DIETARY PATTERNS AND EATING BEHAVIORS AFTER GASTRIC STAPLING

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CHAPTER I

THE RESEARCH PROBLEM

Introduction

The success rate for conservative treatment of morbid obesity is poor. Only 25% of dieters will probably attain a weight loss of 20 pounds by dietary means, and less than 5% can lose 40 pounds (1). Ten percent of adult patients who had successfully lost to ideal weight barely maintained the weight loss for two years; and, after 14 years, most weighed more than before their dieting began (2). Results such as these have led physicians and patients to seek alternatives for weight loss, including surgery. Surgery is justifiable only if 1) the risk of surgery will be less than the potential health benefit of amelioration of obesity and 2) it has a reasonable probability of success.

Individuals permitted to elect to have bariatric surgery have already tried conventional methods such as diet, drugs, and behavior modification to lose weight, with limited long-term results. Initially, these surgical patients were not counseled as to appropriate diet, either before or after surgery, because of their demonstrated inability to comply with a dietary regimen (3). Historical perspectives of bariatric surgery, surgical techniques, and comparisons of weight loss are discussed in many surgical and in some medical journals (4-8). The surgical removal of an intestinal segment to reduce food absorption caused adverse consequences. This led to the development of a new technique for minimizing food intake by reducing stomach size (9). Little has been written regarding nutritional management of the gastric stapling patient or regarding changes in eating behaviors and changes in diet after surgery. Some may deem the surgery a success or failure in terms of weight loss only and may overlook other nutritional sequelae. Data are needed on patients' eating habits and food intakes after surgery. It is not known if patients' eating habits revert to those prior to surgery as energy requirements and food intake approach balance and tolerance for food increases. Long-term studies on overall effectiveness of gastric stapling for weight loss and control are not yet available.

Purpose and Objectives

The purpose of this study is to identify changes in dietary habits and food intakes of female gastric stapling patients which occur after the stapling surgery for weight loss. The objectives of this study are as follows:

1. To determine what changes have been made by the female postoperative gastric stapling patient in dietary intake patterns and eating behaviors four and eight months after surgery, compared with similar data for the period prior to surgery as obtained by recall.

2. To determine the extent of weight loss and to relate loss to the degree or type of change made in eating habits and to postoperative symptoms.

Hypotheses

The following hypotheses were postulated for the research study:

H_1: The food intake of gastric stapling patients at four and eight months postoperatively will be less than intake prior to surgery and will provide lesser percentages of the Recommended Dietary Allowances (RDA) (10) established for this age group of females.

H_2: Eating behaviors after gastric stapling surgery will be modified according to dietary instruction to facilitate weight loss and in response to physical limit to the capacity for food.

H_3: By eight months postoperatively, gastric stapling patients will have lost 50% or more of their excess body weight.

H_4: Patients will report fewer episodes of vomiting and fewer symptoms of food intolerance at eight months postoperatively than at four months.

H_5: The nutritional quality of the diet at four and eight months postoperatively will be related to eating behavior, weight loss and tolerance of food.

Assumptions

This study was conducted on the basis of the following assumptions:

1. Subjects accurately recalled food intake and information regarding eating habits and truthfully reported it.

2. Data for retrospective report of dietary habits were comparable with those reported later.

3. The 24-hour dietary recall is a valid method for estimating the nutritional quality of diets by comparing nutrient intakes with the Recommended Dietary Allowances.

4. The data could be useful in the development and revision of dietary strategies and in evaluating the risks and benefits of gastric stapling as a means of inducing weight loss.

Limitations

The following limitations were present in this study:

1. This study was limited to a select population of gastric stapling patients admitted to Doctors' Hospital, Tulsa, Oklahoma, by two surgeons sharing a practice and counseled by a single dietitian. Subjects selected were all willing to participate in the three interviews between January and May 1983. The small, non-random sample of 23 subjects limits inferences that can be drawn to other groups of gastric stapling patients.

2. Food intake data were limited by usage of the 24-hour recall method of dietary survey.

Definitions

The following terms were defined for this study after a review of the literature:

Dietary Patterns: The standardized set of eating behaviors that are established early in life and are resistant to change (11). Patterns of what one eats, in what amounts, and when, are an integral part of the lifestyle of an individual or population group. Factors that influence dietary patterns are economic, social, psychological, cultural, environmental and physical (capacity, and ability to chew and swallow).

Food Intolerance: The inability to eat a food without experiencing symptoms of discomfort, such as nausea, vomiting, and gastric reflux, or changes in bowel habits, such as diarrhea or flatulence.

Gastric Stapling: A surgical procedure in which a small upper stomach pouch is created by placing several rows of surgical staples across the top of the stomach, leaving a small passageway on the greater curvature. The small pouch limits the total amount of food that can be eaten at one time. The passageway, or stoma, delays the rate at which food leaves the pouch, allowing for early and prolonged satiety.

Ideal Body Weight: The weight associated with lowest morbidity but not necessarily minimizing morbidity or incidence of disease. Ideal body weight was estimated by allowing 100 pounds for the first five feet of height, plus five pounds for each additional inch for a medium frame. Ten percent was subtracted for a small frame and added for a large frame (12). Wrist circumference was used to estimate body frame size (12).

Morbid Obesity: A condition of excess fat in the body. Morbid obesity is defined here as 100 pounds greater than ideal weight. Morbid obesity has been associated with increased risk for a wide range of disease (1). Because of physiological, dietary and psychological factors, it is resistant to conservative treatment.

Recommended Dietary Allowances (RDA): "The levels of intake of essential nutrients considered in the judgment of the Committee on Dietary Allowances of the Food and Nutrition Board on the basis of available scientific knowledge to be adequate to meet the known nutritional needs of practically all healthy persons." (10)

24-Hour Recall: A method of obtaining information by interview concerning food and beverages consumed over 24 hours the preceding day, beginning with the first foods eaten upon arising.

CHAPTER II

REVIEW OF LITERATURE

Many studies concerning gastric stapling surgery have been published in the years since Mason and Ito's (13) work in 1966. Incidences of food intolerances, possible nutrient deficiencies, and the inability of some patients to adapt to a new way of eating have been documented frequently, as will be reviewed, but have not been explored systematically (3,14-19). The focus of the surgery continues to be the efficacy of gastric stapling for weight loss in the morbidly obese. The purpose of this study is to examine dietary patterns and eating behaviors of gastric stapling patients admitted to an Oklahoma hospital. Therefore, the literature pertaining to morbid obesity and bariatric surgery was reviewed.

Morbid Obesity

A condition in which body weight is 100 pounds above ideal level (as defined by life insurance standards) has been called "morbid" obesity (20). Morbid obesity has also been described as twice or more the ideal weight (21). The former definition was used in this report.

The hazardous effects of obesity have been well documented. There is an increased incidence of heart disease, arthritis, hypertension, diabetes, pulmonary insufficiency, and slower recovery following any surgery (15). Obesity may cause common degenerative diseases to begin at an earlier age, progress more rapidly and more frequently be lifethreatening (22). Intangible problems such as low self-esteem and depression may either contribute to obesity or result from it (20). The Health and Nutrition Examination Survey (23) in 1974 found 5% of men and 7% of women aged 21 to 74 years to be "severely" obese. Severe obesity was considered to be weight greater than 244 pounds for men and 250 pounds for women. In the U.S. female population, 0.99% weighed more than 250 pounds and 0.46%, more than 280 pounds.

Theories on Cause of Obesity

The adverse sequelae of morbid obesity are understood more clearly than the etiology. The simplest description of the cause of obesity is a positive energy balance. Although abnormalities in metabolism, hormonal control, or physiological function also have been documented (24), none has persisted consistently after obese individuals reduced to normal weight. Numerous theories exist for roles of various mechanisms responsible for positive energy balance and obesity.

Alteration of the Hypothalamus

One theory of the cause of obesity is an alteration of the hypothalamus (25). The hypothalamus has two food intake regulation centers: a feeding center and a satiety center. Signals are transmitted to the hypothalamus through circulating levels of various nutrients about quantity of food present in the gastrointestinal tract and(or) body size, fatness, and metabolic state (26). There is ongoing research to find a signal that feeds information to the hypothalamus on the state of fat levels in adipose tissue. Prostaglandins (and their precursors, free fatty acids), insulin and(or) plasma glucose, and temperature are most often proposed to play this role (27,28). The two processes of lipolysis and lipogenesis regulate fat levels in the adipose tissue and presumably signal the hypothalamus to control feeding.

Lepkovsky (29) theorized that White Leghorn cockerals' normal lean state was because of a set point controlled by the hypothalamus. He tested the validity of this concept. Cockerals were force-fed excessive amounts of energy so that fat depot levels and the body weight (measured in kilograms) increased without change in the set point. The birds, no longer force-fed, stopped eating when the amount of fat in the adipose tissue rose above the set point level. Resumption of normal eating patterns occurred when the amount of fat in adipose tissue returned to normal. When fat content exceeded the set point, lipolysis increased while food intake and intestinal absorption of food decreased. Lipogenesis and fat deposition in the adipose tissue, from food intake and increased absorption, occurred when fat levels were below the set point. Stabilization of these factors occurred when the adipose tissue was at that set point. This is commonly known as the lipostatic theory of regulation. An alteration in this mechanism may promote obesity. In addition, hyperinsulinemia, common in obese persons, promotes lipogenesis (30).

Currently being studied is the enzyme lipoprotein lipase (26). It facilitates breakdown of plasma triglyceride so that it can be taken up by the adipose tissue (31). An increase in this enzyme's activity would increase fat storage and, according to the lipostatic theory, food intake.

An older, but currently less popular, mechanism is the glucostatic hypothesis. According to this theory, blood glucose concentration rather than adipose tissue mass is the regulating factor (32). However, the decrease in the level of glucose needed to induce eating is much greater than one would normally experience prior to eating a meal.

Thus, any of several signals reflecting body size or satiety may act through the hypothalamus. There is not, however, complete agreement as to the importance played by this set of controls. For example, animals lacking the feeding response to hypoglycemia (due to hypothalamic lesions) were still able to control food intake so that a normal body weight was maintained (33).

Adipocyte Theory

A popular theory about the cause of obesity is commonly called the "fat cell" theory. Fat cell number and age of over-development in children may relate to extent of fat deposition in obese adults (34). Advocates of this theory categorize the obese into two groups: a hyperplastic group, with a proliferation of fat cells; and a group with the same number of cells as seen in non-obese individuals, but hypertrophic and filled to capacity. There is controversy among researchers about whether hypertrophic or hyperplastic fat cells play the more important role in obesity (32). In one study, dieting subjects with hypertrophic obesity maintained weight loss four times longer than subjects with hyperplastic obesity (2). The latter began to regain the weight they had lost after three or four months. Fat cell number was a better predictor of ability to lose weight than was initial weight. Fat content of adipocytes was enlarged after glucose uptake in proper in vitro conditions (32). There is a positive correlation between average adipocyte size and insulin levels (30). Thus, some contend that large adipocytes stimulate the pancreas to produce more insulin. Insulin sensitivity has been inversely related to cell size (1).

Much of the knowledge of fat depot development early in life is limited because adipose tissue cellularity studies have been performed largely on adults. Knittle et al. (34) classified the majority of obese children as hypercellular when compared to non-obese children. A history of obesity as a child is suggestive of hyperplastic obesity. Obese children, and adults that became obese as children, did tend to have the greatest degree of hypercellularity (35). It is not clearly understood why differences in fat cell development exist and what the triggering mechanisms may be. The intervals of time before two years of age and during the adolescent growth spurt period were identified as being of importance in obesity if obesity existed at these times. There are problems with such studies in obtaining accurate measurements of adipose tissue cells and interpreting results, because site-to-site variation in cell size has been shown to occur within a subject (30). There is no evidence that the number of adipose tissue cells can decrease. The tendency to eat or not may be related to the number of fat cells and(or) to the degree to which they are filled. It may be another way of expressing the lipostatic theory that food intake and the processes of lipolysis and lipogenesis are affected by fat concentrations in adipose tissue. It is not yet clear how these mechanisms may work.

Malfunctioning of Brown Fat

Defects in brown adipose tissue have been proposed as another possible cause of obesity (36,37). Brown fat represents only 1% of the total adipose tissue mass of the adult. This brownish colored fat is found around the internal organs as well as other areas in animals and humans. Brown adipose tissue converts excess energy into heat. The generated heat helps animals to survive in cold climates. Additional heat may be produced when an individual overeats for long periods of time. The latter is called diet-induced thermogenesis (36). The amount of brown fat can expand and decrease according to need for its heat-generating ability. The controlling mechanism is the sympathetic nervous system (37). Converting excess energy directly to heat rather than storing much of it as chemical energy is an inefficient use of energy. A defect in the brown adipose tissue may cause excess energy to be stored rather than converted to heat. This change to an efficient use of energy may help to create the dilemma of obesity since conscious control of food intake may be necessary to avoid obesity. It may explain how individuals varied in efficiency of food utilization (36).

Ineffective Satiety Mechanisms

Ineffective satiety mechanisms may be a cause of obesity. Satiety is that physiological state which follows meal termination (38). Relationships of the hypothalumus to adipose tissue and blood glucose as well as other factors may help to create the metabolic basis of satiety. Other factors include the interaction between intake, the gastrointestinal tract and the nervous system. The distension of the stomach and the filling of the intestine may activate neurotransmitters in the hypothalamus to produce satiety. In studies by Duncan et al. (39), meals high in bulk and low in energy density provided for greater satiety than more refined items of high energy density. Persons on the energy-dense diet ate to a point of uncomfortable fullness. These individuals, though less hungry at subsequent meals, continued to eat beyond fullness and consumed greater amounts of energy than the other group.

Physiological mechanisms for satiety may function more normally on a diet of low energy density than on a high energy density diet. Obese and non-obese subjects demonstrated comparable intakes of diet low in energy density. People choosing energy-dense diets might eat more and become obese (40). The energy content of a meal, then, may not be the major factor in determining satiety, but rather the density of a meal or, conversely, the volume. Intake of food has been modified to maintain specific amounts of energy (40).

In addition to providing bulk, high fiber diets may lengthen meal time, because more chewing time is required. This may help to create a sensation of satiety at a fairly low energy intake. Energy consumption may be reduced by prolonging satiety or causing it to occur sooner following ingestion of the food. Hormones released in response to certain nutrients may in turn affect blood sugar, utilization of which was believed to influence short term or meal-to-meal intake (32). Now evidence suggests that satiety is associated with the production of energy from different fuels and not with any one fuel, such as glucose.

Cholecystokinin is released by the small intestine in response to protein and fat in digestion. The length of a meal and amount of food eaten were reduced in subjects to whom the C-terminal octapeptide of cholecystokinin was administered (41). This synthetic form of a hormone is being investigated for possible use as a therapeutic agent for weight reduction. Because fat slows gastric emptying, it provides for greater satiety. However, the effects of satiety may not be obvious, because the slow emptying delays uptake and elevation of blood glucose.

The liver may be involved in producing satiety. In response to injections of glucose, and to a lesser degree, glycerol and amino acids, the liver reduced neural impulses signaling hunger (28).

It should be noted that other metabolic causes of obesity include undiagnosed hypothyroidism or Cushing's syndrome. However, these conditions are very rare and do not usually lead to morbid obesity.

Environmental, Psychological and Activity Factors

Food choices may be affected by the abundant food supply in the Western world as well as by commercial promotion of foods and lifestyle. The morbidly obese may not be so much motivated to eat from feelings of hunger (internal cues) as from cues in the environment, called external (24). External cues that may influence eating patterns include: time of day, social activities, loneliness, boredom, stress and sights and smells of food. These cues may trigger neurochemical mechanisms that stimulate hunger. The palatability of a food to an individual has been affected by the sensory attributes (42). If the food eaten was highly palatable, as dessert, it was frequently eaten beyond the point of meeting energy needs. The immediate environment can play a role in what food is consumed and in what amount. Distractions, such as loud noises and an uncomfortable environment, tended to diminish the desire to eat (28). Perception of food quantities may be distorted in the obese and in the non-obese as well (25). An excessive energy intake may not be perceived as such.

In studies by Fabry et al. (43), individuals who took infrequent meals tended toward obesity. This was likely due to enhanced ability to form metabolic reserves as has been seen in wild animals alternating between fasting and overeating. Adaptive changes included: more rapid absorption of glucose, increased glycogen synthesis and a significant increase in lipogenesis. Jiang and Hung (44) sought to determine how heavy and lean individuals controlled food intake under the ordinary conditions of life. There was a wide range of body weight in their 11 subjects. No significant correlation between daily energy intake and body weight was found, but the heavier subjects consumed a more energy-dense main meal than did leaner subjects.

Low energy expenditure can contribute to the development of obesity (1), and, conversely, obesity itself may lead to physical inactivity. Observations of activity levels of obese and non-obese children indicate the obese children put less effort into playing and activities than did non-obese children (42).

In adults, basal metabolic rate decreases with advancing age. Adipose tissue will then enlarge unless there is either an increase in activity or a decrease in energy consumption.

Genetic traits and environment are often linked to the likelihood of obesity (45). Parents of normal weight have a probability of 9% of having an obese child (33). The likelihood of becoming obese is approximately 40% for a child with one obese parent. If both parents are obese, the likelihood increases to 75% (42). It has not been determined whether this is due to a genetic predisposition to obesity, to learned eating behaviors that contribute to obesity, or to both. Some family, religious, or ethnic customs involve food patterns that may be a source of extra energy or that may discourage physical activity. In Western cultures, there is frequently a corresponding weight increase in men and a decrease of weight in women with increased socioeconomic status (45).

Non-surgical Methods of Treatment

Health care practitioners would probably agree that a conservative approach to weight loss should be attempted before electing for surgical intervention. Under the heading of conservative fall a range of methods including: dietary regimens, behavior modification, and exercise. Medically supervised fasts and drugs are less conservative methods that may be used.

Dietary Regimens

Various dietary regimens for weight reduction exist. The routine approach is a standard hypocaloric, nutritionally balanced diet (46). Energy range may be from 800 to 1800 kilocalories (kcal). A high fiber diet may be prescribed concurrently to increase feelings of satiety, or incidentally as energy-poor foods are substituted for others. Diets providing less than 1000 kcal require vitamin and mineral supplementation to be nutritionally adequate in these respects. Weight loss usually occurs when energy expenditure exceeds intake. Physical activity can help to increase energy expenditure. Reduction in adipose tissue itself will lead to a decrease in energy expenditure. At some point in dieting this contributes to the effect commonly known as the dieter's plateau. Loss of some lean body mass will also occur with dieting (22); physical activity may help reduce this loss (42). It is important to maintain an adequate dietary protein intake to minimize nitrogen loss. Nunro and Douglas (22) contended that as little as 15 to 25 g high quality protein can achieve this, but other sources (42,47) maintain that the minimum is 1-1.5 g per kilogram (kg) ideal body weight, when energy intake is inadequate.

Morbidly obese individuals lost from 0.3 to 1.9 pounds per week on a conservative (from 800 to 1000 kcal or more) dietary regimen (20). With conscientious adherence, it might take two years of continuous dieting before a desirable weight can be achieved by these individuals. Dietary management of obesity was more likely to succeed in patients who are only modestly overweight than in the morbidly obese (1). The majority of studies (1,20,22,46) indicated only a very small number of even these patients maintained their reduced weight. Newmark (46), without defining extent of initial obesity, reported a success rate for a weight loss of 20 pounds as 5 to 20%, and a weight loss of 40 pounds, 1 to 5%. Long term successes of 20-pound weight losses maintained two to five years, were reported at approximately 1 to 2%. Thus, achieving a desirable weight did not necessarily mean that patterns of eating had changed or that weight loss would be maintained. Long-term follow-up studies for many regimens are lacking, but Bothe et al. (47) reported that the weight regained tended to be adipose tissue. In general, the standard hypocaloric diet approach has been ineffective for the morbidly obese (1,46).

Low Carbohydrate Diet

A low carbohydrate diet is often promoted in popular literature. Restriction of carbohydrate leads to ketosis, a condition in which fat breakdown products are excreted in the urine (48). The diet is temporarily effective in causing weight loss; significant amounts of water lost may fool dieters. Temptations of a varied diet are removed, so energy intake may decrease, and nausea associated with ketosis reduces appetite. Problems that can develop on a regimen with less than 100 g of carbohydrate per day include: fluid and electrolyte losses; an extra solute load on kidneys necessitating an increase in water excretion to dispose of protein catabolism end products; dehydration; hyperuricemia; fatigue; and postural hypotension (48). Hyperlipidemia may also be induced by such a regimen because of the saturated fat and cholesterol in relatively large amounts of meat prescribed.

The Very-Low-Energy Diet

A more radical approach is a diet providing only 300 to 500 kcal. For the morbidly obese, an average loss of 3.5 pounds per week was achieved with an energy deficit of 1500 to 1800 per day (49). The proportion of adipose tissue to lean body mass was not measured. Adherence to a diet this low in energy is difficult. A 300-kcal regimen with either 30 to 40 g of protein was provided for 75 morbidly obese out-patients for a minimum of eight weeks, but up to a year for a few (50). Forty-five of 75 patients lost 40 pounds or more. Their average loss was 85 pounds. The weekly excretions of urea and ammonia suggested a continuing nitrogen deficit of 1 to 3 g per day. This corresponds to 30 to 90 g of lean tissue. Loss of cell mass might be expected since gain in adipose tissue was accompanied by a gain in cell mass (50). However, loss of lean tissue mass was more than that associated with the gain in cell mass.

