition of an individual's health that is influenced by the intake and utilization of nutrients. May be defined by categories or levels, i.e. Normal, Mildly Compromised, Moderately Compromised, Severely Compromised.

Nutrition Education The process of utilizing instruction or counseling to bring about desirable changes in beliefs, attitudes, environmental influences and understanding of food. Such desirable changes lead to the adoption of food and nutrition practices, which are scientifically, sound, practical and consistent while meeting individual needs with available food resources.

Nutrition Intervention The preventive or rehabilitative action undertaken to bring about positive effects or maintain nutrition status.

Substance Abuse Treatment Program A rehabilitative program of organized treatment designed to assist the individual to discontinue use of deleterious substances.

Routine, routinely Refers to service or treatment that is always offered and provided to each individual participant during the course of enrollment within a substance abuse treatment program.

By referral A request, such as a consult, for nutrition services from a dietitian or dietetic technician by the clinical provider, i.e. physician, physician assistant, nurse practitioner.

Nutrition Service Complexity

Low Complexity: A nutrition service that requires minimum time of 20 minutes or less, a minimum of effort and/or a basic skill level in nutrition.

Moderate Complexity: A nutrition service that requires greater than 20 minutes but less than 40 minutes; pre-planning such as review of a client's medical record, or gathering educational materials may be required. The skill level requires formal training in nutrition.

High Complexity: A nutrition service that requires 40 minutes or more, includes pre-planning such as the review of the client's medical record, or gathering educational materials may be required. The expertise of registered dietitian is necessary.

Dietary Service: A foodservice or dietary department-related service performed without direct nutrition intervention, e.g. supplemental feeding as part of an established diet order, or ward bulk supplements, either dietary or prescriptive.

DIRECTIONS:

A. **For each nutrition service listed, please blacken the appropriate square to indicate whether or not that service is routinely provided to patients enrolled in your facility's SATP.**

B. **If the nutrition service is provided to any or all SATP patients indicate the percentage of patients that receive the nutrition service using a number between *1 and 100%.***

C. **Identify the time period prior to or during SATP in which the nutrition service is *generally* FIRST delivered.**

D. **Finally, using the definitions provided identify at what level of complexity the nutrition service is *generally* provided.**

Column	**A**	**B**	**C**					**D**			
Part 1 B. **Nutrition Service**	This nutrition service is provided to SATP patients. If **YES** answer columns B, C, D	To what percent of SATP patients is this service *usually* provided?	At what time period during the SATP is the nutrition service FIRST provided?					Rank complexity of nutrition service using definitions provided. **Black appropriate block.** Low Moderate High Dietary/ Adm.			
	No (1) Yes (2)	Specify a number from 1% to 100%.	Prior to Admit	Day 1	Day 2-7	Day 8-14	Day 15-21	Day 22 - beyond	Low	Moderate	High	Dietary/Adm
Q-13. Bulk snacks provided to SATP unit for distribution as determined by SATP unit staff	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-14. Individualized snacks/ supplemental feedings	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-15. Food Preferences	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-16. Vitamin/ Mineral Supplementation (Result of nutrition recommendation)	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-17 Vitamin/Mineral Supplementation (Prescribed by physician)	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-18. Nutrition Screening	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-19. Anthropometric Measurements (Other than height & weight)	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-20. Nutrition Assessment	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-21. Follow-up Nutrition Assessment	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-22. Nutrition Education – Group (Specific to substance abuse)	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-23. Nutrition Education – Individual (Specific to substance abuse)	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-24. Nutrition Education-Group (Specific to normal nutrition)	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

IB. NUTRITION SERVICES

To be completed by a registered dietitian with clinical nutrition program management responsibility.

The questions that follow concern various nutrition services that may be provided to patients enrolled in a VA substance abuse treatment program. The following definitions for nutrition services are used in this part of the questionnaire. Please review these definitions and complete the questionnaire with these definitions in mind.

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Nutrition Assessment Evaluation of the nutrition needs of individuals based on appropriate laboratory results, anthropometric, physical, and dietary data to determine the nutrient and calorie needs; formulating/updating nutrition status level; and confirming or reassigning a nutrition status. At completion of this activity the need for nutrition therapy interventions or further assessment is identified.

Nutrition Status The condition of an individual's health that is influenced by the intake and utilization of nutrients. May be defined by categories or levels, i.e. Normal, Mildly Compromised, Moderately Compromised, Severely Compromised.

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Nutrition Intervention The preventive or rehabilitative action undertaken to bring about positive effects or maintain nutrition status.

Substance Abuse Treatment Program A rehabilitative program of organized treatment designed to assist the individual to discontinue use of deleterious substances.