Protein-Sparing Modified Fast

The very-low-energy diet may be a liquid protein-sparing, modified fast formula. Considered by many to be experimental, medically supervised "fasts" generally involve feeding 20 to 40 g of high biological value protein to lessen the effect on nitrogen balance (46,51). Carbohydrate intake ranges from 20 to 40 g and supplementation with vitamins and minerals are typical. Some over-the-counter liquid-protein diets contain variable amounts of protein of low biological value and may be inadequate in other nutrients. These deficiencies may have contributed to the cardiac and other problems seen in those who died while following this regimen (46).

Bistrain (42,51) used a protein-sparing, modified-fast formula in which nitrogen balance and whole-body protein turnover studies indicated complete maintenance of lean tissue after initial adaptation. This regimen provided 25% of energy requirements and 1.5 g protein per kg of ideal weight. Individuals achieved nitrogen balance in the second and third weeks. Another study (49) found, while severely restricting energy intake, a period of protein loss of variable duration, regardless of protein level. Ketone levels initially increased (but not to levels of a total fast), and then fell. The fall was due to increased ketone reabsorption, with ketones increasingly utilized as fuel by the brain (51). Fluid and electrolyte losses occurred along with urinary ketone body excretion (51). This diet worked best for those who needed to lose 40 to 50 pounds rather than for the morbidly obese because of a high rate of recidivism (49).

Fasting

Fasting results in the most rapid weight loss possible. It was hoped by some that losing weight so rapidly would act as incentive for further weight loss. Some fasting patients stated it was easier to eat nothing than to eat any amount less than what was desired (50). Complications were numerous with this program. Newmark (46) reported problems with fluid and electrolyte depletion, protein-wasting hyperuricemia with renal insufficiency and mental changes. Other complications were cardiac arrhythmias and sudden death (22). Reported nitrogen losses were 12 to 16 g initially, decreasing to 4 g per day at the end of a month (52). Each gram of nitrogen represents 6.25 g protein, and since protein is hydrated, each gram of nitrogen represents 25 to 30 g of lean tissue. Thus, in the first month of fasting about 50% of the weight loss (6 to 7½ pounds) comes from lean muscle or organ tissues (51). In the months that followed, about 25% (males) to 33% (females) of the weight lost was from lean tissue (51). Hunger cravings were experienced the first 48 to 72 hours, then decreased, possibly due to the accumulation of ketones and to reduced gastrointestinal tract motility (22). Munro (22) defined three major fasting techniques. The first two may produce the least psychological and physical discomfort.

1. Short-term, up to three weeks; usually has minimal or no effect on long-term management of obesity.

2. Intermittent fasting period; up to a year with a specific diet plan in between; appears to be the most effective in terms of weight loss after initial follow-up;

3. Prolonged fasting in a hospital setting; follow-up revealed frequent weight regain.

Prolonged abstinence from food failed to alter eating habits or to prevent regain (53). Resumption of the usual diet led to desirable repletion of protein and water and associated gain in weight and often to undesirable redeposition of lost fat. Behavior modification may help maintain losses achieved by fasting (50).

Behavior Modification

Behavior modification involves teaching individuals to cope with normal food in a normal environment. Emphasis is placed on eating habits more than on the specific foods one eats. Teaching behavior modification techniques may help to prevent relapse after weight loss has been achieved. Weight loss in behavior modification programs tends to be modest. The clinically important weight losses obtained were not well maintained (54). Reasons for this may be not only behavioral, but medical and biological as well. Future studies in this area may reveal means to produce and maintain greater weight loss than have so far been achieved.

Pharmacological Agents

Patients may request aid for weight reduction from physicians in the form of drugs. At present, no effective drug has been developed that is safe enough to be used for the prolonged treatment of morbid obesity. Some consider the role of drugs as a temporary one as adjunct to a hypocaloric regimen (22). Use of drugs is questionable, especially if they are used to placate patients who request them.

Most of the antiobesity drugs are centrally active and work as anorectic agents (55). Chemically, they are related to amphetamine. Amphetamine, diethylpropion and mazindol act on catecholaminergic pathways, while fenfluramine appears to increase brain serotonin concentration (55). In animal studies, amphetamines reduced the frequency but not the rate of eating or the amount eaten at each eating session. The euphoric effect produced by these drugs could lead to addiction or side effects such as insomnia, irritability, tremor, excessive sweating, dry mouth, episgastric discomfort and palpitations (56).

Fenfluramine also reduced total food intake, but not in the same way as amphetamine. It slowed the rate of eating and brought about a reduction in the size of meals, but not their frequency (56). Efficacy of the available anorectic drugs appears roughly equivalent (22). A thermogenic drug, one that promotes energy expenditure, may be more beneficial than an anorectic drug which reduces energy intake (56), but hazards of excessive thyroid hormone, which has this effect, are well recognized (55).

Variability in individual response to drug therapy is related to drug absorption and metabolism. One year-long study suggested that weight loss achieved by diet and behavior modification alone was more likely to be permanent than that achieved with drug therapy (54). The use of drugs may be indicated only after other treatments have failed (22,56).

Exercise

Obesity and other conditions may be a repercussion from sedentary lifestyles. Sedentary rats that were allowed to eat as often and as much as they desired became heavy. Those made to exercise one to two hours per day did not become obese (42). Mild exercise increased thermogenic response to food in humans (37). For the morbidly obese, exercise had a fat mobilizing effect. Hormonal responses to exercise led to a decrease in insulin and increased secretion of catecholamines. Lean tissue loss was minimized when dieting was combined with exercise (42). The resting metabolic rate will probably increase in muscle tissue and adipose tissue fat, decrease with regular exercise. Exercise increases utilization of fatty acids as a fuel (rather than carbohydrate) (25). Effectiveness of exercise for weight loss depended on the level of fitness to begin with and the amount of time spent exercising.

Other treatment methods such as jaw wiring and hypnosis are available, but may not be considered conservative. Few scientific data are available concerning their effectiveness. Information describing these techniques can be found elsewhere.

Bariatric Surgery

Yates (57) defined the goals of surgical treatment: to reduce risk of death or illness and to reduce psychosocial disability that can accompany obesity. Effectiveness of surgery cannot be adequately assessed because information about morbidity and mortality is not available (49). Successful weight loss is associated with a decrease of risk factors for some illnesses. Another benefit is an improvement in the quality of life (6). In many cases, surgery could be considered justifiable.

Nonsurgical treatments for morbid obesity are attempted before surgery is considered, unless there is an immediate threat to life. Patients with contraindications for surgery include prepubertal and elderly patients and persons with renal, hepatic and gastrointestinal disease. A weight less than 100 pounds over ideal body weight is not considered severe enough to warrant surgery.

There are complications with surgery associated with the morbidly obese. Hypoventilation is common (58). The large body mass compromises lung capacity. Anesthesia, narcotics, and a reclining position during surgery further reduce the rate and depth of respiratory movements. The midline incision used for bariatric procedures (from the xyphoid process to umbilicus) limits normal breathing. Immobility after surgery predisposes patients to thrombus formation (58).

Ferrara et al. (59) suggests that, despite excess energy reserves, the morbidly obese patient undergoing bariatric surgery compromising the intestinal tract (jejunoileal bypass, gastric bypass) has inadequate substrate available for tissue anabolism. This is based on the premise that limited oral intake following surgery lacks adequate protein and energy (59). Wound healing time is longer in the obese patient due to this low intake of dietary protein and because of a greater pull on the sutures. A proposed solution is the use of a tailored total parenteral nutrition (TPN) regimen post-operatively to avoid depletion of lean body mass. Such a regimen includes a hypocaloric amino acid/glucose solution with vitamins and electrolytes. Ferrara et al. (59) have used TPN only on patients developing surgical complications that require a long hospital stay.

Individuals with hyperplastic morbid obesity of early onset have the poorest prognosis for conservative treatment and should be considered for surgery (2). Other candidates include those with the following medical conditions: Pickwickian syndrome, congestive heart failure, poorly controlled diabetes, degenerative arthritis, and hyperlipidemia (5).

Traditional treatments have little to offer the morbidly obese (49). The condition may be incurable in most patients. Some suggest the greatest advantage of surgery is that it forces the patient to eat less and generates an energy deficit without relying on ability to comply to a diet (60). However, a determined patient can frustrate the purpose of any surgical procedure. A dietary regimen is frequently prescribed after surgery today to control the amount of intake and to assure nutrient adequacy. Surgical treatment shifts some of the responsibility for its success to the surgeon, which may not be of benefit to the surgeon or patient (59). Patients who fail to lose weight may blame the surgeon entirely.

If surgery is not contraindicated because of age or illness, patients must meet criteria such as the following: weight of at least 100 pounds over ideal with a duration of several years, documentation of previous attempts to lose weight with traditional treatment methods under medical supervision, and medical conditions present for which weight loss is desirable. Patients are commonly referred to the surgeon from their regular physician. After these criteria are met, some surgeons also require a psychiatric evaluation (61).

Surgical methods are constantly being revised. Surgery for obesity is either intestinal, gastric, or both. Food intake or absorption can then be modified to facilitate weight loss. All procedures currently used alter the patient's lifestyle in some way. Mason (7) describes the general requirements of bariatric surgery as: effectiveness, safety, freedom from undesirable side effects, and reversibility. No procedure is without risk of complications or provides a guarantee for weight loss.

Operations for other purposes were noted to have weight loss as a side effect. The Billroth II gastrectomy, introduced in 1884, was such a surgery (8).

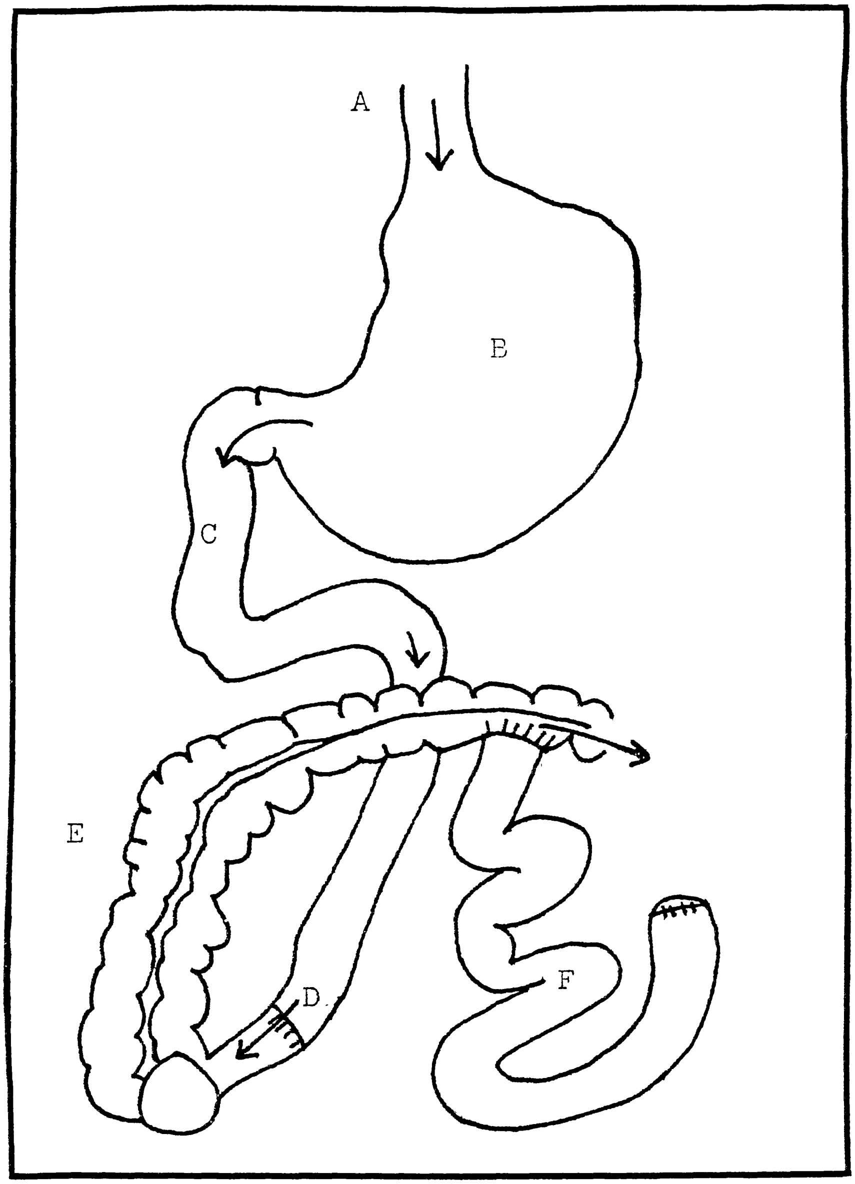
Jejunoileal Bypass

Experimental jejunoileal (J-I) bypass surgery for weight loss was first performed on dogs by Kremen et al. (62) in 1954. The J-I bypass operation is designed to decrease the absorptive surface of the gut so that malabsorption of ingested food occurs. In this procedure, part of the jejunum and ileum are bypassed by shortening bowel continuity (Figure 1). Several surgical techniques are used to accomplish this. Payne et al. (63) anastomized 35 cm of jejunum end-to-side to 10 cm of ileum (referred to as an end-to-side anastomosis). Scott et al. (64) performed an end-to-end anastomosis of 30 cm of jejunum to 30, 20, or 15 cm of the ileum with the bypassed small bowel drained into the colon. These are the variations performed most often, but others exist. Weight loss cannot be predicted (65). Because of variation in operative technique and follow-up assessment, comparisons between reports in the literature are difficult.

Weight Loss

One group of J-I bypass patients lost two-thirds of excess weight by 18 to 24 months after surgery (20). This extent of weight loss is fairly representative of J-I bypass patients. In another group, weight loss was approximately 50 to 60 pounds during the first year for 80% of the patients with 9% failing to lose any weight (25). The rate and amount of weight lost were affected by initial length of intestine, the length of the segment remaining after the operation, the type of operation, initial body weight, amount of food eaten and the degree of malabsorption present (66).

It is generally recognized that most of the initial weight lost after surgery results from significant reduction in food intake rather than severe malabsorption (9,20,25,46,66,67). Rogus and Blumenthal (67) calculated average preoperative intake to be 6830 ± 573 kcal from three-day food intake records of 11 J-I bypass patients. Bray et al. (68) determined an average preoperative intake to be 6700 kcal per day in 21 of J-I bypass patients. The researchers (67,68) offered no explanation for



A. esophagus

B. stomach

C. duodenum

D. site of anastomosis between proximal jejunum and distal ileum

E. colon

F. excluded segment (jejunum) of intestine anastomosis to colon

* arrows indicate food flow pattern

Figure 1. Jejunoileal Bypass

these high preoperative intakes. Presumably, the values may have reflected, in part, final eating binges by the patients before surgery. In the study by Bray et al. (68), during the first six months postoperatively, the energy intake was less than 2000 kcal per day for the majority. These data were obtained from measurements of preoperative and postoperative intake during the hospital stay. The patients were offered more food than they requested. The difference between quantity of food provided and amount eaten was measured (68). Food intake postoperatively increased gradually, but did not return to preoperative levels during the undefined time in which it was monitored.

Taste preferences for high sugar concentrations were less after the J-I bypass surgery than before. Several mechanisms have been proposed for this change and for the changes in feelings of satiety. Taste acuity may be affected by the loss of zinc that occurs after intestinal bypass (69). Gastrointestinal distension and slower emptying time produced early satiety (68).

Alterations in intestinal hormone secretions or production may have caused indirect signals to stop eating (39,70). Bray et al. (68) measured hormone concentrations before and after J-I bypass. Enteroglucagon and pancreatic polypeptide levels were increased after surgery. These hormones were measured after a "standard" meal (standard was not defined). The time interval between meal cessation and when the measuring took place was not noted.

Heavier patients lost weight more rapidly and took longer to plateau than did patients with lower preoperative weights (66). Weights of the majority of J-I bypass patients plateaued between 12 and 24 months after surgery. The plateau probably occurred because of small bowel mucosa adaptation due to villus hypertrophy (70). Absorption was close to preoperative levels after one year (66). Surgery reduced total intestinal absorption surface to 8.5% but at two years it was 26.2% of the original (70). Another factor in plateauing weights was the reduction in adipose tissue, which decreased energy expenditure. In a five-year follow-up, some patients had regained 20 to 30% of the weight lost, but the incidence of significant gain was not given (66). Weight regain was reported in more than one-third of all patients in a three-year postoperative period (71).

Benefits noted after weight loss included: decreased dyspnea and angina, improved psychological well-being, increased activity levels and improvement in metabolic abnormalities present before surgery.

Complications

There were many postoperative complications of the J-I bypass. Mortality was from 2 to 7%, higher than for the morbidly obese without surgery (65). During the first six months postoperatively, when weight loss was most rapid, liver disease and diarrhea were the major problems.

Liver Disease. Liver disease was the largest threat to life, occurring in approximately 3 to 10% of J-I bypass patients (65). Liver biopsy showed fatty liver, with necrosis and fibrosis of liver cells (72). However, the majority of patients had some fatty metamorphosis prior to surgery, probably related to obesity (25). The liver disease was similar to that seen in protein-calorie malnutrition. Van Itallie and Kral (20) blamed the bacterial overgrowth in the excluded intestinal segment for causing the toxic burden to the liver. Other causative factors may be essential fatty acid deficiency, malabsorption of amino acids and the recycling of toxic bile acids through the liver (20). Hyperalimentation or reconstitution of small bowel integrity may be required to prevent further damage in some patients. In more than one-half of the cases, liver failure was reversible (66). Death from liver failure had occurred in 0.5 to 2% at 5 to 24 months postoperatively (66).

Diarrhea. Almost all patients developed diarrhea (9,65,66). The diarrhea subsided anytime from four months postoperatively (25) to a year (9). Factors contributing to diarrhea included: decreased mucosal and enzymatic surface, undigested sugars from a disaccharidase deficiency, bile salt irritation of the colon, and a decreased transit time (9). Episodes of severe diarrhea led to dehydration and electrolyte imbalance. Dietary treatment for diarrhea involved maintenance of a high protein intake with a decrease in fat and sugars. Severe cases warranted intravenous hyperalimentation (66,72).

Other Complications. Complications were encountered beyond the first six months. Jewell (65) reported evidence of bone disease in almost one-half of patients. This might have been due to alterations in vitamin D metabolism and calcium depletion.

Renal problems included increased oxalate stone formation and some cases of irreversible renal failure due to oxalate nephritis (25). The oxalate formation was caused in part by increased absorption of exogenous oxalates, especially by the colon.

Gallstone incidence increased due to increased bacterial deconjugation and fecal loss of bile salts which resulted in a decreased bile salt pool and supersaturated bile (71). Poor liver function may influence synthesis of bile acid but the tendency of bile to cause stone formation increased four-fold because of increased length of functioning ileum relative to jejunum (9).

Bypass enteritis occurred in 25 to 60% (25). The probable cause was reflux of bacteria into the bypassed loop and(or) absorption of bacteria. Antibiotics provided relief, but, for an estimated 5 to 25%, a takedown of the bypass was needed.

Vitamin and Mineral Deficiencies. Many have reported vitamin deficiencies, particularly those of vitamins A and D (9,25,66,72). Alterations in metabolism of vitamins A and D were related to malabsorption, steatorrhea and liver disease (9). Correction of the deficiencies required doses of five to 50 times the RDA (25). Other reported deficiencies were with the B vitamins, especially B_{12} (25).

The most common mineral deficiencies were those of calcium, magnesium, and potassium. These deficiencies were usually reported during episodes of diarrhea or vomiting. Plasma zinc and copper concentrations were frequently low. This may have been related to intestinal malabsorption and the loss of bile in the stool, because zinc and copper are excreted primarily in pancreatic secretions and bile (66).

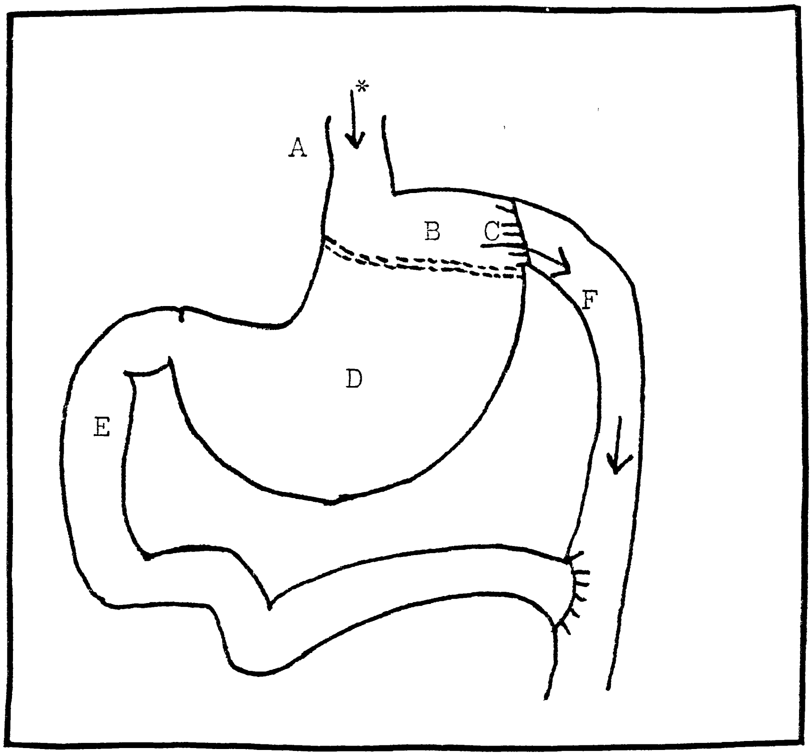
Revision. Reversal of the surgery was sometimes performed because of complications, patient disenchantment, or inadequate weight loss (20). Reversal rates ranged from 2 to 25% (65,66,71). After the reversal, if no other form of bariatric surgery is performed, patients may return to their original weight or exceed it (20).