Routine, routinely Refers to service or treatment that is always offered and provided to each individual participant during the course of enrollment within a substance abuse treatment program.

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High Complexity: A nutrition service that requires 40 minutes or more, includes pre-planning such as the review of the client's medical record, or gathering educational materials may be required. The expertise of registered dietitian is necessary.

Dietary Service: A foodservice or dietary department-related service performed without direct nutrition intervention, e.g. supplemental feeding as part of an established diet order, or ward bulk supplements, either dietary or prescriptive.

DIRECTIONS:

A. For each nutrition service listed, please blacken the appropriate square to indicate whether or not that service is routinely provided to patients enrolled in your facility's SATP.

B. If the nutrition service is provided to any or all SATP patients indicate the percentage of patients that receive the nutrition service using a number between *1 and 100%*.

C. Identify the time period prior to or during SATP in which the nutrition service is *generally* FIRST delivered.

D. Finally, using the definitions provided identify at what level of complexity the nutrition service is *generally* provided.

Column	**A**	**B**	**C**						**D**			
Part 1 B. **Nutrition Service**	This nutrition service is provided to SATP patients. If **YES** answer columns B, C, D	To what percent of SATP patients is this service *usually* provided?	At what time period during the SATP is the nutrition service FIRST provided?						Rank complexity of nutrition service using definitions provided. **Black appropriate block.** Low Moderate High Dietary/ Adm.			
	No (1) Yes (2)	Specify a number from 1% to 100%.	Prior to Admit	Day 1	Day 2-7	Day 8-14	Day 15-21	Day 22 - beyond	Low	Moderate	High	Dietary/Adm
Q-25. Nutrition Education-Individual (Specific to normal nutrition)	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-26. Nutrition education, other Specify:	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-27. Drug-Nutrient Interaction Education	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-28. Meal Rounds	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-29. Meal Service (Tray, Cafeteria, and/or Dining Room	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-30. Nutrition Discharge Instructions	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-31. Dietitian participation in Interdisciplinary Team Meeting (Treatment planning)	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	■
Q-32. Nutrient Intake Analysis	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-33. Enteral Nutrition (via tube in the gastrointestinal tract)	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-34. Parenteral Nutrition (feeding by vein)	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Q-35. Other Nutrition service Specify:	☐ ☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

PART II. SUBSTANCE ABUSE TREATMENT PROGRAM

To be completed with input from SATP Coordinator or designee.

The following questions concern the Substance Abuse Treatment Program at your facility. You will need to consult with the SATP Coordinator or a designee to answer these questions. Substance Abuse Treatment refers primarily to alcohol abuse.

Q-36 For the purpose of treatment SATP patients are considered to be,
Blacken the appropriate box.

- ☐ 1 ALL OUTPATIENTS
- ☐ 2 ALL HOSPITAL INPATIENTS
- ☐ 3 A COMBINATION OF OUTPATIENTS AND HOSPITAL INPATIENTS

Q-37 During the initial phase of treatment SATP patients are housed in
Blacken the appropriate box.

- ☐ 1 COMMUNITY HOUSING
- ☐ 2 A VA DOMICILIARY
- ☐ 3 A VA SUBSTANCE ABUSE RESIDENTIAL REHAB TREATMENT PROGRAM (SARRTP)
- ☐ 4 COMBINATION COMMUNITY AND DOMICILIARY AND/OR SARRTP
- ☐ 5 INPATIENT HOSPITAL UNIT

Q-38 Is there a required period of abstinence prior to commencing a Substance Abuse Treatment Program for alcohol?

- ☐ 1 YES **If response is 'YES' go to Q-40.**
- ☐ 2 NO **If response is 'NO' go to Q-39.**

Q-39 If the answer to question #36 is NO, does detoxification from alcohol occur while in the treatment program?

- ☐ 1 YES **Go to Q-40.**
- ☐ 2 NO **Go to Q-40.**

Q-40 What is the planned total length of treatment exposure for participation in the Substance Abuse treatment program? _____ days

Q-41 Is the SATP divided into 'phases' of treatment?

- ☐ 1 YES **If the answer is 'YES' go to Q-42.**
- ☐ 2 NO **If the answer is 'NO' go to Q-43.**

Q-42 **If the response to Q-41 was 'YES' identify treatment each phase by name; specify the number of hours of treatment exposure per day and total the hours per week of treatment exposure for each phase listed in the columns below.**

	Specify number of hours of treatment exposure per day.								
TREATMENT PHASE NAME	SUN	MON	TUES	WED	THUR	FRI	SAT	TOTAL HRS/WK	Number Weeks

Q-43 Does SATP include an aftercare component? *A component that extends beyond the last identified phase of treatment.*

☐ 1 YES **If the response is "NO" go to Q-45.**

☐ 2 NO **If the response is "YES" go to Q-44.**

Q-44 What is the length of aftercare?
_____ days.

Q-45 What is the range of the total length of treatment exposure with SATP?
From _____day(s) to _____ days.

Q-46 From October 1, 1997 to September 30,1999 [FY 98 & 99] what was the number of total admissions to SATP? (Suggestion: use DSS data base for that time period)
_____ admissions

Q-47 Of the total number of admissions from October 1, 1997 to September 30,1999[FY 98 & 99] how many patients actually completed the substance abuse treatment program?
_____ patients.

Q-48 Please state the *definition of treatment success* applied in your substance abuse treatment program:
_____

_____

Q-49 Of those patients admitted during the time period of October 1,1997 through September 30,1999 how many were identified as achieving *treatment success* in your program?
_____ patients

Q-50 What is the alcohol treatment model upon which your SATP is based?
Blacken the appropriate box.

- ☐ 1 12-STEP FACILITATION
- ☐ 2 COGNITIVE-BEHAVIORAL COPING SKILLS
- ☐ 3 MOTIVATIONAL ENHANCEMENT THERAPY
- ☐ 4 12-STEP AND COGNITIVE-BEHAVIORAL COPING SKILLS
- ☐ 5 12-STEP AND MOTIVATIONAL ENHANCEMENT THERAPY
- ☐ **6** COGNITIVE-BEHAVIORAL THERAPY AND MOTIVATIONAL ENHANCEMENT THERAPY
- ☐ 7 OTHER, Specify: _____

Q-51 Which of the following professional services are represented as part of the SATP treatment team?
Blacken the box of all appropriate responses.

☐	1 MEDICINE
☐	2 NUTRITION
☐	3 PSYCHOLOGY
☐	4 REHABILITATIVE MEDICINE
☐	5 SOCIAL WORK
☐	6 VOLUNTEER SERVICE
☐	6 NURSING
☐	7 PSYCHIATRY
☐	8 WORK THERAPY COORDINATOR (CWT and/or IT)
☐	9 RECREATION THERAPY
☐	10 CHAPLAIN
☐	11 OTHER, Specify:

PART III. DEMOGRAPHICS

To be completed by a registered dietitian with clinical nutrition program management responsibility.

Finally, some questions about you and your facility to help interpret the results.

Q-52 VA station complexity level. (Refer to N&FS Annual Report) **Blacken the appropriate box.**

- ☐ 1 ONE
- ☐ 2 TWO
- ☐ 3 THREE

Q-53 Geographical setting **Blacken the appropriate box.**

- ☐ 1 LARGE URBANIZED, area with population greater than one million
- ☐ 2 URBAN, area with population of at least 50,000 and population density of at least 1,000 per square mile.
- ☐ 3 NON-URBAN, area with population less than 50,000 and population density of less than 1,000 per square mile

Q-54 The person completing this questionnaire is employed as: **Blacken the appropriate box.**

- ☐ 1 The chief, clinical section or clinical nutrition program manager, responsible for direct oversight of clinical nutrition.
- ☐ 2 Chief, Nutrition and Food Service or multi-department manager with oversight responsibility for clinical nutrition.
- ☐ 3 Registered dietitian with no management responsibility.
- ☐ 4 Other, **specify** _____

Q-55 The SATP Coordinator or designee provided input for responses in Part II.
Blacken the appropriate box.

- ☐ 1 YES
- ☐ 2 NO [If no, what was the source of information in Part II?]

END OF QUESTIONNAIRE.

Thank you for your participation.

Send completed questionnaire in the addressed envelope provided to:

Louise P. Grant, M.S., R.D., LDN
James H. Quillen VA Medical Center (001A)
Box 400
Mountain Home, TN 37864

Appendix E:

Letter to Survey Participants

Department of Veterans Affairs

Memorandum

Date:

From: AA to Associate Director (001A)

Subj: Consent to participate in research study

To: Clinical Nutrition Program Manager (120)

1. You are invited to participate in a research study, "Survey of Nutrition Intervention in VA Substance Abuse Treatment Programs" whose purpose is to determine if nutrition intervention is used in VA substance abuse treatment programs and to what extent. This research study is being conducted jointly by the Department of Nutrition, College of Human Ecology, University of Tennessee and the James H. Quillen VA Medical Center, Mountain Home, Tennessee.