The numerous complications that can occur have led the majority of surgeons to abandon the J-I bypass and turn to gastric procedures. Many times while taking down the J-I bypass, a gastric bypass or partitioning surgery was performed to replace it (66,72). Alden (72) reported the difference in weight loss between the J-I and gastric bypass surgery was negligible. Gastric bypass and stapling (partitioning) procedures are thought to avoid many of the complications of the J-I bypass.

Gastric Bypass

The gastric bypass for weight loss, patterned after the Billroth II gastrectomy, was introduced in 1966 by Mason and Ito (13). At first, an exclusion operation, equivalent to a 90% gastrectomy, was criticized by surgeons (8). Those surgeons treating the morbidly obese at the time were performing the J-I bypass. There were many questions about how patients would respond to a drastic reduction in stomach capacity. With the J-I bypass, patients supposedly did not need to control intake; now there is evidence that patients did control intake to avoid feeling ill (25,66). In a gastric bypass, the reduced food holding capacity should provide for early and prolonged satiety after consuming about one-half cup of food.

The gastric bypass has been modified many times since its introduction. It is generally considered to be technically more difficult to perform than the J-I bypass. Currently, most surgeons create from a stomach capacity of 500 ml, a small pouch with a capacity of 30 to 60 ml. Surgical staples are placed in the proximal portion of the stomach in a line across the upper part of the stomach. The upper pouch empties through the jejunum that was joined to the greater curvature side of the stomach (Figure 2). The new passageway is approximately 10 mm in diameter. Secretions in the bypassed distal part of the stomach, duodenum, and proximal jejunum drain into the distal jejunum through an end-to-side anastomosis, but chyme bypasses their absorbing surfaces.



A. esophagus

B. pouch

C. stoma (gastrojejunostomy)

D. lower portion of the stomach

E. duodenum

F. anastomosis of jejunum

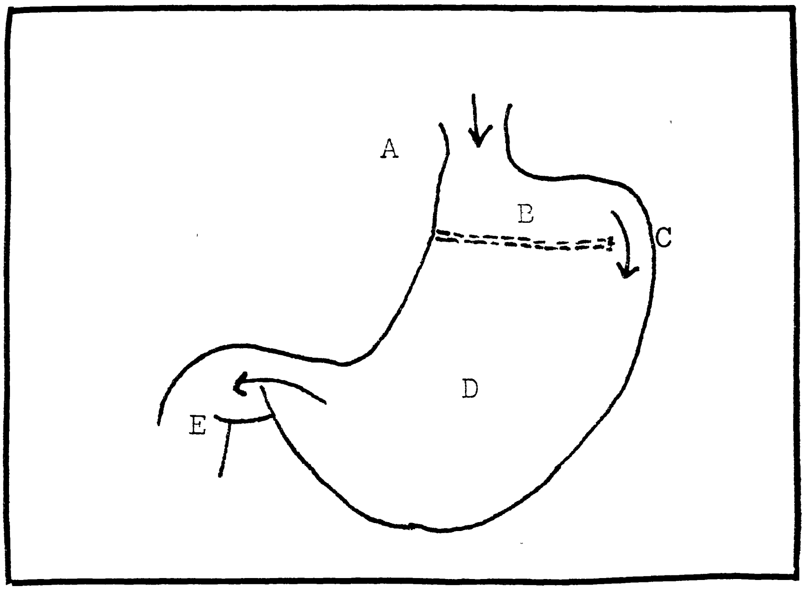
Figure 2. Gastric Bypass

The entire lower stomach remains viable but is no longer used in digestion.

Gastric Stapling

It has not been established that bypassing the lower portion of the stomach and duodenum is necessary. Gastric stapling, also called gastroplasty or gastric partitioning, offers an alternative to the gastric bypass. It is described as technically simpler than the gastric bypass (5). Differences in gastric bypass and stapling are relatively small but the gastric stapling may be minimally safer in terms of operative morbidity and mortality. Other areas of concern, as will be discussed, are the occasional, but severe, dumping syndrome and the fate of the bypassed segment in the gastric bypass surgery (5,18).

In gastric stapling, the upper stomach is stapled almost completely closed leaving a small opening on the greater curvature. Like the gastric bypass, the pouch has a capacity of 30 to 60 ml. The stoma, or passageway to the lower portion of the stomach, has a diameter of 10 to 14 mm (Figure 3). Rapid satiety is produced by the early filling of the upper pouch where stretch receptors are located (25). Because of the small diameter of the stoma, the food leaves the pouch slowly. Thus, distal gastric emptying, flow of secretions, flow of food, and absorption occur more slowly than before gastric stapling. In the gastric bypass, food is excluded from the distal part of the stomach and from the duodenum, whereas in gastric stapling, it is not. The gastric bypass eliminates the actions of some secretions and reduces absorptive area. This is the major difference in the two procedures. However, weight loss in both procedures occurs from the decreased amount of energy consumed rather than from malabsorption (6).



A. esophagus

B. pouch

C. stoma

D. lower portion of the stomach

E. duodenum

* arrows indicate food flow pattern

Figure 3. Gastric Stapling

Results of these surgeries are usually reported together. Complications, benefits and nutritional concerns are similar. Most dietary studies have used the gastric bypass patients as subjects. Further discussion will include both procedures with any significant differences noted.

Modification of Eating Habits

Success with gastric stapling requires behavior modification. Patients undergoing gastric surgery for weight reduction are counseled before and after surgery about the new ways of eating they need to adopt. Classes in nutrition are conducted in some institutions. Medical ethics require surgical patients to be informed of benefits and risks of surgery. Mason et al. (8) emphasized the importance of informing the patient of what will be required so that unsure patients can change their minds about having surgery. Dietary regimens vary, with nutritionists and surgeons having their own thoughts on what is appropriate. Uhl (73), the dietitian at Ohio State University Hospitals, counsels patients to maintain a blenderized diet for the first eight weeks postoperatively. The rationale is that this strategy will protect the staple line from disruption. Ellison (74), a physician at the same institution, proposes a liquid regimen throughout the first year. Another regimen (3) progresses the diet from liquids to soft solids before the patient is discharged from the hospital. This regimen appears to be the most common routine as determined from an informal survey of institutions and the literature (3,14,16,17,73,75,76).

A summary of the recommended guidelines from these sources includes:

1. Eat slowly and chew foods until they are of a mushy consistency.
2. Avoid liquids during meals and up to one hour before and after.
3. Stop eating when full (approximately one-half cup of food).
4. Eat three balanced meals each day.
5. Include a protein source at each meal.
6. Take a multiple vitamin and mineral supplement daily.
7. Avoid high energy liquids and foods.

Diet After Stapling Surgery

The diet for gastric stapling patients most closely resembles the hypocaloric regimens discussed earlier, with intakes the first few months postoperatively likely to be a very low energy diet (3,16,17). Because the physical capacity to hold food is limited, and because of the small stoma through which food must exit the pouch, the consistency of the food must be altered before consumption by blending, chopping, or thorough chewing. Reports of food intolerance are common. Because some items such as meat, raw fruits and vegetables are difficult to chew well, they may be avoided (19). These foods are also less likely to be tolerated, as evidenced by reports of vomiting. Milk is another item sometimes reported as difficult to tolerate after gastric stapling. Thus protein intake may often be less than the RDA, either from the limited food holding capacity or avoidance of foods causing discomfort. Vitamin and mineral intakes from food are also decreased after surgery. This is due in part to decreased consumption of fibrous fruits and vegetables, because of the challenge in chewing them well, or to the limited capacity to hold bulky food items (3). Vitamin and mineral supplements are prescribed to help meet nutrient needs. Patients who discontinue taking the supplements risk deficiencies of these nutrients (8). Unless a supplement is taken, the diet is generally low in fiber. This probably contributes to the change in bowel habits, such as a decreased frequency of bowel movements and occasional constipation that are sometimes reported by patients.

The percentages of carbohydrate and fat in the diet usually have decreased, indicating changes in the types of foods consumed (16). These decreases may be, but are not necessarily, proportional to energy intake. The changes may indicate adherence to instructions to assure adequate protein in the limited intake of food. Patients' preferences and, therefore, consumption of fried foods was reported to decrease (16,74). Other characteristics of the diet will be discussed when the complications of gastric stapling, related to diet, are explored.

Weight Loss

Comparisons Between J-I Bypass and Gastric Bypass. Weight loss from gastric bypass surgery was compared to that from the J-I bypass to determine the effectiveness of the former, which was the newer bariatric procedure (72). Two groups, each with 100 morbidly obese patients, were selected by the same criteria for either the J-I bypass or the gastric bypass (72). Preoperative weights were similar for the two groups. Patients in the J-I bypass group weighed an average of 127.1 kg and those in the gastric bypass group, 122.6 kg. No description was given of dietary counseling. After one year, weight loss for the J-I bypass patients averaged 40.6 kg with a range of 17.7 to 77 kg. Weight loss for the gastric bypass patients was 40.2 kg with a range of 20 to 67 kg. Thus, gastric bypass was at least as effective as the J-I bypass.

Comparisons Between Gastric Bypass and Gastric Stapling. Lechner and Elliot (77) compared weight loss by 147 gastric bypass patients to that by 95 gastric stapling patients. The average preoperative weight was 119.9 kg in the gastric bypass group and 118.6 kg in the gastric stapling group. After one year, the bypass patients had lost an average of 43.6 kg while the gastric stapling patients had lost an average of 28.6 kg. At three years, 16 gastric bypass patients had lost an average of 44.2 kg and eight gastric stapling patients, 32.3 kg. These results are comparable to those of Cohn et al. (15), who reported loss of 36 to 45% of excess weight with gastric bypass patients and 20 to 25% with gastric stapling patients after one year. Halverson et al. (17) reported greater than 50% of excess body weight was lost in gastric bypass patients at one year.

Discrepancies between studies in the amounts of weight lost may be related to patient preselection. All the patients of Halverson et al. (17) underwent psychiatric consultation, whereas Cohn et al. (15) had psychiatric screening for patients only if there was a history of psychiatric illness. This screening may help by eliminating those patients not ready for the changes that will occur, leaving the patients more likely to do well. Halverson et al. (17) required that patients demonstrate willingness to accept responsibility for a long-term weight loss and a realistic view of likely impact of diet and ensuing weight loss on their lives.

The absolute amount of weight lost is smaller with gastric stapling than with the gastric bypass (15). This is probably due to pouch enlargement and stoma dilation (8,20). However, because gastric stapling is technically simpler and minimally safer than the gastric bypass, efforts continue to improve its efficacy in weight loss.

Rate of Weight Loss and Criteria for Success. Weight loss is most rapid the first six weeks after gastric surgery (8). The average weight loss at this time has been 22.7 pounds per month, with a standard deviation of 9.2 pounds (78). The greater the initial weight, the greater the initial rate of loss (5). About 85% of the total weight loss achieved occurred in the first 12 months for gastric stapling and bypass patients observed for three years (78). Weights after three years were dependent upon the balance of food intake and energy expenditure. The closer the patient approached normal weight at the end, the less the tendency was to regain the weight. Because most gastric staplings have been done since 1978, comparative weight loss data beyond three years are not yet available (3). Follow-up studies for gastric bypass patients are difficult to compare because of the changes in techniques and pouch size occurring over the past 10 years.

Criteria for determining if the surgery was a success vary. Lechner and Elliot (77) defined loss of 80% excess body weight as excellent. The basis of that figure is that, since 20% overweight is often defined as the beginning of obesity, loss of 80% of excess body weight would return a patient to a non-obese state. However, others, without stating the basis for their determination, judged success to be a loss of 25% or more of their preoperative weight (72). In this case, criterion for surgery was 100 pounds or greater than ideal weight with a duration of at least five years.

Energy Intake

The range of average energy intakes for the first few months postoperatively was from 500 kcal to 1200 kcal (3,14,47,55). One study related intake to rate of weight loss. Gastric bypass patients had a preoperative energy intake of 3979 ± 492 kcal (± SEM). At one year postoperatively, mean energy intake was 1091 ± 116, with mean percent of original weight lost equal to 38% for the 25 patients (16). Preoperative average intake for 12 bypass patients was 2819 ± 305 kcal (14). At three months postoperatively, patients had a 2300-kcal per day mean decrease. The study did not extend to a full year, so the two groups of gastric bypass patients cannot be compared with regard to energy intake.

Changes in Body Composition

Knowledge concerning changes in body composition occurring after surgery is limited. There is controversy over amounts of body components that contribute to the weight loss. In one study, it was concluded that the loss came primarily from adipose tissue (78). Potassium-40, as an index of lean tissue, was counted at various times after surgery to estimate muscle mass. In the patients measured, total lean tissue was decreased from 46 to 38 kg at three months postoperatively, but had risen at six months to 47 kg, so, overall, there was no significant change. The initial protein loss was confirmed by negative nitrogen balance during early weight loss. Bothe et al. (47) made similar observations. They reported that the greatest loss of lean body mass occurred in the first month after surgery. Lean body mass changes were studied using the whole body potassium-40 as an index as well as urinary creatinine excretion. Maximal absolute loss appeared to have taken place by three months postoperatively. While fat loss continued, lean body mass was then gradually restored. An intake of 1.5 g protein per kilogram ideal weight was encouraged, but there was no discussion on whether or not patients were able to achieve this level of intake or evidence for assuming it was necessary. In another study, researchers calculated the creatinine height index for six gastric bypass patients before and after surgery (19). Prior to surgery, all were at least 93% of the standard creatinine excretion for height, while at four months postoperatively, all were between 17 and 53% of standard. This suggests extensive catabolism of skeletal muscle protein had occurred. Transferrin levels, reflective of visceral protein (and iron) status, showed no change from preoperative levels. Plasma albumin, another indicator of protein status, was not measured.

Complications

Operative mortality was reported to be 1% (17). These deaths were due to anastomatic leaks and splenic laceration. Complications that occurred after surgery included: a disrupted staple line (5%), stomal dilation (5 to 10%), and pouch enlargement (most tend to stretch and enlarge over time) (6,8,15,18,73). In addition, eating and drinking too soon after surgery can rupture the stomach.

Staple Line. To prevent staple line disruption, some surgeons are now placing four rows of staples in the stomach. Close staple application is recommended to prevent necrosis of the stomach and possible leaking of gastric contents into the rest of the stomach or, more rarely, the abdominal cavity. Placing the staples immediately adjacent to each other can eliminate the problem of staple migration and disruption. It also ensures an adequate blood supply without necrosis (79). The newly introduced vertical pouch, parallel to the lesser curvature, may cause fewer reflux problems since the original angle between the esophagus and stomach is maintained (7). No data were available on whether or not this affected stretch receptors and the same feeling of fullness occurs as in horizontal stapling. Halverson et al. (17) reported staple line disruption in four patients out of 69 having the gastric bypass, related to "binge" eating and psychiatric disability in three of the four cases.

Stoma. If the stoma stretches and widens, larger amounts of food easily and quickly slip through the stoma from the upper to the lower pouch. Widened stomas in gastric bypass allow food to slip more quickly into the jejunum. This condition decreases much of the sensation of satiety originating from fullness of the upper tract. Smith (18) reported that a stoma dilation of 14 mm or more allowed patients to eat normally. Surgeons (8,79) use various techniques to reinforce the diameter of the stoma to prevent dilation. Silastic tubing or a dacron mesh or polypropylene ring is commonly used. Currently, the trend is towards creation of a smaller stoma (diameter of 10 mm) (8,77). Other problems in this area may occur. Stomal stenosis with formation of scar tissue can block the passageway. Ulcers around the stoma occurred in 2.7% of patients (7). Prolonged and severe vomiting irritates the stoma, causing swelling. A narrowed passageway makes food intake difficult. This complication usually resolves itself after treatment with intravenous fluids and rest for a few days. Persistent vomiting and stomal swelling caused 7.5% of patients to be rehospitalized in one study (18). Food items become temporarily lodged in the stoma if not chewed thoroughly enough. Stenosis of the stoma caused one patient in a group of 69 to have a revision (80).

Pouch. Patients can "outeat" the pouch, causing it to stretch and hold larger volumes. At one year, the greater the pouch was dilated, the less excess weight had been lost (80). Even with dietary compliance, the pouch tends to stretch over time (3). Information about the exact amount of size increase is limited. In some patients, however, the pouch had stretched to 10 times its capacity after surgery (3). In addition to stretching the pouch, consuming small frequent meals, high energy foods and beverages or both can frustrate weight loss. Liquids pass through the stoma more quickly than solid foods. Eating and drinking small but frequent amounts has been a major factor in defeating the purpose of the operation (7,15,80,81). This statement is based on random observations rather than systematic records.

Other Complications. Mason (7) and Halverson et al. (17) reported evidence of esophageal reflux in most patients after radiographic inspection. Endoscopic examination, however, revealed little inflammation. Alterations around the cardia during surgery may offer partial explanation for reflux (7).

Patients have not developed the liver disease as seen in J-I bypass patients. Liver biopsy 12 to 18 months postoperatively showed a statistically significant decrease in steatosis from preoperative levels (72).

Revision. Reports of revision rate vary from 3 to 30% (8,17,82) and have usually been performed because of failure to lose weight. More revisions were performed in the years when the surgery was first introduced; surgical techniques and success rates have since improved (8).

Vomiting and the Dumping Syndrome. Ingestion of large quantities of food caused severe epigastric distress and(or) vomiting (14). Vomiting continues to occur with overeating unless patient has stretched the pouch. Vomiting was the most common postoperative problem (19). Other causes of vomiting are: eating foods too rapidly, or eating foods difficult to tolerate. Severe, chronic vomiting led some patients to decrease consumption of a variety of foods and decrease amount of overall intake (19). Vomiting was the main reason for rehospitalization in studies by Gomez (5,6). Vomiting was corrected by modification of eating habits. Vomiting was reported as negligible when dietary instructions were carefully followed (17). Incidence of vomiting was 41% in one group initially. Eleven percent complained of vomiting after three months.

Dumping syndrome has not been a problem with gastric stapling patients. It developed in some gastric bypass patients after the stoma stretched and allowed the food to flow rapidly into the jejunum (3).

Food Tolerance and Preference Changes

Post-surgical food intolerance varies with each individual. Food intolerance may last as long as a year (3). Red meats, milk, and some raw fruits and vegetables are frequently mentioned as causing discomfort, nausea, or vomiting. Changes occurred in food preferences after surgery (14). Many patients reported losing interest in sweets although almost one-half continued to consume them. Brown et al. (14) theorized changes in food preferences were from a lack of proteolytic enzymes and HCL in the stomach to begin digestion, but did not attempt to substantiate this theory. Other patterns noted were increased water and beverage consumption (14). Patients ate an average of seven times per day postoperatively compared to six times per day before surgery. Smaller amounts (exact amount unspecified) were consumed at each eating session after surgery (14). In contrast, another study (19) reported that patients ate less frequently after surgery, with five sessions per day before surgery and three and one-half after. This apparent contradiction could be caused by different definitions of an eating session, or differences in dietary strategies. Most sources suggest three meals per day without snacks (3,5,7), but at least one other source recommends three meals and three snacks (47). The two studies (14,19) did not provide information on what number of meals patients were instructed to eat.

Nutrient Intake

Laboratory values which reflect nutritional status were usually normal or minimally abnormal at six months and normal again at one year (75). The laboratory tests used were not specified but probably included plasma albumin and transferrin. Halverson et al. (17) reported vitamin deficiencies, based on blood levels, in up to one-fourth of gastric bypass patients despite daily oral supplementation. The frequencies were: vitamin A, 18%; vitamin B_{12}, 26%; folate, 9%; and vitamin K, 20%. Hypokalemia was seen in 33% of the same group of patients. One-half of this number were taking potassium-depleting diuretics. Hypokalemia was more commonly seen in those patients with prolonged vomiting.

Based on serum iron and hematocrit values, iron deficiency anemia was reported in 18% of 69 gastric bypass patients (17). Mild deficiency was found in 20 of 830 gastric bypass and stapling patients (12). The measure of iron status used was not mentioned in this particular report. Compared with gastric of J-I bypass, gastric stapling should decrease the potential of calcium and iron deficiencies by exposure of chyme to the duodenum where these minerals are most readily absorbed, but it also reduces contact with hydrochloric acid which otherwise would reduce iron and enhance its absorption (14). Lower intake of poorly tolerated foods (meat and fresh fruits and vegetables) may also reduce availability of the iron consumed. Some patients are anemic when they leave the hospital because of surgical blood loss. Nevertheless, it is generally assumed that deficiencies that develop later are from inadequate intake rather than from malabsorption (14). The major exception would be an iron deficiency resulting from reduced duodenal exposure of ingested iron in gastric bypass.

Peripheral neuropathies have been reported. Bukoff and Carlson (3) reported four out of 830 patients developed neuropathies. They developed in patients who stopped eating because of excessive vomiting or did not take supplemental vitamins. Updegraff and Neufeld (19) found a decreased intake of foods high in folate compared with preoperative intake. This may be related to the bulkiness of the foods rich in folacin and the small capacity of the pouch. At four months postoperatively, however, serum folate levels were higher than preoperative values, possibly due to the vitamin supplement. Four patients out of the 12 did not show this increase. These patients may not have been taking the supplement. Another explanation is the variation of folic acid content in the supplements, but since variation is not great in the over-the-counter supplements, this is less likely.

Fifteen percent of one group of gastric bypass patients reported not taking vitamin and mineral supplements (17). Approximately 30% of another group discontinued taking the supplements, despite repeated emphasis on their importance (16).

Hair loss occurred early in the postoperative period in slightly more than 50% of gastric bypass patients (16). Depletion of the nutrients protein, vitamin A, zinc or a combination of these has been proposed as a possible cause for the hair loss (16). Though not documented, hair loss may be related to the stress of the surgery and the changes in lifestyle that occur. In a study of 12 gastric bypass patients, the mean protein intake at three months was 24 $\pm$ 3 g (14). Intake was calculated from a three-day food record. Serum albumin, total protein, and transferrin, serum indicators of protein status, showed no significant difference at three months postoperatively from preoperative values. Thus, Brown et al. (14) maintained that patients in a semi-starvation state (mean intake was 566 $\pm$ 78 kcal) did not generally have documented protein deficiencies after three months. This was despite intakes of protein well below the RDA. Catabolism of the body's lean tissue, however, provides for an endogenous supply of protein to maintain the rest of the body (52).

Benefits of Surgery

Benefits from weight loss following surgery were mentioned earlier. Improvements in diabetes, reduction in blood pressure, cardiorespiratory function and muscoskeletal improvements have been seen (15).

Halmi et al. (83) studied the emotional responses to weight reduction with surgery and those with diet. Previous periods when the patient was losing weight without surgery were used as the control. Episodes of depression, anxiety, preoccupation with food were reported by 53% of 80 patients who were to have a gastric bypass later. Far fewer emotional disturbances during weight loss from the surgery were reported than weith weight loss achieved with diet. Gastric bypass patients were asked how they felt about their lives after surgery (17). Before surgery, 54% of the patients that were not satisfied with their lives became satisfied after surgery. None of the patients became less satisfied with their lives after surgery. The last contact with patients was not documented so it is not known if patients later changed their minds. Also, there was no mention if patients who later regained weight became less satisfied with their lives.

Summary

Morbid obesity has resisted conventional methods of treatment. Current research on causes of obesity may provide guidelines for treatment in the future. Review of the literature indicates that surgical intervention may be appropriate for some morbidly obese individuals. Careful patient selection with continued medical and dietary support postoperatively can maximize benefits. Information about nutritional consequences of surgery and of the patients' change in eating habits and intake is fragmentary, and these subjects deserve further study.

CHAPTER III

METHOD AND PROCEDURES

Included in this chapter are descriptions of the population and sample selected for this study, and sections concerning instrumentation, data collection and methods of statistical analysis of results. The purpose of this study was to describe dietary habits and intakes of gastric stapling patients and the changes in these which occurred after the stapling surgery for weight loss.

Population and Sample

The subjects were female gastric stapling patients, aged 23 to 50 years, admitted for surgery at Doctors' Hospital in Tulsa, Oklahoma, during January to May 1983. The study subjects were limited to the patients of either of two surgeons (sharing a practice), to minimize variables such as different surgical techniques, patient selection criteria, and follow-up care. The two surgeons, together, perform approximately 80% of gastric stapling surgeries at this facility. The other 20% are performed by a surgeon whose techniques and follow-up care differ.

Plans for the study were presented and discussed with the surgeons, one of whom was chief of staff. Permission was obtained to conduct the study, from both Hospital and University groups.

Twenty-three female patients were available for the study; all gave written informed consent to participate in the interviews (Appendix A). One hundred percent of those asked (from January 1983 to May 1983) were willing to participate. The study includes only females because they form the majority of the population of gastric stapling patients. The age range of 23 to 50 years allowed for comparison of subjects' intakes to the Recommended Dietary Allowances for this age group. The population of gastric stapling patients is not large. A random sampling method was not used so that as large as possible a sample size could be obtained. The sampling method used is defined as a deliberate or non-probability sampling method (84).

Instrumentation

In order to meet the objectives stated in Chapter I, the procedure chosen for this study was based upon a questionnaire/interview format. The questionnaire was developed by the researcher (Appendix B and C). Each questionnaire form was completed by the researcher during the three interview sessions. In addition, a 24-hour dietary recall was recorded during the interviews and once at six months alone. Background information was obtained from hospital records (Appendix D).

The researcher had the opportunity to develop a rapport with the subjects because of responsibility for their nutritional care and education throughout the hospital stay. The interview method was selected to obtain detailed information that subjects might be more willing to discuss than to take the time to write about. Misinterpretation of questions may be less likely with the interview method than with questionnaires alone because the interviewer can elaborate on and clarify questions (84). To provide a check for consistency, some questions were asked later during the session in a slightly different form. The researcher tried to avoid asking leading questions. However, a limitation of the interview may be the desire of the subject to say what they believe the interviewer wants to hear. The researcher attempted to overcome this problem by emphasizing that answers would be kept in strict confidence and that the information would help future gastric stapling patients. The data collection instrument had both open and closed form questions. The closed form questions were less subject to interviewer bias. Interviewer bias was recognized to be a major disadvantage with the interview method. Copies of the instrument and a proposed time table for the study were provided for the two surgeons. The surgeons were asked to make any suggestions or comments desired. Reviewing the questionnaire gave them an opportunity to determine if any questions were too sensitive to ask patients. They recommended that no changes be made. The instrument was reviewed by the members of the researcher's graduate committee. Their suggestions were noted and revisions made.

The patients' hospital records provided demographic data such as age, height, weight, and medical history, as well as history of previous weight loss attempts, surgical report, laboratory report and the patients' hospital progress. The initial interview form, used prior to surgery, differed from that used at the subsequent telephone interviews at four and eight months post-operatively. It consisted of 43 questions concerning eating habits, food preferences, activity level and diet history. Some questions allowed for several answers while others required a short one-word answer. A 24-hour dietary recall was included at each interview, including: initial contact and four and eight months postoperatively. In addition, at approximately six months after surgery, subjects were called for a 24-hour dietary recall only. This information helped to provide a basis for gross comparison with the patients' reported intakes at four and eight months postoperatively and the interview was a means of maintaining contact with subjects. The initial 24-hour dietary recall, prior to surgery, asked patients what they ate on the day before hospital admission. The recall was usually performed on the day of admission or the next morning if patients were admitted in the evening. Since the day of recall may not have been typical of usual intake, patients had the opportunity to note what was unusual about that day. If an item was very atypical for the patient, a typical item was substituted for the food. This was only done for three patients. An example is a patient who rarely ate steaks (of restaurant proportion) but did so the day before admission. Since 12 ounces of steak was not typical for her, only six ounces was counted. The other two instances were patients who had consumed double and triple portions of desserts. Plastic measuring cups were used to help subjects estimate amounts eaten.

The interview and questionnaire used at four and eight months after surgery were identical. Subjects were asked 51 questions. Questions were asked concerning the rate and amount of weight loss, ability to tolerate different foods, physical activity, general appearance of skin and hair, dietary habits and eating behaviors.

Collection of Data

The purpose of the study was explained to each subject. Written informed consent was obtained. Overall response to the purpose of the study was positive. Subjects expressed interest in helping future gastric stapling patients by providing information about their individual progress. Many said that they were interested in learning the outcome of the study.

Data were collected over a one-year period beginning January 1983. The initial interviews were all conducted in the first five months, when patients were admitted to the hospital for surgery. Each subject was then contacted by telephone at four and eight months post-operatively for the complete interview, and at six months for a 24-hour dietary recall only. Each complete interview lasted approximately 45 minutes. Responses were kept in strict confidence and names of participants deleted for data analysis. Of the 23 subjects, 100% participated in all three interviews.

Data Analysis Procedures

Nutrient Intake

Individual Nutrients

Prior to statistical analysis, data were recorded, organized, coded, and keypunched for processing by the computer. The data were divided into four sets: one-time, zero-month, four-month, and eight-month (Appendix E). One-time data were patients' medical and diet histories. The other three data sets correspond to the initial interview and interviews at four and eight months postoperatively. Six-month data were not analyzed by the computer. The data served as a check for consistency in patients' reports to the researcher. The Statistical Analysis System (SAS) (85) was used to generate and analyze most of the data. A computer program designed for a beginning nutrition course at Oklahoma State University was used to determine nutrient composition and RDA percentages of food and beverages in each of the 24-hour recalls for all subjects. Values for energy, protein, calcium, iron, vitamin A, thiamin, riboflavin, preformed niacin, and vitamin C were derived from USDA Handbook Number Eight (86). The RDA percentages correspond to the 1980 RDA (10) for women in the 23 to 50 years age group. Carbohydrate values were estimated by determining the Diabetic Exchange List Value (87) for the recorded amount of food in the 24-hour recalls. The amount of fat could then be determined by difference ([total energy - protein energy - carbohydrate energy]/9 = fat energy/9 = grams of fat).

Nutrient Score

To help make a general assessment of nutrient intake, a new variable called "nutrient score" was created. This variable was based on the percentage of the RDA achieved for each nutrient by a patient. The nutrient score for each patient was the mean of the percentage for calcium, iron, vitamin A, thiamin, riboflavin, niacin and vitamin C. Percentages of more than 100% were counted as only 100% since amounts exceeding the RDA are not expected to contribute more nutritionally.

Statistical Analyses

Standard statistical procedures were used (88). For grouped continuous values, least squares (adjusted) means obtained by analysis of variance were compared by Duncan's multiple range test. Spearman rank order correlation (85) or simple regression with a general linear model for analysis of variance were calculated to describe relationships among continuous variables. Some frequencies are also reported.

The level of significance for use in statistical analysis was 0.05. Significance implies that the differences between two means are in probability real differences and, with 95% certainty, not chance occurrences. P values of greater than 0.05 but less than 0.10, while not considered statistically significant, are sometimes presented due to their usefulness for signaling possible data trends or patterns worthy of further investigation. Unless otherwise noted, the measure of variability given with the means ($\pm$) will represent the standard error of the mean (SEM).

CHAPTER IV

RESULTS AND DISCUSSION

Background and Description of Subjects

This study describes the changes in dietary habits and intake of female gastric stapling patients following surgery. Prior to surgery, background information was obtained from medical records and initial interviews (Table I). This information was helpful in providing a general picture of surgical candidates.

Eighteen of the 23 patients were married and 13 had one or more children. Twenty patients were Caucasian, two were Negro and one, Indian. Spouses and other family members were usually present for dietary counseling sessions. In general, patients seemed more enthusiastic over anticipated weight and related changes than apprehensive about the surgery and the effort required afterward for successful weight loss.

Age of Onset of Obesity

Patients were asked if they first became obese as a child, as an adolescent or as an adult (Table II). Based on comparison of means following analysis of variance, the age of onset of obesity was not related to extend of preoperative weight. One study of gastric stapling patients (7) reported that those who became overweight as a child had the highest preoperative weights, and, while data in Table II do not confirm it, neither are they inconsistent with that report since means follow the expected pattern.

TABLE I

BACKGROUND AND DESCRIPTION OF FEMALE GASTRIC STAPLING PATIENTS

characteristic	mean ± SD		no
	metric units	"English" units	
patients studied			23
age,yr			37.4 ± 8.3
height,cm,in	163.3 ± 21.0	64.3 ± 2.1	
preoperative weight,kg,lb	122.1 ± 22.1	269.3 ± 48.9	
calculated ideal weight,kg,lb	56.6 ± 4.5	125.0 ± 10.0	
patients' goal* weight,kg,lb	60.3 ± 4.9	133.0 ± 10.9	
patients having concurrent disease			
hypertension			14
diuretics used			7
diabetes (total no)			5
insulin dependent			1
oral hypoglycemic agent and(or) diet			4
weight bearing arthritis			20
gall bladder disease			2
using:			
tobacco			5
alcohol (occasional use)			6
lab values			
serum cholesterol mg/dl	230 ± 39		
serum triglyceride mg/dl	122 ± 27		

*The weight patients reported that they would be happy to achieve (determined preoperatively)

TABLE II

AGE AT ONSET OF OBESITY
AS RELATED TO EXTENT
OVERWEIGHT

age at onset	N	mean preoperative weight ± SEM	
		lb	kg
child	8	289.4 ± 17.3	131.3 ± 7.9
adolescent	7	266.6 ± 18.5	121.1 ± 8.4
adult	8	251.7 ± 17.3	114.4 ± 7.9

Blood Lipids and Preoperative Weights

Using Spearman's rank order correlation, extent of obesity and preoperative serum cholesterol ($r = 0.210$, $p = 0.335$) and triglyceride ($r = 0.050$, $p = 0.808$) were not correlated. Blood lipid values generally fell within the normal range for adult women (Table I).

Elevations in serum cholesterol and triglyceride often have accompanied obesity (30). However, one study of 12 gastric bypass patients (14) found preoperative serum cholesterol and triglycerides within the normal range as was seen with this study of gastric stapling patients. Mean weights for the two groups were 290 and 269 pounds, respectively.

Methods of Weight Loss Attempted Prior to Surgery

Prior to surgery, patients had attempted various methods of losing weight (Table III). The most frequently used methods were diet programs such as Weight Watchers or self-imposed diets learned from books, television or friends. Drugs, prescribed or over-the-counter, were used by a majority. Exercise and behavior modification were used alone or as part of another program by a considerable number of patients. All patients had tried more than one method to lose weight. Two patients had tried six different methods to lose weight. Eighteen patients had tried either three or four methods.

Occasionally, less conservative methods were used. One patient had had her jaw wired and another had her ear stapled. Rubbing the staple was falsely believed to decrease appetite and desire for food.

TABLE III

NUMBER AND PERCENT OF PATIENTS TRYING VARIOUS METHODS OF LOSING WEIGHT AND ACHIEVING SUCCESS BEFORE ELECTING FOR SURGERY

weight loss method	patients using method		patients achieving success (loss of 20 lb)	
	N	%	N	%
reduced food intake				
diet program (e.g. weight watchers)	18	78	10	43
self-imposed (from book or friend, etc.)	18	78	5	22
other aids to weight loss				
over-the-counter diet pills	13	57	3	13
prescribed pills, injections	15	65	3	13
exercise	14	61	0	0
behavior modification	6	26	1	4
other	2	8	1	4

Response to Surgery

Weight Loss

Table IV describes weight changes following gastric stapling surgery. To compare patients with widely varying preoperative weights, percentages of excess body weight were used. Percentage excess body weight was defined as:

(current weight - ideal weight)/ideal weight x 100

At four months postoperatively, the percent excess body weight decreased by 45%; and at eight months, it decreased by 65%. Weight loss at four and eight months postoperatively was similar to that in other studies for gastric bypass and gastric stapling patients (means ranging from 44-81 pounds) (3,14,16,17).

A few patients reported a temporary weight gain of 5 to 10 pounds between four and eight months postoperatively. All but one were able to resume losing significant amounts of weight after this setback. One patient failed to lose more than 10 pounds after having the surgery. This patient was unable to alter eating habits and by four months after surgery, weighed 5 pounds more than her preoperative weight. It is not known if the failure to lose weight was related to stoma dilation or a stretched pouch capacity in addition to eating habits. The patient losing the most weight, 169 pounds, weighed the most preoperative, 379 pounds.

Weight loss was most rapid the first four months after surgery. A comparison of the means indicated that the weight change from zero to four months was significant ($p = 0.0001$) but was not significant from four to eight months ($p = 0.283$). Some weight loss may continue beyond the study period. The amount of such loss has depended on energy intake, physical activity, pouch capacity and dilation, if any, of the stoma (5,8,81).

TABLE IV

MEANS, STANDARD ERRORS, AND RANGES FOR BODY WEIGHT, PERCENT EXCESS BODY WEIGHT, AND WEIGHT CHANGE BEFORE (0 mo) AND AFTER (4 mo and 8 mo) STAPLING SURGERY

weight	unit	time following surgery			ranges		
		0 mo[*]	4 mo	8 mo	0 mo	4 mo	8 mo
actual	lb	269.3 ± 10.3[a†]	210.9 ± 8.8[b]	137.9 ± 7.8[b]	200 to 379	175 to 336	132 to 293
	kg	122.1 ± 4.6	95.6 ± 3.9	35.2 ± 3.5	91 to 178	79 to 152	60 to 138
excess	%	115.9 ± 7.3[a]	70.0 ± 6.7[b]	51.4 ± 6.5[b]	70 to 216.8	26 to 168.8	1.5 to 134.4
change	lb	-	-55.4 ± 3.2	-78.4 ± 6.2	-	+5 to -85	-10 to -169
	kg	-	-25.1 ± 1.4	-35.5 ± 2.8	-	+2.3 to -39	-4.5 to -76.5

* "0 mo" indicates the preoperative period or time of initial interview

† means in a row not having a common superscript are different ($p < 0.05$)

Goals and Ideal Weights

The researcher and(or) physician determined ideal weights, those associated with lowest morbidity (20). In addition, patients set personal weight goals. These were the weights they thought they would be satisfied with. Their goals were usually slightly higher than ideal weights. Patients' goals and weights eight months after surgery were compared to determine if a relationship existed. There was a correlation ($r = 0.446$, $p = 0.017$) between the goal and actual weight after the stapling surgery. The same correlation was not demonstrated between ideal and actual weights at eight months ($r = 0.404$, $p = 0.064$) but the data were not inconsistent with a trend in the same direction. Patients were happy with weight loss, even if goal weight was not yet achieved, as will be discussed later.

Motivating Factors

Patients had various reasons for wanting to lose weight. The reasons were grouped into physical, psychological, or medical categories. "Physical" reasons were defined as wanting to feel more energetic and to improve appearance, while "medical" reasons were defined as wanting to prevent or lessen the effects of a chronic disease such as diabetes or hypertension. Some of the latter elected for the surgery upon advice from their primary physicians. Analysis of variance was used to determine if a relationship existed between percent of excess body weight at eight months and the primary reason for wanting to lose weight. The statistics did not support the hypothesis that reason or motivation to lose weight was related to percent of excess body weight at eight months.

Thirteen patients wanted to lose weight to feel better physically, seven, to feel better about themselves psychologically, and three, to reduce risk of developing chronic disease (medical). Those motivated to lose weight for medical reasons had 36 $\pm$ 18% excess body weight at eight months. Patients losing for physical reasons had 47 $\pm$ 8%, and those losing for psychological reasons had 67 $\pm$ 12% of excess body weight. Thus, though the statistics do not support a relationship between primary motivation to lose and the percent of excess body weight, those losing for medical reasons were closest to ideal weights, followed by those with physical and psychological reasons.

Changes in Eating Patterns

Based on comparison of means following analysis of variance, the number of daily eating sessions was not significantly affected by surgery. Before surgery, 2.3 $\pm$ 0.8 ($\pm$ SD) meals and 2.3 $\pm$ 1.2 snacks were consumed. After surgery, 2.5 $\pm$ 0.6 meals and 2.3 $\pm$ 2.5 snacks were consumed, so that overall, as seen in another study (17), there was little change. The number of eating sessions after gastric bypass surgery sometimes (14) showed a slight increase and sometimes (19) decreased (Table V).

Patients eating fewer meals and snacks postoperatively may have been counseled to do so, although this was not made evident in the studies mentioned here. Dietary strategies vary, with some recommending fewer eating sessions (75) and others encouraging more frequent sessions (17). The differences may also be related to food-holding capacity of the pouch, which ranges from 30 to 120 ml (71). Presumably, smaller but more frequent meals would be indicated for the smaller pouch. One study that

TABLE V

NUMBER OF DAILY EATING SESSIONS
AFTER GASTRIC BARIATRIC SURGERY

study	type gastric surgery	preoperative	postoperative
		no sessions	no sessions
Halverson et al.(17)	bypass	4.3 ± 1.3*	4-6 for 60% ≤ 3 for 33%
Brown et al.(14)	bypass	6	7
Updegraff & Neufeld(19)	bypass	5	3.5 for 83% >3.5 for 17%
Present Study†	stapling	4.8 ± 1.2	4.9 ± 0.1

* mean ± standard deviation

† this report of 23 female gastric stapling patients

reported more frequent eating sessions after surgery noted the smaller amounts of food consumed per session compared to before surgery (14). The differences in the reported number of eating sessions could also be due to different definitions of an eating session.

Using Spearman's rank order correlation, the number of eating sessions was found to be positively correlated ($r = 0.751$, $p = 0.001$) to the nutrient score before surgery. After surgery, at neither four ($r = 0.182$, $p = 0.492$) nor eight months ($r = 0.117$, $p = 0.594$) could a relationship be found. This may be due to the extent of overall decrease in intake, so that eating more often did not necessarily contribute more nutritionally, but may have compensated for the smaller capacity of some. Also, variety of food items and, therefore, nutrients contributed from these foods generally decreased after surgery (3).

Breakfast

Before surgery, four patients did not eat breakfast or a snack before lunch. After surgery, five did not. The mean number of breakfast or early snacks consumed by the group per week was 3.8 ± 2.8 ($\pm$ SD) before and 3.6 ± 3.4 after surgery. Spearman's rank order correlation was used to calculate the relationship between frequency of eating breakfast and nutrient score. Weekly frequency of eating breakfast or an early snack and mean daily nutrient score were correlated before surgery ($r = 0.583$, $p = 0.003$) and four months after surgery ($r = 0.437$, $p = 0.036$) but not eight months after surgery ($r = 0.138$, $p = 0.527$). The energy contribution from breakfast was more consistent throughout the study while lunch, dinner, and especially snacks changed, so breakfast may not affect total intake equally all the time.

Time of Day of Energy Consumption

The percentage of energy intake during breakfast, lunch and dinner changed little from before to four and eight months postoperatively (Table VI). This is consistent with results from a study of gastric bypass patients one year after surgery (16). The percentage of intake from snacks, however, decreased by almost one-half. In general, patients believed that they consumed fewer "balanced meals" than before surgery (Table VII). This finding was not unexpected because the smaller meals were probably thought of as less complete and(or) complex when compared to the meals before surgery.

Food Choice

After surgery, consumption of fried foods decreased. Sweets were consumed only slightly less often. Before surgery, 10 patients reported consuming at least one fried food item daily. At four and eight months after surgery, only one or two patients ate fried foods this often. Sweets (not including soft drinks) were consumed by 20 patients six or seven times per week. After surgery, 17 patients continued to eat sweets at a frequency of approximately four times per week.