2. The results of this research will have significance to clinical nutrition programs and to substance abuse treatment programs in VA and will provide a basis for the future design of a model nutrition intervention program to be tested in a controlled setting. The results could assist you in developing or modifying your own program of nutrition intervention as well as provide justification for clinical nutrition resources to improve patient treatment outcomes.

3. You are asked to complete a written questionnaire. The time to complete the questionnaire is estimated to be 45 minutes. You will need to consult with the SATP Coordinator at your facility to obtain some of the answers. This may take additional time. There are no risks associated with completing this written survey.

4. All responses will be kept completely confidential. Completed surveys will be stored separate from numerical identifiers in a secured file cabinet located in Room N370, Bldg. 160 located at the James H. Quillen VA Medical Center, Mountain Home, TN for a period of not less than ten years. The use of numerical identifiers is for the purpose of data analysis only and will in no way identify actual participants. A copy of the pooled study results will be provided to you at its conclusion. Your participation is completely voluntary. There is no penalty should you choose not to complete this survey and you can withdraw from the study at anytime without penalty. **Your return of the completed survey constitutes your informed consent to participate in this study.**

5. Should you have any questions or concerns you may contact the principal investigator, Louise P. Grant at James H. Quillen VA Medical Center, Mountain Home, TN 37684, by phoning (423) 926-XXXX, Ext. XXXX, or through e-mail using XXXX.

Louise P. Grant, M.S., R.D., LDN

Appendix F:

Data Collection Form

Comparison of outcomes in outpatients receiving substance abuse-nutrition education

Directions:
Complete each data line for transfer to electronic database. Circle number associated with correct response or fill in blank as directed.
If data not available from medical record, mark space "NA". Initial and date bottom of form indicating data extraction complete.

Gender	Male 1	Female 2				
Age at last birthday	Record whole number		If ≥ 90 years mark here.			
Marital Status	Married 1	Single, never married 2	Divorced 3	Separated 4	Widowed 5	
Race/Ethnicity	African American 1	Asian American 2	Caucasian 3	Hispanic 4	Other 5	
Employment Status	Employed 1	Unemployed 2				
Occupation	Professional 1	Non-Professional 2	Laborer 3	Not Employed 4		
Primary Diagnosis Code	Circle		303.90	303.91	303.92	305
Total Length of Treatment Period	# Days from date of admission until discharge up to 365 days total (calculate)					
Treatment Attempts	Number total treatment attempts prior to this tx.					
Number of Inpatient Treatments	Number of inpatient treatment programs prior to this tx.					
Years Problem Drinking	5 or more standard drinks/day					
Age at First Drink	Age at which subject had first drink of alcohol					
Education	Highest level of education attained	College Degree 1	High School Diploma/GED 2	> 8th grade 3	< 8th grade 4	
Nutrition Ed	Yes 1	No 2				
Nutrition Ed Group	Yes 1	No 2	N/A 3			
Time of group nutrition education N/A 7	Pre-Admission 1	Day of Admission 2	Days 2 – 7 3	Days 8 – 14 4	Days 15-21 5	Day 22+ 6
Nutrition Ed, Ind	Yes 1	No 2	N/A 3			

Time of individual nutrition N/A 7	Pre-Admission 1	Day of Admission 2	Days 2--7 3	Days 8-14 4	Days 15-21 5	Day 22+ 6
Number of days abstinent	Since date of admission					
Number of drinking days	Since date of admission					
Number of non-drinking days	Since date of admission					
Number of days to first drink	Since date of admission					
Nutrition Status Classification	Normal 1	Mild 2	Moderate 3	Severe 4	None 5	
Co-Morbid Diagnoses	Polydrug 1	Psychiatric 2	Hepatitis C 3	PTSD 4	Diabetes 5	HTN 6

Comments:

_____

_____

_____

Initials _____ Date Completed _____

Vita

Louise Patricia (Zang) Grant attended primary and secondary schools in Allegheny County, Pennsylvania graduating from Vincentian High School in 1971. She majored in Food and Nutrition at Indiana University of Pennsylvania, receiving a Bachelor of Science Education degree in 1975. In 1982 she completed Commission of Dietetic Registration (CDR) experience requirements along with a Master of Science degree in Professional Growth majoring in nutrition and business from Indiana University of Pennsylvania. She received her Registered Dietitian credential in 1983.

Throughout her career Louise has worked in dietetic practice in various commercial and government food service, education, clinical and management settings. She received her Doctor of Philosophy degree from the University of Tennessee in December 2004. She is presently employed by the Department of Veterans Affairs as the Chief, Nutrition and Food Service for the VA Medical Centers of Miami, FL and West Palm Beach, FL.