Patients' food preferences were not necessarily the same as food choices. This probably was due to a low tolerance for some items and an attempt to comply with the new way of eating which they were instructed in preoperatively. Patients were advised to limit intake of low-nutrient, high-energy foods such as sweets and fats.

Two studies of gastric bypass patients (14,16) reported decreased consumption of "junk" foods, including fried foods and sweets. Another study of gastric bypass patients (19) reported that while all 12 patients ate sweets before surgery, only five continued to do so after surgery.

TABLE VI

ENERGY CONSUMPTION (± SEM) AT VARIOUS TIMES AFTER SURGERY

meal	energy consumption					
	0 mo	4 mo	8 mo	0 mo	4 mo	8 mo
		kcal			%kcal	
breakfast or early snack	298 ± 58	158 ± 32	199 ± 28	16.0 ± 3.2	18.1 ± 3.7	19.1 ± 2
lunch	606 ± 49[a*]	329 ± 38[b]	354 ± 37[b]	32.6 ± 2.6	37.8 ± 4.4	34.0 ± 3.5
dinner	671 ± 49[a]	277 ± 34[b]	398 ± 48[c]	36.1 ± 2.6	31.9 ± 4.5	38.2 ± 4.6
snacks (afternoon and(or) evening)	282 ± 49[a]	106 ± 34[b]	91 ± 29[b]	15.2 ± 2.6	12.2 ± 3.8	8.7 ± 2.7

* means in a row not having a common superscript are different ($p < 0.05$)

TABLE VII

NUMBER OF PATIENTS PERCEIVING NUMBER OF DAYS A WEEK WHEN *MOST MEALS WERE BALANCED

frequency	time after surgery		
	0 mo	4 mo	8 mo
every day	11	5	3
4-5 days/wk	4	8	5
2-3 days/wk	4	8	12
1 day/wk or less	4	2	2
do not know	0	0	1

* 2 out of 3 meals

Snacking. In dietary counseling, prior to surgery, patients were advised to eat three meals and to avoid between meal snacks but, as noted earlier, patients snacked 2.3 $\pm$ 1.2 ($\pm$ SD) times daily before and 2.3 $\pm$ 2.5 instances after surgery. Reasons for snacking reported by patients varied (Table VIII). Prior to surgery, patients snacked most often because of nervousness, boredom, appeal of a food seen or smelled, and because of habit. After surgery, hunger, a feeling of needing a snack for physical well-being, or a desire to snack after seeing or smelling a highly palatable item were the reasons cited most often.

Snacking preferences preoperatively and postoperatively were noted (Table IX). A decrease in preference for salty foods occurred, while preference for sweets as a snack, increased in spite of the overall slight decrease in consumption of sweets. Preferences for cheese and sometimes milk appeared, possibly because of the use of these items as an easily tolerated protein source. Overall, patients preferred salty and sweet snack foods above others, both before and after surgery.

Beverages

Beverage consumption did not change significantly after surgery (Table X). Specifically, patients did not increase water consumption after surgery as was in a study of gastric bypass patients (14). At four months after surgery 10 patients drank milk, and at eight months 13 did, whereas only eight drank milk before surgery. This result also differs from that seen in the same study of gastric bypass patients (14) in which eight of 12 "seldom" drank milk. Dietary counseling before surgery emphasized the need to include milk, if tolerated, to achieve an adequate protein intake. This may partially explain the comparatively greater

TABLE VIII

NUMBER OF PATIENTS WHO SNACKED FOR VARIOUS REASONS

	number of patients		
reason	0 mo	4 mo	8 mo
hunger	3	7	4
boredom	5	2	2
nervousness	6	1	3
desire to eat after seeing/ smelling/preparing food	4	8	4
substitute for a missed meal	0	1	4
habit	4	1	3
"I need it to feel better physically"	1	3	3

TABLE IX

NUMBER OF PATIENTS REPORTING PREFERENCES FOR VARIOUS TYPES OF FOODS AS SNACKS

item	time after surgery		
	0 mo	4 mo	8 mo
salty chips, pretzels, crackers	11	6	5
sweets candy, ice cream, baked goods	7	7	9
soft drinks (sweetened with sucrose)	3	4	4
sandwich leftovers from a meal	1	1	1
fruit fruit juices	1	2	1
milk or cheese	0	2	2
other	0	1	1

TABLE X

CONSUMPTION OF BEVERAGES BEFORE AND FOUR OR EIGHT MONTHS AFTER SURGERY

beverage	usual beverage choices			amount consumed (± SEM)		
	0 mo	4 mo	8 mo	0 mo	4 mo	8 mo
	no subjects			ounces		
water	21	23	21	18 ± 3	20 ± 2	23 ± 4
coffee	8	8	7	27 ± 7[a*]	19 ± 3[b]	12 ± 5[b]
tea	13	13	12	28 ± 2	23 ± 3	28 ± 2
soft drink	15	11	13	26 ± 4	25 ± 4	25 ± 4
"diet" soft drink	4	7	8	42 ± 9	35 ± 11	38 ± 10
whole milk	7	9	13	8 ± 6	8 ± 2	8 ± 1
lowfat milk	1	1	0	4 ± 0[a]	8 ± 0[b]	0[c]
fruit juice	13	15	18	8 ± 1	8 ± 1	8 ± 1
beer	2	1	2	8 ± 1	4 ± 1	6 ± 2
other alcoholic beverage	8	6	7	4 ± 1	4 ± 2	5 ± 1

* means in a row not having a common superscript are different ($p < 0.05$)

number consuming milk. Milk was reported as difficult, or as sometimes difficult to tolerate in slightly less than one-half (nine patients at four months and 10 at eight months). This differs from a study in which two-thirds reported an intolerance to milk (16).

Preoperative and postoperative means for quantity of soft drink consumed were not significantly different. Patients consumed a mean of 26 ounces soft drink per day before and 25 ounces after surgery. Fifteen patients drank soft drinks (not including artificially sweetened beverages) before and 13 drank them after surgery. One study of 12 gastric bypass patients reported that all drank soft drinks before surgery but only six continued to do so after the surgery (14).

Drinking energy-dense beverages has been blamed for frustrating weight loss after gastric bariatric surgery (3,18). The hypothesis of a relationship between soft drink consumption and percent excess body weight was tested at eight months postoperatively by Spearman's rank order correlation. Amount of regular soft drink consumed did not correlate with percent excess body weight at eight months ($r = -0.252$, $p = 0.245$). One patient consuming a mean of 40 ounces of soft drink per day had the highest percent excess body weight at eight months (69.5%), but a patient consuming 48 ounces per day had an excess body weight of only 49%. No trend was evident.

To determine if drinking regular soft drinks compromised nutrient intake, the variables, nutrient score and soft drink consumption, were studied. No significant relationship was found before ($r = 0.227$, $p = 0.297$) or after the surgery ($r = -0.060$, $p = 0.784$).

Consumption patterns of caffeine-containing coffee, tea, and soft drinks versus decaffeinated choices of these beverages were evaluated.

Nineteen to 21 patients drank coffee, tea or both throughout the study, while 19 to 21 drank either regular, unsweetened, or both types of caffeine-containing soft drinks. Overall, patients did not decrease consumption of caffeine-containing beverages or increase consumption of decaffeinated beverages after surgery. Only one patient drank decaffeinated coffee or tea before surgery, two at four months, and one at eight months after surgery. No patient consumed decaffeinated soft drinks prior to surgery, perhaps due to limited availability before January 1983. At four months postoperatively, three consumed decaffeinated soft drinks, and at eight months, two patients did.

To avoid discomfort of food intolerance symptoms after surgery, patients may alter food and beverage choices. Caffeine is generally considered to be a gastric stimulant and could possibly be avoided by patients because of this. The number of patients consuming caffeine-containing coffee did not change significantly. The amount of coffee that these patients consumed, however, decreased from 27 to 19 and 12 ounces at four and eight months, respectively. It was thought patients might change from the products containing caffeine to decaffeinated products because of media attention, and recent availability of the decaffeinated soft drinks. Patients in this study may have preferred to decrease consumption of coffee with caffeine rather than switch to decaffeinated coffee. No data were available in the literature related to caffeine consumption and gastric bariatric surgery patients.

Patients' Perception of Changes in Eating Habits

Patients were asked if they believed eating habits had improved "for now", improved "probably forever", remained the same or changed for the worse since having the gastric stapling surgery. Weight loss was not related to patients' beliefs about changes made in eating habits. It was expected that those improving eating habits would lose more weight than those who did not. Twenty patients reported that eating habits had improved "for now" or "probably forever" at eight months. These patients lost a mean of 55.5 $\pm$ 5.1 pounds. Three patients believed their eating habits remained the same as before having the surgery and lost a mean of 53.6 $\pm$ 9.3 pounds. No patient reported that eating habits became worse. Thus, mean weight loss was not significantly different among the categories.

Nutrient Intakes

The nutrient intake values were calculated from food and do not include contributions from the vitamin and mineral supplements taken by the majority of patients. The contribution of these nutrients will be discussed later in this section.

Energy

The mean intake of all nutrients measured, including energy, decreased postoperatively (Table XI). Mean preoperative energy intake of 1856 kcal was at least 1000 kcal less than that seen in similar studies (14,16,19). The RDA for this age and sex is 2000 kcal. The one patient with an intake of only 699 kcal preoperatively had been trying to lose weight prior to surgery as well as adjust to the type of changes that would have to be made after surgery. Two other patients mentioned this "trial run" approach and had intakes in the 800-kcal range. Intakes for most patients were still less than others report. The approximately 1000-

kcal daily mean decrease in energy intake following surgery is considered to be responsible for the weight loss seen by four months postoperatively. The amount of weight lost was compatible with this estimated change in intake. An energy deficit of 1000 kcal per day for four months would allow for a loss of approximately 34 pounds at four months and 68 pounds at eight months. The mean number of pounds lost was 55 at four months and 78 at eight months. As mentioned earlier, weight loss is most rapid the first four months after stapling surgery. In addition, patients probably consumed even less energy in the months before the 24-hour recall that was recorded at four months because of the need to adjust to the new pouch and way of eating. By eight months, energy intake showed a gradual rise. Energy levels at four and eight months were similar to those seen in other gastric bariatric surgery patients (3,16,19).

Percentage of Energy Distribution

Although energy intake decreased, the percentage distribution from protein, fat, and carbohydrate did not change significantly following surgery (Figure 4). Percentage of energy from protein tended to decrease slightly at eight months, whereas in studies of gastric bypass patients there was a slight increase at three months (14) and one year (16). Percentage of energy from carbohydrate was maximal at four months in this study. Other studies showed a decrease (16) after two years and no change (14) after only three months. Percentage of energy from fat appeared to fall at four months but that at eight months was almost identical with that before surgery. Gastric bypass patients in two studies had a small decrease in the percentage of kcal from fat, one at three months (14) and the other at a year (16) following surgery. Data in Figure 4 suggest such

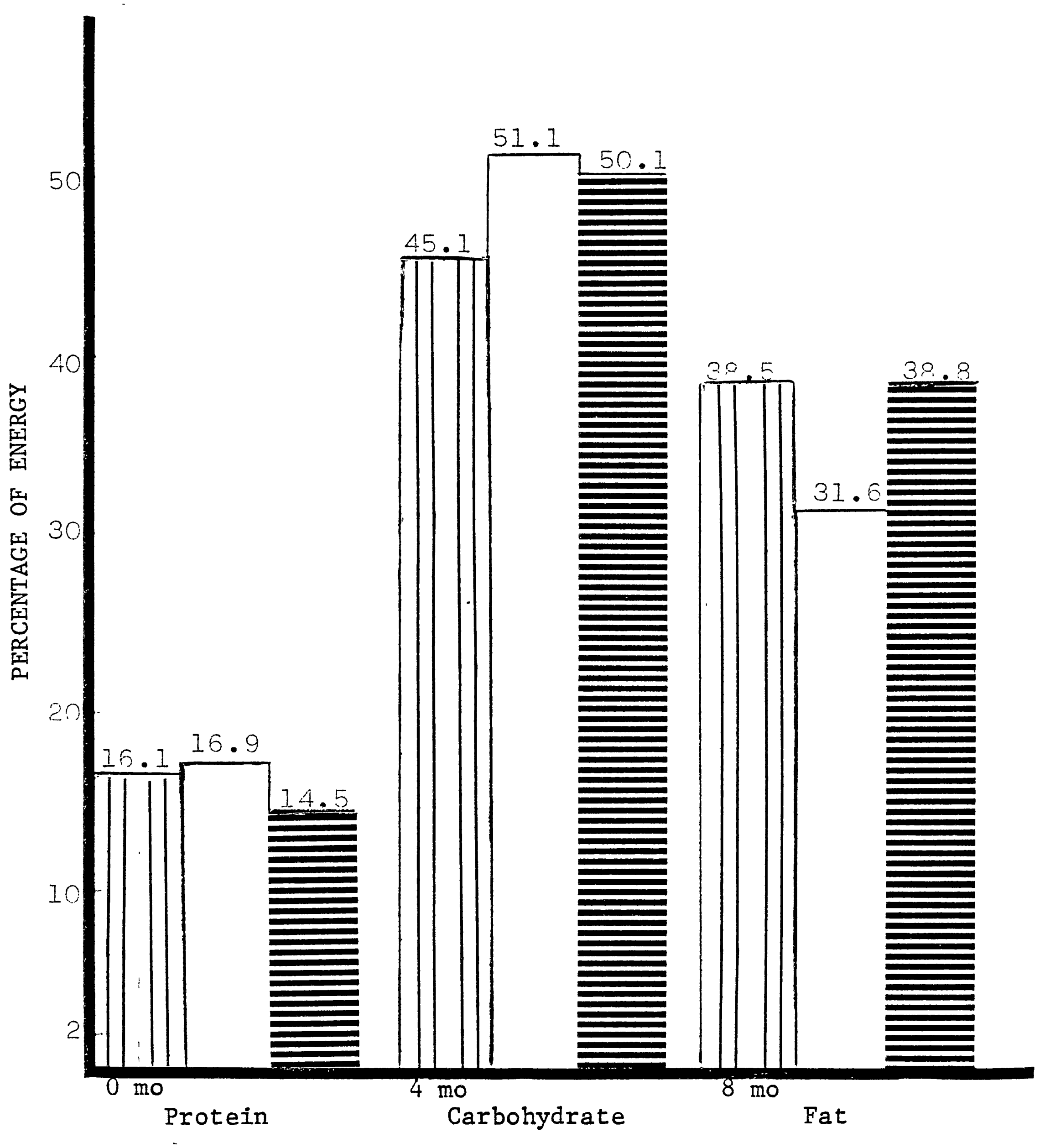


Figure 4. Percentage distribution of energy intakes before and at four and eight months after gastric stapling surgery, based on 24-hour recalls.

a decrease may be transient. Values from this study of gastric stapling patients and the others with gastric bypass patients vary only by a few percentage points. All studies have small sample sizes of 12 to 25, which allows variability in estimates in food intake reported by patients. No study included a breakdown of type of carbohydrate or information on dietary fiber.

Protein

Preoperatively, daily intake of protein was over 100% of the RDA for the majority of patients (Table XII). The remaining three patients consumed more than 50% of the RDA. At four and eight months, 12 patients attained 75% or more of the RDA. Mean protein intake of 35 g at four months (Table XI) was close to the 33 g intake observed in 12 gastric bypass patients at four months postoperatively (19) and it was higher than the 19 g for 25 bypass patients after three months (16). At eight months, mean intake of protein was 37 g, which was similar to the amount (38 g) reported for gastric bypass patients six months after surgery (19).

The reduction in protein after surgery reflects two changes: first, the limited physical capacity for large quantities of a variety of foods; and second, a decreased ability to tolerate meat, particularly red meat. Cheese was the most frequently eaten protein source. Twenty-two patients reported consuming cheese at four months and 10 at eight months after surgery. Eggs were second most popular choice, followed by fish, chicken, ground beef, pork, milk, nuts and yogurt. Although the majority drank milk, nine to ten patients reported an intolerance to milk.

TABLE XI

MEAN NUTRIENT INTAKE, MEAN PERCENTAGE NUTRIENT INTAKE OF RDA AND RANGE OF NUTRIENT INTAKE FOR 23 GASTRIC STAPLING PATIENTS PREOPERATIVELY AND 4 AND 8 MONTHS POSTOPERATIVELY

nutrient	mean intake			range			%RDA			p*
	0 mo	4 mo	8 mo	0 mo	4 mo	8 mo	0 mo	4 mo	8 mo	
energy (kcal)	1856	870	1042	699-3273	472-2133	453-1677	93[a†]	44[b]	52[b]	0.0001
protein (g)	71	35	37	31-118	14-100	11-60	161[a]	80[b]	84[b]	0.015
calcium (mg)	546	376	449	115-1801	57-996	55-1040	54[a]	45[b]	56[b]	0.017
iron (mg)	10.5	4.5	5.3	4.6-17.5	1.8-12.3	1.6-11	59[a]	25[b]	30[b]	0.009
vitamin A (iu)	4417	3684	3719	395-16692	183-18574	519-19999	110[a]	92[b]	95[b]	0.042
thiamin (mg)	0.91	0.52	0.53	0.24-2.09	0.10-1.74	0.17-1.64	91[a]	52[b]	53[b]	0.009
riboflavin (mg)	1.17	0.68	0.78	0.34-3.21	0.24-2.17	0.13-2.22	100	57	65	0.294
(preformed) niacin (mg)	15.3	6.3	7.8	6.4-25.5	1.3-12.4	1.3-17.6	118[a]	49[b]	60[b]	0.012
vitamin C (mg)	59	61	52	14-225	2-155	1-239	99	101	87	0.060

* mean % RDA 0, 4 and 8 months

† means in a row not having a common superscript are different ($p < 0.05$)

TABLE XII

NUMBER OF GASTRIC STAPLING PATIENTS INGESTING NUTRIENTS
IN CATEGORIES OF AMOUNTS RELATIVE TO RDA

nutrient	number with intake as percentage of RDA											
	100%			75-99%			50-74%			≤50%		
	0 mo	4 mo	8 mo	0 mo	4 mo	8 mo	0 mo	4 mo	8 mo	0 mo	4 mo	8 mo
protein (g)	20	5	9	1	7	3	2	6	9	0	5	2
calcium (mg)	4	1	3	4	1	4	3	4	2	12	18	14
iron (mg)	0	0	0	6	0	0	10	1	2	7	22	21
vitamin A (RE)	9	8	7	0	2	0	5	2	4	9	11	12
thiamin (mg)	10	3	3	3	1	2	5	5	4	5	14	14
riboflavin (mg)	11	3	4	3	0	2	7	5	7	2	15	10
preformed niacin (mg)	14	0	3	5	6	4	3	2	5	1	15	11
vitamin C (mg)	8	9	7	1	1	2	4	1	3	10	12	11

Vitamin A

Vitamin A intake was variable according to selection of foods eaten. The minimal and maximal values in the range (Table XI) demonstrate that variability. Postoperative intake was significantly different from preoperative levels, but distribution of intakes relative to the RDA was similar (Table XII). Thirteen patients at four months and 16 at eight months received less than 75% of the RDA, whereas before surgery, 14 patients were in this category. Patients in this study had a mean intake of 3682 International Units (IU) at four months (Table XI), while gastric bypass patients at three months had a mean intake of 1252 IU (14). Brown et al. (14) attribute the low intake to the type of food selected by their patients. Some difference in the studies may be related to the additional month in the study of gastric stapling patients. Perhaps they were able to tolerate a wider variety of foods by this time. Gastric stapling patients in this study reported consuming food sources of vitamin A such as vegetable juices (tomato and V-8), cooked squash and carrots and fortified milk.

Thiamin, Riboflavin, and Niacin

Thiamin, riboflavin, and niacin intakes were less than 50% of the RDA for one to five patients prior to surgery (Table XII). After surgery, incidence of intake of less than 50% increased to 10 to 15 patients. Other studies have not included information on these or other B vitamins, except for an observation of vitamin B_{12} deficiency in gastric bypass patients (17). This problem was thought to be the result of inadequate intake rather than due to malabsorption or any pathological change which might have resulted from the operation. Thiamin and riboflavin are widely distributed in animal and vegetable foods, but only in small amounts in most of them. Thus, the limited intake of the gastric stapling patient did not allow for recommended amounts of these nutrients. The amino acid tryptophan can be converted to niacin in the body. An approximate amount of synthesized niacin can be calculated from protein (89). The average intake of protein at four and eight months postoperatively was equal to 36 g. This would provide for an additional 6 mg of niacin, bringing postoperative intakes closer to the RDA of 13 mg (Table XI). However, under conditions of such low energy intake, close to fasting in some cases, the ratio of conversion of tryptophan to niacin may not be applicable (82).

Vitamin C

Mean intake of vitamin C was at least 87% of the RDA throughout the study (Table XI). Some individuals, 13 to 14 patients, however, received less than 75% of the RDA preoperatively and also at four and eight months postoperatively (Table XII). Again, this level does not reflect the contribution of the recommended supplement. Vitamin C-rich foods, such as citrus and other fresh fruits and vegetables, are sometimes difficult to chew well (3). Some patients reported irritation or discomfort after ingestion of orange juice, but this has not been documented elsewhere. Fresh fruit and vegetable consumption decreased postoperatively. In addition, patients were instructed to eat the protein source first at mealtime in preference to other foods because total quantity of food that can be consumed at one time is limited.

Iron

Mean iron intake of 10.5 mg preoperatively did not meet the RDA of 18 mg (Table XI). It is generally considered difficult for the average woman to meet the RDA from diet alone without exceeding energy allowances. It was expected that the excess energy intake of the majority may have provided for an adequate iron intake before surgery. The mean preoperative value for hemoglobin, an indicator of iron status, was 13.0 $\pm$ 0.2 g/dl. The range was 10.5 - 15.1 g/dl (normal range is 12.0 - 16.0). Mean preoperative hemoglobin was 13.7 $\pm$ 0.4 g/dl for 12 gastric bypass patients who had mean iron intakes of 18 mg.

Postoperatively, as seen in other studies (14,17), iron intake declined, with means of 4.5 and 5.3 mg at four and eight months, respectively (Table XI). All were below 75% of the RDA and most (21 to 22 patients) were below 50% (Table XII). Intake of iron-rich food sources, such as meat and bulky dark green vegetables, decreased after surgery. Seventeen to 18 patients took supplements that contained iron after surgery.

Iron status of some individuals was questionable before surgery (three patients had hemoglobin levels below normal and several were borderline). The low intakes of iron after surgery may have created a greater problem for some individuals.

Calcium

Mean calcium intakes pre- and postoperatively were below the RDA of 800 mg (Table XI). Fifteen patients had intakes less tha 75% of the RDA prior to surgery. The number of patients in this category increased to 22 at four months and decreased to 16 at eight months (Table XII). Before and after surgery, eight to 13 patients drank milk (Table X). Cheese, another calcium-rich food was consumed by 19 to 22 patients throughout the postoperative period. Food quantities suitable for the pouch size were not large enough to meet the RDA for calcium, and mean milk consumption of eight ounces provided for approximately 300 mg of calcium for those who drank milk. The low preoperative intakes of calcium were not different from those in the general population (90). Data were not available concerning calcium intake of other gastric bariatric patients. The nutritional supplement taken by patients contained amounts of 0 to 128 mg of calcium.

The lack of this mineral is of particular concern for these females and their age group because there is a significant relationship of inadequate calcium intake to incidence of osteoporosis (90). Bone loss occurs with weight loss. To reduce risk or extent of bone loss and its sequelae, a calcium supplement may be needed.

Summary

The mean nutrient score from food intake for the 23 gastric stapling patients was 69.5 ± 4.2 preoperatively, 47.8 ± 4.0 at four months, and 51.0 ± 3.4 at eight months postoperatively. The nutrients protein, calcium, iron, vitamin A and three B vitamins (thiamin, riboflavin, and niacin) were frequently found to be provided for insufficient amounts in the postoperative diets of the patients. The minerals calcium and iron were low prior to surgery, providing only 50 to 60% of the RDA. The intake of these two nutrients declined further after surgery to about 25 to 50% of the RDA. Vitamin A intake decreased after surgery, but the B vitamins showed the most dramatic decrease. Preoperative intakes provided approximately 90 to 120% of the RDA, while postoperatively, approximately 50% of the RDA was provided by intake of food. Overall, these results demonstrate the importance of postoperative vitamin and mineral supplementation and of placing emphasis on adequate sources of dietary protein.

Vitamin and Mineral Supplements

Because of the limited food capacity, patients cannot at first consume nutrients equivalent to the RDA. For this reason, multi-vitamin and mineral supplements are prescribed. Patients took vitamin supplements that usually, but not always, contained iron and(or) calcium (Table XIII).

Patients may not have taken supplements on a daily basis. Patients were asked how many times per week, if any, a supplement was taken. Preoperatively, those two patients taking supplements averaged 0.9 $\pm$ 0.5 ($\pm$ SD) times weekly. At four months after surgery, patients taking supplements took them on the average of 4.7 $\pm$ 0.6 times weekly; and at eight months, mean intake was 4.1 $\pm$ 0.6. The majority of patients in this study (18 to 19) took supplements on a regular basis, while four to five patients did not take any. Fifteen percent of 69 gastric bypass patients did not take the prescribed supplements in another study (17).

Except for calcium and sometimes iron, the supplements taken provided the nutrients not adequately supplied by food intake (Table XIII). The two patients taking Theragran M received 67% of the RDA for iron while the patient taking Al-Vite received 0% of the RDA for iron from the supplement. Patients taking Centrum received more than 100% of the RDA for iron. Centrum provided 16% of the RDA for calcium. The other

TABLE XIII

NUMBER OF SUBJECTS TAKING SUPPLEMENTAL VITAMINS AND MINERALS AND THE PERCENT OF RDA PROVIDED*

supplement	nutrients: vitamin A	vitamin C	thiamin	riboflavin	niacin	iron	calcium	number of patients		
	% RDA									
Centrum	100	150	150	153	100	150	16	0	16	16
Theragran M	200	333	687	588	500	67	0	1	2	1
Al-vite	100	333	2000	833	769	0	3	1	1	1
supermarket brand	100	100	100	100	100	0	0	1	0	0

* some of the listed supplements contain additional nutrients that were not included in this study

supplements contained from 0 to 3%. Food intake plus the calcium supplied by Centrum provided for 61 to 72% of the RDA.

Further attention should be directed toward calcium and iron intakes of gastric stapling patients since not all supplements contain these nutrients in adequate amounts. All patients should take a vitamin and mineral supplement on a regular basis to assure adequacy of the diet in terms of the RDA.

Physical Activity

Patients were asked if they felt more or less energetic than before having the gastric stapling surgery and if they were, in fact, more active. Twenty patients reported that they felt more energetic four months postoperatively, and 19 felt that way eight months after surgery. There was a relationship as determined by Spearman's rank order correlation between energy intake and how energetic patients felt at four months ($r = 0.372$, $p = 0.053$) and eight months ($r = 0.372$, $p = 0.049$). Mean energy intake was 918 at four months and 131 at eight months.

Preoperative and eight-month postoperative data were statistically compared to determine changes in activity level, based on the investigator's classification. Activity levels were assessed by the number of hours patients reported spending in light, moderate, or heavy activity. An average of 15 hours was spent in light physical activity, eight hours in moderate, and one hour in heavy activity for the 23 patients. Most of the patients were categorized as having light or moderate physical activity levels overall. The mean weights of the patients in the three categories of light, moderate, and heavy were not significantly different. The difference, if any, was not large enough to be detected with the sample size. Patients' activity levels were not changed a great deal after surgery as had been expected.

Statistical analysis using Spearman's rank order correlation did not support a relationship between physical activity and percent of excess body weight eight months after surgery ($r = -0.10$, $p = 0.629$). It was expected that those having higher activity levels would have the lowest percent excess body weight or that the loss of weight would allow for greater and longer periods of activity.

Changes in Bowel Habits

One-half of patients were not aware of any change in bowel habits other than a decreased frequency of bowel movements after surgery. Episodes of constipation occurred in 12 patients between zero and four months and in 11 between four and eight months. One or two patients experienced alternating episodes of constipation and diarrhea.

There was little or no mention in the literature regarding bowel habits after gastric stapling or bypass other than the diarrhea associated with the J-I bypass was avoided (81). Constipation may be related to decreased intake of bulky or fibrous foods and possibly a decreased physical activity in some. Some patients may have reported changes, confusing a decreased frequency with constipation or irregular bowel intervals between times of elimination. Patients were not asked how frequently bowel movements occurred, but rather what problems, such as diarrhea, constipation, bloating or any other change, had been noted.

Postoperative Side Effects

Vomiting

Frequency

Vomiting occurred on the average once a week four months postoperatively and 0.8 times per week at eight months. Two patients reported vomiting once a day at four and eight months. In addition, nine patients vomited two to four times per week at four months; by eight months this number had decreased to four patients. The most prominent complication seen following gastric stapling and bypass surgery was vomiting (3,16,17,19).

Cause

Possible causes of vomiting are: food intolerance, large quantities of food, liquids with meals, liquids taken too soon after meals, inadequate chewing of food, or rapidly eaten meals. Patients were asked what they believed caused their vomiting episodes (Table XIV). Food intolerance was reported as the primary reason by the greatest number of patients at both four and eight months. Surprisingly, more reported this as a reason at eight months than at four. This may be because patients began experimenting with more variety of food items than before four months. Foods mentioned as difficult to tolerate included: red meat, bread, raw fruits and vegetables, nuts, corn and citrus fruits. Many patients stated that they easily tolerated "junk" foods such as potato chips and candy. Spicy food items did not seem to cause discomfort for the majority after the first few weeks postoperatively.

TABLE XIV

NUMBER OF GASTRIC STAPLING PATIENTS INDICATING VARIOUS CAUSES FOR POSTOPERATIVE VOMITING

cause of vomiting	time after surgery	
	4 mo	8 mo
food intolerance	7	10
large volume of food	5	5
inadequate chewing of food	4	3
eating too rapidly	3	2
don't know	4	3

Eating too much food at one time was thought to be the cause by five patients at both four and eight months. Even without the signal that vomiting provides, patients knew when they ate too much at one eating session because all had been instructed on the appropriate portion sizes during their hospital stay. Inadequate chewing was selected as the next most likely cause by three or four patients. According to patients, eating too fast was the least likely cause of vomiting. A few patients did not know what the cause might have been. Reports on the most likely cause vary with each study but eating too rapidly, eating too much food and food intolerance are mentioned most often (3,8,14-17).

A general linear model was used to evaluate dependency of vomiting frequency on several different variables studied together. The variables were: quantity of food per eating session, thoroughness of food chewing, volume of liquid taken with meals, length of interval after meal before beverage consumption and length of meal (Table XV). Results of the analysis follow.

Meal Volume

Meal volume at four and eight months was not significantly related to frequency of vomiting (Table XV), but the p of 0.07 and 0.06 suggests that such a relationship may exist. At four months after surgery, 17 patients consumed three-fourths to one cup of food per eating session and had a mean vomiting frequency of once a week. The range of intake for the group was one-half to two cups of food. At eight months, range of intake was one-fourth to two cups of food. Ten patients consumed a mean of one cup of food per session and vomited 0.8 times per week. A patient consuming one-fourth cup of food per meal vomited about once a day and the three patients

TABLE XV

FACTORS RELATED TO POSTOPERATIVE VOMITING FREQUENCY

factor	category	regression probability (p)	
		4 mo	8 mo
food quantity, c	1/4 - 1/2 3/4 - 1 1-1/4 - 1-1/2 1-3/4 - 2	0.074	0.064
thoroughness of food chewing	chunky lumpy mushy don't know	0.269	0.944
liquids with meals, amount in oz	0 1 - 2 3 - 4 5 - 6 7 - 8	0.683	0.039
liquids after meals, min before consuming	0 - 9 10 - 19 20 - 39 40 - 59 >59	0.243	0.541
length of meal, min	3 - 10 11 - 15 16 - 25 26 - 35 36 - 45 46 - 60	0.397	0.841

consuming two cups, about once a month. A patient consuming as little as one-fourth cup of food at eight months may be doing so to avoid intolerance symptoms. Persistent vomiting episodes may cause patients to reduce meal volume when, originally, eating excess volumes caused the vomiting. Patients may consume quantities according to what they can tolerate.

Thoroughness of Food Chewing

Ten patients reported chewing food until it was lumpy, nine until it was mushy, and four reported that they did not chew their food well and swallowed chunks of food. Mean vomiting frequency for the first two categories was once a week. Those gulping chunks of food vomited three times per week. There was no significant effect, however, of thoroughness of chewing food on vomiting frequency in this sample at four or eight months (Table XV). Chewing thoroughness is difficult to estimate, so reports may sometimes be inaccurate.

Foods such as citrus fruits, raw vegetables and red meats have been reported as difficult to chew well (14,17). Patients were counseled in this study and another (3) to chew food until it was of a mushy consistency to improve degree of tolerance. Early in the postoperative period, patients usually learn how thoroughly food must be chewed to achieve some similar degree of tolerance, or they select foods that are easy to chew.

Liquids During and After Mealtime

Patients drank from 0 to 8 ounces with meals at four and eight months postoperatively. Vomiting frequency was not affected by volume of liquid consumed at mealtime at four months (Table XV). Either the volume of liquid did not matter or at that time they had learned to reduce the amount to what they could handle. At eight months, however, increased volume of liquids consumed at mealtime increased vomiting frequency. Perhaps patients thought they could or should be able to handle larger volumes by this time, but were unsuccessful.

Patients were counseled to consume liquids between meals for fluid replacement (3). Liquids consumed with meals can fill the pouch taking the place of solids.

Vomiting may be more likely to occur with a combined volume of liquids and solids. The mean daily fluid consumption was 70 ounces at four months and 87 at eight months. Total volume of combined solids and liquids for the day was 77 ounces at four months and 96 ounces at eight months. Drinking too soon after meals can also create a volume too large for the pouch to hold. Patients waited from 0 to 60 minutes to drink after meals. All were originally instructed to wait 60 minutes. There was no apparent relationship between length of time patients waited to drink after meals and vomiting frequency. Other factors could be involved here as well. Persons eating small quantities of foods at mealtime would have a greater capacity for liquids and would be able to tolerate them sooner than those eating larger quantities. Also, high fat meals may leave the stomach slowly, delaying fluid comsumption, but this has not been documented for gastric stapling patients.

Length of Meal

Before surgery, mean length of mealtime was 27 minutes (range, 15 to 60). At four months, it was 22 minutes (range, 10 to 60) while at eight months, the mean was 21 minutes (range, 10 to 45). These times are similar to those in another study (17) reporting a mean of 23 ± 9 (± SD) minutes for gastric bypass patients at a mean follow-up time of 20 ± 10 months postoperatively.

Length of meal did not appear to be related to vomiting frequency in this sample (Table XV). Patients in this study and others (3,17) were advised to eat slowly (from 30 to 45 minutes) to prevent vomiting and to allow time for satisfaction from food. Mealtime decreased by five minutes postoperatively, but meal volume was reduced from presumably normal size to one-half cup. The majority of patients were "full" after meals. This fullness did not appear to be related to the length of the meal. The sensation of fullness was generally described as a physical feeling (18 to 19 patients) rather than psychological (four to five patients) at four and eight months postoperatively.

Nutrient Score

Using Spearman's rank order correlation, patients vomiting frequently did not have significantly lower nutrient scores than those not vomiting so often, but at four months, the p value of 0.09 ($r = -0.367$) suggests the possibility of some relationship. There was no evidence of this at eight months ($r = -0.251$, $p = 0.245$). The lack of a significant relationship may reflect an attempt to replace the lost food items (from vomiting) later in the day. Patients were counseled to try nutrient-dense liquids such as milk or soup later in the day of a vomiting episode. No attempt was made to estimate energy and nutrients lost from vomiting.

Hair Loss

Forty-three percent (10 patients) reported some hair loss and easy pluckability of hair at four months postoperatively. The number decreased to 26% (six patients) by eight months. Postoperative hair loss was reported by others in 50 to 56% (8,16) of gastric bypass patients. Hair loss usually occurred in the first few months after surgery. Reduced intakes of protein, vitamin A, or zinc or a combination of these nutrients was suggested as the probable cause (8,16). Protein and vitamin A intakes were both reduced postoperatively. Zinc intake was not measured.

The mean number of servings of high-protein foods (one serving equals one-fourth cup) was 1.9 at four months and 2.2 at eight months. The foods usually consumed were cheese, eggs, chicken, fish, and milk. Using Spearman's rank order correlation, no significant correlation was found between number of protein-food servings or grams of protein per day and reports of hair loss at four and eight months.

Serum albumin concentration is frequently used to define nutritional status, specifically visceral protein. Serum albumin for 11 patients was within the normal range [normal range equals 4.0 to 5.6 g/dl (88)] upon hospital admission preoperatively, but 12 patients had values of less than 4.0 g/dl. The mean protein intake for the 12 patients was 65 g preoperatively. The added stresses of surgery and reduced protein intake after surgery may have further reduced their protein reserves, but reports of hair loss at four months postoperatively were not correlated ($r = 0.179$, $p = 0.411$) to preoperative serum albumin. A more appropriate test that was not feasible for this study would be to determine if a relationship exists between hair loss and values of serum albumin taken at four months. Gastric bypass patients had mean serum albumin values of

4.4 g/dl preoperatively and 4.3 at three months postoperatively. No documentation was made of hair loss (14). Coughlin et al. (16) reported postoperative albumin levels within the normal range and hair loss in 56%.

Protein intakes of less than the RDA are associated with the decreased intake of meats that occurs postoperatively. Zinc levels may also be depleted because meat, liver and seafood are primary sources of the mineral. Vitamin A, another nutrient possibly related to hair loss, was taken in amounts of less than the RDA (less than 50%) for 11 to 12 patients at four and eight months without counting the contribution of the supplements. At both four and eight months, five of those with low intakes of vitamin A from food were among that group who reported hair loss.

A decreased intake of the sulfur-containing amino acids may contribute to hair loss. Keratin, a fibrous type of protein found in hair, skin and nails contains a high amount of the sulfur-containing amino acid, cystine (82). The protein sources consumed most often by the gastric stapling patients were milk and cheese, which contain little of the sulfur-containing amino acids found in hair.

Skin

A few patients expressed concern over the loose skin remaining after weight loss. This condition may decrease over time and with aggressive exercise or may require operative correction (77).

Patients' Reaction to Surgery and Their Lives After Stapling Surgery

All patients were asked both before and after surgery whether or not they were satisfied with their lives. Four patients were happy with their lives and 17 were either satisfied or usually satisfied with their lives before having the surgery. Eight months after surgery, 11 patients were "happy" and 10 were "satisfied" or "usually satisfied". Two patients were dissatisfied with their lives after surgery. The amount of weight lost did not seem to be related to how satisfied patients were with their lives at eight months. One patient who had lost only 10 pounds was dissatisfied, but the other dissatisfied patient lost 88 pounds. The other patients, all of whom were happy or satisfied with their lives, lost from 45 to 165 pounds.

Patients were asked at eight months postoperatively if they would have chosen to have gastric stapling surgery if they knew then what they know now (for example, postoperative side effects, the effort required to comply with the diet). Sixteen patients said yes, five said no, and two did not know. Their decision was not significantly related to the amount of weight lost. In addition, patients that experienced temporary weight gain during the postoperative period were not less satisfied with their decision to have the surgery than those who did not gain weight. This may be because all but one patient were able to lose a significant amount of weight after the setback. Patients' decision also was not related significantly to the frequency of vomiting. Vomiting was perhaps the most unpleasant side effect and it was thought that those with the greatest frequency of vomiting may have regrets about the surgery.

Patients were asked if they felt better, the same, or not as well physically and psychologically as before having had the surgery. Ninteen patients felt better physically and 22 felt better psychologically at eight months after surgery. Four patients did not feel as well physically and one did not feel as well psychologically after the surgery. No patient, however, felt the same either physically or psychologically as before they had the gastric stapling surgery.

Hypotheses

Five hypotheses were postulated for the research study. At the stage of statistical analysis, the hypotheses were restated and tested in the null form. On the basis of the results, the researcher failed to fully reject any of the hypotheses.

H_1: Food intake of gastric stapling patients was less in amount or as a percent of the RDA at four and eight months postoperatively than that prior to surgery (Table XI). Intake at four months was the least or not significantly less than that at eight months. Intakes of most nutrients was greater than the RDA for those 17 to 18 patients taking vitamin and mineral supplements postoperatively.

H_2: Patients modified eating behaviors after surgery, presumably because of both the physical limit to the capacity for food and the desire to lose weight. Some of the variables that were modified by a majority of patients included: meal volume, consumption of beverages with meals, perception of eating habits, energy value of most meals, use of vitamin and mineral supplements and changes leading to a decreased intake of all nutrients (except vitamin C and riboflavin). Other possible changes were thoroughness of food chewing, length of meal relative to volume, perception of number of balance meals, food choices, reasons for snacking and types of snacks consumed. The number of eating sessions during the day, however, did not change nor did energy contribution by breakfast and distribution of energy among meals. The choices and amounts of most beverages also did not change significantly.

H_c: The majority of patients were able to lose 50% or more of their excess body weight by eight months after surgery. Seventeen patients lost more than 50% of excess body weight by eight months. The remaining six patients lost a mean of 36% of excess body weight.

H_4: Patients reported fewer vomiting episodes at eight months postoperatively than at four months. Mean vomiting frequency was once a week at four months and 0.8 times per week at eight months. In general, incidence of food intolerance decreased as demonstrated by the increase in variety and volume of food consumed at eating sessions at eight months postoperatively.

H_5: The nutritional quality of the diet at four and eight months after surgery was frequently, but not always, related to eating behavior, weight loss and tolerance of food. Persons experiencing food intolerance symptoms frequently made an effort to replace the foods that were lost or not tolerated by substituting alternate food items, or intolerance was such that the nutritional effects were not detected. The nutritional quality of the diet was not, as had been expected, affected by eating behaviors such as number of eating sessions per day or soft drink consumption but did seem to be affected by whether or not breakfast was eaten at four months postoperatively. The decrease in postoperative energy intake was related to weight loss.

Patients were uniformly successful with regard to weight loss (except for one patient). A comparison of successful patients versus unsuccessful patients cannot be done with this sample; therefore, this hypothesis was not fully tested.

Recommendations

Based on the findings reported here, the following recommendations are made for the nutritional care and education of gastric stapling patients:

Nutrient Deficiencies: Supplements to Treat and Tests to Monitor

1. Supplement the postoperative diet with calcium (approximately 300 mg, minimum), particularly the diets of those patients unable to tolerate or unwilling to drink milk.

2. Include iron in the postoperative supplement for all patients.

3. Evaluate the iron status biochemically for each patient at one or two intervals postoperatively.

4. For those patients drinking milk, and with low tolerance for meats and(or) limited knowledge and ability to plan balanced meals, consider adding: Pro Mix (2 TBL = 10 g protein, 45 kcal) or dry skim milk powder (2 TBL = 3 g protein, 32 kcal) to increase postoperative protein intake.

For those patients unable to drink milk, consider use of a nutritional supplement, at least for the first few months postoperatively (example: Sustacal, 4 oz = 7.3 g protein, 120 kcal) to boost protein intake to that closer to the RDA.

5. Evaluate protein status biochemically at six months postoperatively since evidence suggests (47,78) depletion of lean tissue occurring up to three months should have been corrected by six months.

Psychological Support

6. Maintain contact with all gastric stapling patients for several months at least by telephone to provide additional encouragement and support and to answer questions that arise after hospital discharge.

Volume Consumed at Meals

7. Stress the need to drink liquids after meals (preferably 60 minutes after) throughout the postoperative period, not just for the first few months, to prevent stretching of the pouch and to decrease the possibility of vomiting.

Future Research

Future research may add important information to the knowledge of the nutritional effects of gastric stapling. For example, an evaluation should be made of nutritional losses and physiological consequences of frequent prolonged vomiting sessions. The mineral nutritional status of male gastric stapling patients, whose pouches are no larger than those of females, should also be evaluated several months after surgery.

CHAPTER V

SUMMARY

The purpose of this study was to identify changes in dietary habits and food intakes of gastric stapling patients. The data collected will add to a body of knowledge which can be used by nutritionists in preparing dietary strategies for nutritional care and education of gastric stapling patients.

The success rate for conservative treatment of morbid obesity is poor. This fact has led physicians and patients to seek alternatives for weight loss, including the gastric stapling surgery. This surgery minimizes food intake by reducing stomach size. Literature was reviewed related to factors influencing morbid obesity and bariatric surgery. The review suggested the need for more information regarding nutritional management of the gastric stapling patient and study of the changes in eating behaviors and diet after surgery. Nutritional sequelae are not well understood. The accessible population for the study was patients admitted to a Tulsa hospital for gastric stapling from January to May 1983. Twenty-three female gastric stapling patients ranging in age from 23 to 50 participated in the study. All patients met the criteria for surgery of at least 100 pounds overweight and prior attempts to lose through conservative methods. All patients participated in the three interviews and four 24-hour recalls. Initial personal interviews were conducted at the hospital prior to surgery. Follow-up interviews were conducted at four and eight months by telephone. A contact at six months for a 24-hour recall only was used to check consistency of patients' reported intakes and a means of staying in touch with the subjects. Questions pertained to dietary intake and food-eating and related behaviors. After the data were collected, they were analyzed using analysis of variance and correlation.

At four months postoperatively, the mean percent of excess body weight had decreased by 45% and eight months, 65%. The mean number of pounds lost was 55.4 ± 3.2 (± SD) and 78.4 ± 6.2 at four and eight months, respectively. There was a moderate correlation between patients' goal, weight which each patient had determined would make them happy, and weights at eight months after surgery. Mean weights were not significantly different among patients wanting to lose weight for physical, psychological or medical reasons.

The number of daily eating sessions was not significantly affected by surgery. Prior to surgery, but not after, the number of eating sessions was related to the nutrient score. The nutrient score was the mean of RDA percentages achieved for six nutrients. Eating breakfast correlated positively with nutrient score before surgery and at four months after surgery, but not at eight months after. The percentage of energy intake during breakfast, lunch, dinner, and snacks changed little from before to after surgery. Patients' preferences for fried foods decreased distinctly while preferences for sweets decreased only slightly. Salty and sweet foods were the most preferred type of snack, both before and after surgery.

Mean preoperative energy intake was 1856 kcal. At four months, it had decreased to 870 kcal and at eight months, 1042. The percentage of energy distribution among fat, carbohydrate and fat did not change significantly following surgery. Before surgery, more patients achieved 75% or more for all nutrients except calcium and iron than at four and eight months. After surgery, patients received from food less than 75% for all nutrients studied, except for protein with 82% of the RDA; vitamin A, 93%; and vitamin C, 94%. However, 17 to 18 patients took vitamin supplements containing iron or other nutrients an average of four times per week postoperatively.

Energy intake was related to how "energetic" patients felt, but actual activity levels were light to moderate, similar to those before surgery. Physical activity level was not related to percent excess body weight after surgery. The most prominant postoperative complication was vomiting with a mean frequency of once a week at four months and 0.8 times per week at eight months. A general linear model was used to study dependency of vomiting frequency on some of the possible causes. There was no apparent relationship between vomiting frequency and meal volume, thoroughness of food chewing, length of a meal, or liquids consumed after a meal. Vomiting frequency was related to the amount of liquid consumed with meals at eight months but not at four months. Vomiting frequency was not related to patients' nutrient scores. Hair loss was reported by 43% at four months and 26% at eight months. No significant relationship was found between hair loss and number of protein-rich foods that were eaten per day or between mean protein intake or preoperative serum albumin.

The amount of weight lost was not related to patients' happiness with their lives after surgery. The majority of patients would choose to have the surgery again knowing what they do now of postoperative side effects and the effort required to comply with the diet. Most of the patients felt better psychologically and physically than before having had the surgery.

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APPENDIX A

PATIENT CONSENT FORM

CONSENT FORM

DOCTORS' HOSPITAL

DOCTORS' MEDICAL CENTER, inc.
2323 SOUTH HARVARD AVENUE • TULSA OKLAHOMA 74114 • 918 936 5481

Dear Friend,

Persons electing to have gastric stapling surgery experience changes in eating habits and dietary intake after surgery. A study evaluating these changes has been initiated by your dietitian, Jean Schreiner. The overall goal is to use this information to benefit future gastric stapling candidates. The study has met with the approval and support of your physicians, Dr. Story and Dr. Childers.

If you choose to participate in the study you will be interviewed during your hospital stay regarding eating habits and intake prior to surgery. At four and eight months after your surgery date, I will call you to conduct an interview over the phone. You will be asked very similiar questions to those asked in the interview. At some date between 4 and 8 months post-operatively, you may be called and asked to recall what you have eaten for the past 24 hours. You may be assured of complete confidence. Only coded numbers will be used to distinguish between participants after all the data have been gathered.

Your participation would be greatly appreciated. Please note however, that there will be no difference in your follow-up care or treatment if you choose not to participate or choose to drop out of the study in the future (You may choose not to be in the study at any time). There will be no special compensation for those who do participate.

Please sign below if you would like to participate in the study.

______________________________ _______________
Signature Date

Thank you.

Sincerely,

Jean E Schreiner, RD

Jean E. Schreiner, R.D.
Chief Dietitian
Dietetics Department
Doctors' Hospital

A voluntary non-profit hospital dedicated to Family Health

APPENDIX B

THE INSTRUMENT (INITIAL)

INITIAL INTERVIEW QUESTIONS

At the interview, the patients' answers will be recorded by the interviewer using this form. A telephone interview, conducted at 4 and 8 post-operatively will have many of the same questions (to identify changes in eating habits, preferences, and intake). New questions will address the patients' adaptation or compliance to strategies taught during hospital stay. Patients will also be called at approximately six months post-operatively for a 24 hour recall only.

1.) Which of the following methods have you tried in order to lose weight? (circle all that have been tried)
a. Diet Program : Weight Watchers, T.O.P.S., others(please specify) ______________
b. Self Imposed Diet (describe or give source, if any) ______________
c. Diet Pills/ Injections, if yes were they__________over the counter
__________medically prescribed
d. Exercise program , if yes, major activity______________
e. Hypnosis
f. Behavior modification
g. Others (please indicate) ______________

2.) At what age do you first remember being concerned about your weight?
a. 6 to 12 years of age
b. 13 to 19 years of age
c. 20 to 30 years of age
d. 31 to 40 years of age
e. 41 to 50 years of age

3.) Do you consider yourself to have been an overweight (circle all that apply)
a. infant
b. child
c. adolescent
d. None of the above, I became overweight as an adult

4.) What do you feel is most difficult for you when you are trying to lose weight?
a. to stay motivated
b. to cope with hunger
c. to prevent becoming bored with diet/routine
d. to cope with feelings of fatigue
e. other (please indicate)

5.) How do you feel after finishing most meals/snacks? (please indicate all that apply)
a. uncomfortable
b. comfortably full
c. dissatisfied
d. satisfied
e. other (please explain) ______________

6.) If you indicated that you were satisfied or dissatisfied after finishing most meals/snacks, did you mean
a. satisfied or dissatisfied physically ?
b. satisfied or dissatisfied psychologically ?

7.) What do you think is your usual reason for having a snack? (Indicate all that apply)
a. hunger
b. boredom
c. nervousness
d. desire to eat after seeing/smelling/preparing food even when not hungry
e. substitute for a missed meal
f. habit
g. "I need it to feel better physically"
h. other

8.) How many meals do you eat each day?

_____ meals

9.) What does a usual meal consist of?

____

10.) How many snacks do you usually eat each day?

a. _____ snacks

b. unable to determine, I snack all day long

11.) What does a snack usually consist of?

____

12) Do you ever feel out of control when eating? (this is sometimes called binge eating)
a. yes
b. no

13.) If you answered "yes" to question # 9, how often do you "binge" eat?
a. several times daily
b. daily
c. several times a week
d. about once a week
e. rarely, once or twice a month
f. never

14.)How did you find out about the procedure of gastric stapling as a method for weight reduction?
a. friend,acquaintance,relative
b. physician
c. book, magazine, paper, T.V.
d. other (please specify)

15.)Which of the following best describes your reason for wanting to lose weight?
a. to feel better now, physically
b. to feel better about myself, psychologically
c. to reduce risk of developing chronic disease

16.) After having gastric stapling surgery, do you expect that your eating habits will
a. stay the same
b. change until I lose weight, then return as they were before surgery
c. change forever
d. other

17.) In general, how do you feel about your life right now?
a. happy
b. satisfied, things are fine the way they are now
c. usually satisfied, but things could be better
d. dissatisfied
e. unhappy

18.) Would you describe your present activity level as
a. light (no exercise program or recreational activities; sedentary most of the day
b. moderate (exercise program or recreational activity 1 to 3 times a week; on your feet most of day)
c. high (daily exercise program or recreational activity)

Further comments about activity level; what do you do during the day?

____

____

19.) Do <u>you</u> think you generally eat a balanced diet? (one that includes a variety of food items such as meat, milk, fruit, vegetables, grains, and breads daily)
a. yes, every day
b. 4 to 5 days a week
c. 2 to 3 days a week
d. 1 day a week or less

20.) How many days a week do you eat a meal or snack within 2 hours of the time you get up in the morning?

______ days

21.) Which of the following are your favorite snacks?
a. salty snack foods (chips, pretzels, crackers)
b. sweets (candy, ice cream, baked goods)
c. soda pop (regular. not diet)
d. sandwich or leftovers from a meal
e. fruit, fruit juice, or vegetables
f. milk or cheese
g. other (please indicate)

22.) How often do you eat fried foods (fried seafood, meats, potatoes, vegetables, etc.)
a. daily, I eat at least one fried food item every day
b. frequently, several times a week
c. occasionally, once a week
d. rarely, once or twice a month
e. other (please indicate)

23.) How many meals a week do you eat away from home? (not including a packed lunch)

________ meals

24.) The kind of restaurant you eat at most often is
a. a fast-food chain restaurant; examples ____________________
b. a sit-down, family, cafeteria or fine dining restaurant

examples ____________________

25.) How thoroughly do you chew your food?
a. not well, I gulp chunks of food
b. moderately well (lumpy consistency)
c. very well (mushy consistency)
d. do not know

26.) Who is responsible for food purchasing in your household?
a. I am
b. other family member

27.) Who is responsible for most of the food preparation?
a. I am
b. other family member

28.) Are you presently taking a vitamin or mineral supplement?
a. yes, brand name(s) ______________ no. of pills or amount per pill ______________

If taking a multiple vitamin, does it contain iron? ______ other minerals? ______

b. no

29.) Approximately how long does it take you to eat your largest meal of the day?
a. 1 hour
b. 45 minutes
c. 30 minutes
d. 20 minutes
e. 15 minutes or less
f. other

30.) Which of the following beverages do you most frequently consume? (circle all that apply)

a. water
b. coffee
c. tea
d. soft drinks (not diet)
e. diet soft drinks
f. milk (note percent fat)
g. fruit juice
h. beer
i. alcoholic beverages
j. other

31.) How much of the following beverages do you drink each day? (show example of size cup)

a. water ______ 8oz. cups
b. coffee _____ 8 oz. cups
c. tea ______ 8 oz. cups
d. soft drinks (not diet) ______ 8 oz. cups
e. diet soft drinks _____ 8 oz. cups
f. milk _____ 8 oz. cups
g. fruit juice _____ 8 oz. cups
h. beer _____ 8 oz. cups
i. alcoholic beverages _____ 8 oz. cups
j. other _____ 8 oz. cups

32.) If you drink coffee or tea is it usually decaffeinated or regular? (circle response)

33.) If you drink soft drinks, are they those with caffeine or without caffeine? (circle response)

34.) Why do you think your previous attempts to lose weight and keep it off did not succeed?

35.) Have any of the following directly influenced your dieting in the past?
a. husband/ boyfriend
b. parents
c. children
d. friends
e. other
f. no, no one has

36.) If someone has directly influenced your dieting in the past, how did they do so?

37.) How many pounds would you like to lose?

_______ pounds

38.) Do you believe the gastric stapling surgery and diet will result in your losing all the weight you want to lose?
a. yes
b. no

39.) Name any foods that you avoid because you do not care for them.

40.) Do you usually eat "health" foods?
a. yes
b. no

If yes, name some examples.______________________________

41.) Do you usually eat "dietetic" or special diet foods?
a. yes
b. no

If yes, name some examples.______________________________

42.) Do you have any difficulties chewing or swallowing?
a. yes (please explain)
b. no

43.)Are you now on any special diet or diet modification? (eg. diabetic diet, low sodium, low cholesterol, high fiber, etc.)
a. no
b. yes, (please indicate) ______________________________

44.) What is your usual pattern for eating during the day? Write down a usual day's intake. Under comments make notes about where the food was eaten, with whom and any associated activities with eating.

TIME	FOOD EATEN	AMOUNT	COMMENTS
Morning			
Mid-morning			
Noon			
Afternoon			
Early Evening			
Late Evening			

45.) Was yesterday like this pattern?
a. yes
b. no

46.) In what ways was yesterday different from this pattern?

____

____

47.) In what ways was yesterday the same as this pattern?

____

____

APPENDIX C

THE INSTRUMENT

(FOUR AND EIGHT MONTHS AFTER SURGERY)

QUESTIONS FOR FOLLOW-UP TELEPHONE INTERVIEW

AT FOUR AND EIGHT MONTHS POST-OP

(At approximately six months a random call will be made to have subjects do a 24 hour dietary recall only)

Questions from initial interview that will be repeated include: numbers

3,11,12,19,20,25,26,27,28,30,31,32,33,38,39,40,41,42,43,44,45,46,47,48,49,50,52,53,54,55.

1.) What has been the most difficult part of the diet since having the gastric stapling surgery?
a. to stay motivated
b. to cope with hunger
c. to prevent becoming bored with diet/routine
d. to cope with feelings of fatigue
e. other

2.) Do you snack between meals now? (If yes, please name some examples)
a. yes, liquids only ______________________________
b. yes, solid foods only ______________________________
c. yes, liquid and solid foods ______________________________
d. no, I only drink water between meals.

3.) What do you think is your usual reason for having a snack? (Indicate all that apply)
a. hunger
b. boredom
c. nervousness
d. desire to eat after seeing/smelling/preparing food even when not hungry
e. substitute for a missed meal
f. habit
g. "I need it to feel better physically"
h. other

4.)Do you now feel
a. better physically than before having the gastric stapling surgery
b. the same physically as before having the gastric stapling surgery
c. not as well physically as before having gastric stapling surgery

5.) Do you now feel
a. better psychologically about yourself than before having gastric stapling surgery
b. the same psychologically about yourself as before having gastric stapling surgery
c. not as good psychologically about yourself as before having gastric stapling surgery

6.) In your opinion, have your eating habits
a. improved for now
b. stayed the same
c. improved and are probably changed forever
d. changed for the worse

7.) How many pounds have you lost since having the gastric stapling surgery?

a. _____pounds

b. _____pounds lost, but _____pounds regained.

8.) How many more pounds would you like to lose?

a. _______ pounds

9.) After each category below, please list any foods you have not been able to tolerate.

Meats_______________

Milk, dairy products_______________

Fruits, vegetables _______________

Breads, cereals_______________

10.) Can you now eat larger meals than you were able to for the first (4) (3) months after surgery?

a. yes

b. no

c. other, please explain

11.) How do you feel after finishing most meals/snacks? (please indicate all that apply)

a. uncomfortable

b. comfortably full

c. dissatisfied

d. satisfied

e. other (please explain) _______________

12.) If you indicated that you were satisfied or dissatisfied after finishing most meals/snacks, did you mean

a. satisfied or dissatisfied <u>physically</u> ?

b. satisfied or dissatisfied <u>psychologically</u> ?

13.) Please indicate what quantity of food you can consume at one meal(taking approximately 30 minutes to eat).

a. ¼ cup

b. ½ cup

c. 3/4 cup

d. 1 cup

e. 1¼ cup

f. 1½ cup

g. 2 cups

h. greater than 2 cups of food

14.) Do you drink liquids at meal time?

a. yes

b. no

c. sometimes, please explain _______________

15.) If you answered <u>yes</u> to question #14 what is the amount that you drink with meals?

approximately _________ounces

16.) If you answered no to question #14. , how long do you wait after a meal to drink liquids?
a. 5 minutes
b. 10 minutes
c. 15 minutes
d. 20 minutes
e. 30 minutes
f. 40 minutes
g. 50 minutes
h. 60 minutes or more

17.) How frequently do you vomit after eating?
a. every time I eat
b. at least once a day
c. several times a week
d. at least once a week
e. at least once every 2 weeks
f. once a month or less
g. other, please explain ______________________________

18.) What do you believe usually causes the vomiting?
a. eating too fast
b. eating too much
c. not chewing food throughly enough
d. eating foods that do not agree with me
e. other, please explain ______________________________

19.) Do you ever feel out of control when eating? (this is sometimes called binge eating)
a. yes
b. no

20.) If you answered "yes" to question # 9, how often do you "binge" eat?
a. several times daily
b. daily
c. several times a week
d. about once a week
e. rarely, once or twice a month
f. never

21.) Have there been any changes in your bowel habits since having gastric stapling surgery?
a. yes, I experience episodes of constipation more frequently (how often? __________)
b. yes, I experience episodes of diarrhea more frequently (how often? __________)
c. yes, I feel bloated or experience more flatulence now (how often? __________)
d. no, no noticable change (circle all that apply)

Additional comments: ______________________________

22) Do you feel more or less energetic physically since having gastric stapling surgery? (circle response)

23.) Have you noticed any recent changes in your skin's
a. texture ? dry, scales, increased oiliness, other, describe ________________

b. color? describe ________________

24.) Have you noticed any recent changes in your hair? (circle all that apply)
a. lackluster, dry
b. sparse, easy pluckability, increased hair loss
c. other, please describe ________________

25.) How many meals do you eat each day?
_____ meals

26.) What does a usual meal consist of?

____

27.) How many snacks do you usually eat each day?
a. ______ snacks
b. unable to determine, I snack all day long

28.) What does a snack usually consist of?

____

29.) How long does it take for you to drink 1 cup (8 oz.) of a liquid?
__________ minutes

30.) Which of the following beverages do you most frequently consume? (circle all that apply)

a. water
b. coffee
c. tea
d. soft drinks (not diet)
e. diet soft drinks
f. milk (note percent fat)
g. fruit juice
h. beer
i. alcoholic beverages
j. other

31.) How much of the following beverages do you drink each day? (show example of size cup)

a. water ______ 8oz. cups
b. coffee ______ 8 oz. cups
c. tea ______ 8 oz. cups
d. soft drinks (not diet) ______ 8 oz. cups
e. diet soft drinks _____ 8 oz. cups
f. milk _____ 8 oz. cups
g. fruit juice _____ 8 oz. cups
h. beer _____ 8 oz. cups
i. alcoholic beverages _____ 8 oz. cups
j. other _____ 8 oz. cups

32.) If you drink coffee or tea is it usually decaffeinated or regular? (circle response)

33.) If you drink soft drinks, are they those with caffeine or without caffeine? (circle response)

34.) Approximately how many servings of protein do you consume each day? (one serving is equal to ½ cup)
________ servings

35.) What protein sources do you most frequently consume? (Circle 2 to 3)
a. milk
b. eggs
c. cheese
d. fish
e. chicken
f. beef, pork
g. dried beans, nuts, peanut butter
h. yogurt
i. other, please name ____________________

36.) How often do you include sweets in your diet (candy, ice-cream, baked goods)?
a. daily, I eat at least one sweet item every day
b. frequently, several times a week
c. occasionally, once a week
d. rarely, once or twice a month
e. never
f. other, please indicate __________________________

37.) How often do you include salty snack foods in your diet (chips, pretzels)
a. daily, I eat at least one salty item every day
b. frequently, several times a week
c. occasionally, once a week
d. rarely, once or twice a month
e. never
f. other, please indicate __________________________

38.) Do you think you generally eat a balanced diet? (one that includes a variety of food items such as meat, milk, fruit, vegetables, grains, and breads daily)
a. yes, every day
b. 4 to 5 days a week
c. 2 to 3 days a week
d. 1 day a week or less

39.) How many days a week do you eat a meal or snack within 2 hours of the time you get up in the morning?

______ days

40.) Which of the following are your favorite snacks?
a. salty snack foods (chips, pretzels, crackers)
b. sweets (candy, ice cream, baked goods)
c. soda pop (regular. not diet)
d. sandwich or leftovers from a meal
e. fruit, fruit juice, or vegetables
f. milk or cheese
g. other (please indicate)

41.) How often do you eat fried foods (fried seafood, meats, potatoes, vegetables, etc.)
a. daily, I eat at least one fried food item every day
b. frequently, several times a week
c. occasionally, once a week
d. rarely, once or twice a month
e. other (please indicate)

42.) How many meals a week do you eat away from home? (not including a packed lunch)

_________ meals

43.) The kind of restaurant you eat at most often is
a. a fast-food chain restaurant; examples ____________________
b. a sit-down, family, cafeteria or fine dining restaurant

examples ____________________

44.) Do you have any difficulties chewing or swallowing?
a. yes (please explain)
b. no

45.) How thoroughly do you chew your food?
a. not well, I gulp chunks of food
b. moderately well (lumpy consistency)
c. very well (mushy consistency)
d. do not know

46.) Who is responsible for food purchasing in your household?
a. I am
b. other family member

47.) Who is responsible for most of the food preparation?
a. Iam
b. other family member

48.) Are you presently taking a vitamin or mineral supplement?
a. yes, brand name(s) ____________ no. of pills or amount per pill ____________

If taking a multiple vitamin, does it contain iron? ______ other minerals? ______

b. no

49.) Would you describe your present activity level as
a. light (no exercise program or recreational activities; sedentary most of the day
b. moderate (exercise program or recreational activity 1 to 3 times a week; on your feet most of day)
c. high (daily exercise program or recreational activity)

Further comments about activity level; what do you do during the day?

____

____

50.) In general, how do you feel about your life right now?
a. happy
b. satisfied, things are fine the way they are now
c. usually satisfied, but things could be better
d. dissatisfied
e. unhappy

51.) If you had to make the decision to have gastric stapling surgery, knowing what you do now, would you choose to have it done?
a. yes
b. no
c. I do not know

Additional comments about this: ______________________________
____
____

52.) What is your usual pattern for eating during the day? Write down a usual day's intake. Under comments make notes about where the food was eaten, with whom and any associated activities with eating.

TIME	FOOD EATEN	AMOUNT	COMMENTS
Morning			
Mid-morning			
Noon			
Afternoon			
Early Evening			
Late Evening			

53.) Was yesterday like this pattern?
a. yes
b. no

54.) In what ways was yesterday different from this pattern?

____

____

55.) In what ways was yesterday the same as this pattern?

____

____

APPENDIX D

THE INSTRUMENT

(BACKGROUND INFORMATION)

RECORDING FORM FOR SUBJECT DATA

Name_______________________________________ Date______________

Address____________________________________ Phone_____________

Occupation______________ Religion____________ Date of Birth______________

Sex______ Marital Status ______ Number of Persons in Household______________

Number of Children____________ Age Span ________ Physician______________

Health Problems____

____

Past Hospitalizations (if significant) ______________________________

Limitations on Activity, if any, and Activity Level___________________

____

Medications____

Vitamins/Minerals____
how often taken______________________ what amounts_____________________

Food Intolerance/Food Allergies______________________________________

Blood Pressure______ EKG Results___________ Chest X-ray Results______________
Lab Data: Chol____ Trig____ Hgb.____ Hct.____ Alb.____ FBS____ Others__________
Ht. ____ Adm. wt.____ Discharge wt.____ ibw____ max. adult wt.____ pt.'s goal wt.___

Initial Instruction date:
Comments:

Follow up Visits dates:

Diet History/ Comments

APPENDIX E

CODED DATA AND KEY

SAS

OBS	SUBJ	OCC	REL	MARR	AGE	CHIL	WBA	DIAB	HTN	GB	INS	OIJR	ANA	TAG	IND	CHOL	TRIG	HGB	HCT	ALB	FBS	HT	MAXWT	IBW	GCWT	Q1DP	Q1SID	Q1OTC	Q1PRE	Q1EX	Q2AGE	Q3IF	Q3CH	Q3ADO	Q14HOW	Q15WHY	Q16EX	Q34PRE	Q35INF	Q36HOW	Q37LBS	Q40HLTH	Q41SPC	Q43DIET	TOBAC	A_CD
1	1	6	1	2	49.8	0	2	2	2	2	2	2	2	1	2	111	55	14.0	40.0	5.2	110	66.0	238.0	130	130	2	1	1	2	1	2	2	2	1	1	1	3	1	2	2	110	1	1	3	2	0
2	2	4	1	1	43.2	5	1	2	2	2	2	2	1	1	2	200	120	13.8	42.0	4.8	108	56.0	340.0	135	160	1	1	2	2	1	2	2	2	1	1	1	3	2	2	1	186	2	1	3	2	0
3	3	4	1	1	45.3	2	1	2	1	2	2	1	2	2	2	284	111	12.7	37.5	3.7	115	63.5	290.0	120	150	1	1	1	2	1	1	2	1	1	3	2	3	1	5	3	140	2	1	3	2	0
4	4	1	1	1	32.4	0	1	2	1	2	2	2	2	1	1	220	140	14.0	43.7	4.5	105	69.2	379.0	150	150	1	2	1	2	1	3	2	2	2	1	1	3	1	4	1	200	2	2	3	2	0
5	5	2	1	1	50.8	3	1	2	1	2	2	2	1	2	2	215	114	13.3	41.5	4.3	110	64.0	228.0	130	140	1	1	2	1	2	1	2	1	1	1	1	3	6	1	2	70	1	2	3	2	0
6	6	5	1	1	44.1	5	1	1	2	2	2	2	2	2	2	174	51	14.7	42.9	3.8	137	67.0	298.0	140	130	2	1	1	2	1	1	2	1	1	1	1	4	3	5	3	100	2	1	3	1	4
7	7	2	1	1	41.5	1	1	2	1	2	2	1	2	2	2	194	152	12.4	37.3	3.7	79	56.0	239.5	135	140	1	1	2	2	1	2	2	2	2	1	2	3	1	1	2	110	1	1	3	2	0
8	8	5	1	1	50.7	4	1	2	1	2	2	1	2	2	2	215	130	10.5	31.5	3.9	105	64.0	242.0	130	140	1	2	1	1	2	1	2	1	1	1	1	3	6	5	3	100	2	1	3	2	0
9	9	1	1	1	32.8	4	1	1	2	2	2	2	1	2	2	205	110	13.2	41.3	4.1	110	65.0	295.0	125	125	1	1	1	1	2	1	1	1	1	1	1	3	6	1	2	155	1	1	1	2	0

OBS	PCTXS	INT	Q4DIFF	Q5FEEL	Q6PHYS	Q7SNK	Q8NOM	Q9PROM	PROO	STAR	VEG	FRT	DES	BEV	Q11SNK	Q12BG	Q13FREQ	Q17LIFE	Q18ACT	Q19BAL	Q20BK	Q21FSNK	Q22FF	Q23AWA	Q24REST	CHEW	VIT	IRON	WMIN	MEALX	BEVH2O	COFF	TEA	SCFDK	DIETCK	WHMILK	LFMI_K	FRTJC	BEEF	CTDECAF	SDDECAF	CHSWA	PHYSFEEL	PSYFEEL	EATHAB	LBLDST	BREG	MEATOL	MILKDAI	FRTVEG	BRDCER	QUAN	IQ	DKWAIT
1	183.077	2	1	1	1	4	3	1	1	2	1	2	1	2	2	2	2	1	3	2	3	1	1	3	2	2	1	1	1	35	48	0	0	32	0	24	0	8	0	3	2	2	1	1	3	55	0	1	2	1	2	0.50	4	30
2	251.852	2	2	2	1	1	2	2	1	1	1	2	2	1	4	2	6	3	2	1	0	1	4	3	2	2	2	2	2	60	24	0	24	48	0	0	0	8	0	2	2	1	1	3	2	70	0	1	3	3	1	0.75	2	40
3	241.667	2	2	1	2	4	2	1	1	1	1	2	2	1	2	2	6	1	2	2	3	4	2	1	2	3	1	1	1	20	24	16	0	0	0	0	0	8	0	2	2	2	1	2	1	50	0	2	1	3	1	0.75	3	20
4	252.667	2	5	1	1	1	2	1	2	1	1	2	2	2	0	2	6	1	2	1	1	3	2	1	2	3	1	1	1	20	32	0	40	0	0	0	0	16	0	2	2	2	1	1	3	85	0	1	1	3	1	1.00	0	60
5	175.385	2	2	1	1	1	2	2	1	1	1	2	2	2	2	2	6	1	2	2	6	5	3	1	2	3	1	1	1	30	24	12	16	0	32	0	0	0	0	2	2	2	1	1	1	53	0	3	1	3	1	1.00	2	15
6	212.857	2	1	2	1	4	2	1	1	1	1	2	1	1	4	2	6	3	3	3	0	2	2	1	2	2	1	1	1	15	8	8	8	0	32	0	0	8	0	2	2	1	2	1	2	80	0	3	2	3	1	1.00	5	15
7	177.407	2	2	2	1	4	3	1	1	1	1	2	2	1	2	2	6	2	1	1	7	1	4	1	2	3	1	1	1	20	16	24	0	0	24	0	0	4	0	1	1	1	2	1	3	32	0	3	1	3	1	0.75	8	30
8	186.154	2	4	1	2	1	3	2	1	1	1	2	2	1	2	2	6	1	1	1	0	2	2	1	1	3	1	1	1	20	24	24	0	0	12	4	8	0	0	1	1	2	1	1	3	53	0	3	1	3	3	0.75	4	30
9	236.000	2	2	1	1	4	2	2	1	1	1	2	2	1	2	2	6	2	1	2	7	3	3	1	2	2	1	1	1	20	48	0	8	24	0	0	0	4	0	2	2	2	1	1	3	67	5	3	2	3	3	0.50	1	5

OBS	VOMFREQ	VOMWHY	BOWEL	ENERG	SKIN	HAIR	GSSURG	NOPRO	MILK	EGG	CHEE	FISH	CHIX	BEPK	NUTS	YOG	MINDK	VITWK	CURWT	KCALTOT	CHCPCTD	PROPCTD	FATPCTD	KCALB	KCALL	KCALD	KCALSNK	PROPCTRD	CAPCTRDA	FEPCTRDA	APCTRDA	THPCTRDA	RIPCTRDA	NIPCTRDA	CPCTRDA	PCTEBW	LIQOZ	NUTSCORE	MEATMI_K
1	3	1	8	1	3	3	1	2	1	1	1	2	1	2	2	2	5	0	183.0	2133	60.0	18.8	21.2	375	544	561	653	227	125	45	78	174	181	83	213	40.8	112	715.429	2
2	2	2	8	1	3	2	2	2	1	1	2	2	1	1	1	2	21	4	266.0	994	48.3	16.5	35.2	0	302	374	313	93	32	39	113	106	49	95	50	97.0	104	441.143	3
3	3	4	8	1	3	2	1	2	2	2	1	2	2	1	1	2	40	3	234.0	655	58.0	15.9	26.1	125	395	135	0	59	34	27	208	56	47	42	78	95.0	43	425.143	3
4	5	5	8	1	3	2	1	2	2	2	1	1	1	2	2	2	15	7	294.0	732	23.0	21.0	56.0	120	502	160	0	93	11	27	33	86	37	81	218	96.0	88	306.143	1
5	3	2	1	1	3	3	1	2	2	1	2	1	1	2	1	2	30	3	175.0	760	32.6	23.2	44.2	126	293	342	0	100	59	20	116	16	35	21	32	35.0	84	271.571	3
6	3	4	8	1	2	3	2	1	2	2	1	2	2	1	1	2	20	3	176.0	757	39.6	18.0	42.4	565	0	192	0	77	22	34	107	48	48	48	32	26.0	68	311.571	3
7	5	4	1	2	1	2	1	1	2	2	2	1	2	2	2	1	30	7	207.5	996	29.0	15.3	55.8	340	377	254	25	86	43	30	98	69	55	43	30	53.3	68	342.286	3
8	2	1	1	1	1	3	1	2	1	1	1	1	2	2	2	2	10	7	178.8	526	49.4	17.5	33.1	0	131	199	197	52	62	12	26	30	48	10	5	37.0	72	188.714	3
9	3	1	1	1	3	3	1	2	2	1	1	1	2	2	2	2	10	7	228.0	1128	70.6	13.8	15.6	228	7	749	145	89	83	68	185	129	125	60	258	82.4	84	686.857	3

OBS	SUBJ	OCC	REL	MARR	AGE	CHIL	WBA	DIAB	HTN	GB	INS	DIUR	ANA	TAG	IND	CHOL	TRIG	HGB	HCT	ALB	FBS	HT	MAXWT	IBW	GOWT	Q1DP	Q1SID	Q1OTC	Q1PRE	Q1EX	Q2AGE	Q3IF	Q3CH	Q3ADO	Q14HOW	Q15WHY	Q16EX	Q34PRE	Q35INF	Q36HOW	Q37LBS	Q40HLTH	Q41SPC	Q43DIET	TOBAC	ALCO
10	10	5	3	3	37.3	4	1	2	1	2	2	2	2	2	2	260	160	12.8	14.1	4.3	85	61.0	243	115	120	2	1	2	1	2	3	2	2	2	1	2	3	6	1	2	100	2	1	2	2	4
11	11	1	1	1	37.3	2	1	2	2	2	2	2	1	2	2	270	150	14.9	44.4	3.5	218	65.0	396	125	150	1	1	2	1	1	1	2	1	1	2	2	3	6	1	1	130	1	2	3	1	0
12	12	4	1	3	30.7	0	2	2	2	2	2	2	2	2	2	250	140	13.2	40.5	4.4	96	61.5	230	110	130	1	1	2	1	1	3	2	2	2	1	1	3	1	5	3	100	2	2	3	2	0
13	13	1	1	1	33.1	0	1	1	1	2	2	1	1	1	1	260	150	11.6	36.3	3.8	136	63.0	250	115	130	2	1	2	1	2	3	2	2	2	1	3	3	6	1	2	114	2	1	2	1	0
14	14	2	3	1	32.7	0	1	1	1	2	2	1	2	2	2	240	135	12.8	40.4	4.1	91	63.0	200	115	120	1	1	1	1	1	2	2	2	2	1	1	4	5	5	3	50	2	2	2	2	8
15	15	2	1	1	35.8	0	1	2	1	2	2	2	2	2	2	280	112	12.7	38.2	3.7	97	63.5	251	120	125	1	2	1	1	2	3	2	2	2	1	2	3	6	1	1	100	1	2	3	2	0
16	16	6	3	1	26.1	0	1	2	2	2	2	2	2	2	2	241	142	12.4	37.4	3.4	89	65.0	243	125	130	1	2	1	1	1	2	2	2	1	1	3	3	4	2	1	110	2	2	3	2	4
17	17	1	1	1	28.7	2	1	2	1	1	2	1	2	2	2	250	126	11.4	36.6	3.9	99	63.8	280	120	130	1	1	2	1	1	1	1	1	1	1	2	3	1	1	2	150	2	2	2	2	0
18	18	2	1	1	41.2	0	1	1	1	2	1	2	2	2	2	260	138	15.1	46.6	3.9	165	65.0	275	125	130	1	1	1	2	2	2	2	2	1	1	3	3	6	1	2	110	2	1	1	1	0

OBS	PCTXS	INT	Q4DIFF	Q5FEEL	Q6PHYS	Q7SNK	Q8NOM	Q9PROM	PROD	STAR	VEG	FRT	DES	BEV	Q11SNK	Q12BG	Q13FREQ	Q17LIFE	Q18ACT	Q19B_	Q20BK	Q21FSNK	C22FF	Q23AWA	Q24REST	CHEW	VIT	WIRON	WMIN	MEA_X	BEVH2O	COFF	TEA	SODK	DIETDK	WHMILK	LFMILK	FRTJC	BEER	CTDECAF	SDDECAF	CHSWA	PHYSFEEL	PSYFEEL	EATHAB	LBLOST	LBREG	MEATOL	MILKDAI	FRTVEG	BRDCER	QUAN	LIQ	DKWAIT
10	211.304	2	3	2	1	2	3	2	1	1	2	1	1	1	2	1	5	1	1	3	2	2	4	0	3	1	2	2	2	15	16	0	32	16	0	0	0	8	0	2	2	2	1	2	1	40	5	3	2	3	1	1.00	0	10
11	316.800	2	1	1	2	5	2	1	1	1	1	2	2	2	0	2	6	1	2	2	0	1	2	0	3	3	1	1	1	30	8	32	24	0	0	4	0	4	0	2	2	2	1	1	3	50	0	3	1	1	1	1.00	0	50
12	209.091	2	3	1	1	4	2	2	1	1	1	2	2	2	3	2	6	2	2	3	2	1	2	4	2	3	1	1	1	20	8	0	24	32	0	4	0	0	0	2	2	2	1	1	1	40	0	2	1	1	1	1.25	2	30
13	217.391	2	5	1	1	7	2	1	1	1	1	2	2	1	2	2	6	3	1	3	2	2	3	0	3	3	2	2	2	15	24	0	16	0	0	4	0	0	0	2	2	1	1	1	3	51	0	3	1	3	2	0.75	3	10
14	173.913	2	5	1	1	3	1	2	1	1	2	2	2	1	2	1	4	5	2	4	5	2	3	1	1	2	1	1	1	20	8	0	0	32	0	8	0	0	0	3	2	2	3	3	2	13	10	1	2	1	1	2.00	8	10
15	209.167	2	3	1	1	4	1	2	1	1	1	2	2	2	3	2	6	1	1	3	0	3	3	5	2	3	1	1	1	30	8	0	24	32	0	0	0	0	0	2	2	2	1	1	3	56	0	3	2	3	1	0.75	1	30
16	194.400	2	4	2	2	7	1	2	1	1	2	2	2	2	3	2	6	3	1	4	0	5	3	2	2	2	1	2	2	20	16	0	0	8	0	8	0	8	0	2	2	2	3	1	1	55	0	2	2	3	1	0.75	4	10
17	233.333	2	3	1	1	2	3	2	1	1	1	2	2	2	2	2	6	1	2	1	7	2	3	1	2	3	1	1	1	20	16	0	32	0	0	0	0	4	0	2	2	2	1	1	3	53	0	3	2	3	2	0.75	0	30
18	220.000	2	5	2	2	1	3	1	1	1	2	2	2	1	0	2	6	1	2	3	7	7	3	1	2	2	1	1	1	10	8	0	0	0	96	8	0	0	0	3	2	2	1	1	1	75	0	3	1	1	1	1.00	0	60

OBS	VOMFREQ	VOMWHY	BOWEL	ENERG	SKIN	HAIR	GSSURG	NSOPRO	MILK	LGG	CHEE	FISH	CHIX	BEPK	NUTS	YOG	MIND<	VITWK	CURWT	KCALTOT	CHOPCTD	PROPCTD	FATPCTD	KCALB	KCALL	KCALD	KCALSNK	PROPCTRD	CAPCTRDA	FEPCTRDA	APCTRDA	THPCTRDA	RIPCTRDA	NIPCTRDA	CPCTRDA	PCTEBW	LIQOZ	NUTSCORE	MEATMILK
10	4	2	8	1	2	2	1	2	2	1	1	2	1	2	2	2	15	7	203	1854	61.2	15.2	23.7	0	318	342	0	57	52	12	18	10	28	25	15	77.0	76	147.143	3
11	4	2	8	1	1	2	1	1	2	2	1	2	1	1	2	2	15	7	336	472	36.4	25.4	38.1	0	395	77	0	68	7	19	38	22	22	92	205	168.8	72	229.286	3
12	5	3	8	1	3	2	1	1	1	1	1	2	2	2	1	2	20	0	190	779	59.3	7.7	23.0	0	340	138	301	34	10	12	19	34	20	22	18	73.0	68	119.571	3
13	3	4	1	1	3	3	2	2	1	1	1	1	2	2	2	2	20	7	193	511	47.7	20.4	32.0	145	220	76	70	59	49	22	464	22	134	49	18	90.4	44	742.571	3
14	6	5	8	2	1	3	2	1	1	2	2	2	2	2	2	2	10	1	197	1168	86.6	5.1	9.1	378	420	150	220	32	35	12	20	39	38	31	203	71.3	56	204.000	2
15	5	4	1	1	1	3	1	2	2	2	1	1	2	2	2	2	20	7	195	862	53.8	8.8	37.4	145	362	65	290	43	32	10	23	21	43	21	47	62.5	64	156.714	3
16	4	4	6	2	3	2	2	1	2	1	1	1	2	2	2	1	20	5	188	800	64.0	9.5	26.5	0	465	265	70	43	56	10	40	34	27	20	205	50.4	44	216.286	3
17	6	5	5	1	3	2	1	3	2	1	1	1	2	2	2	2	40	7	226	759	43.7	23.2	33.1	130	281	323	25	100	40	26	136	26	49	92	7	88.3	52	370.000	3
18	6	2	8	1	3	3	3	2	2	2	1	2	1	1	2	2	30	7	200	1355	38.4	15.4	46.3	90	895	370	0	118	33	44	14	63	66	95	5	60.0	112	315.714	3

SAS

OBS	SUBJ	OCC	RE_	MARR	AGE	CHIL	WBA	DIAB	HTN	GB	INS	DIUR	ANA	TAG	IND	CHOL	TRIG	HGB	HCT	ALB	FBS	HT	MAXWT	IBW	GOWT	Q1DP	Q1SIC	Q1OTC	Q1PRE	Q1EX	Q2AGE	Q3IF	Q3CH	Q3ADO	Q14HOW	Q15WHY	Q16EX	Q34PRE	Q35INF	Q36HOW	Q37LBS	Q40HLTH	Q41SPC	Q43DIET	TOBAC	ALCO
19	19	3	1	1	39.5	2	1	2	1	2	2	2	2	2	2	243	120	13.3	41.3	4.0	107	59.5	265	105	120	1	1	2	1	1	2	2	2	1	1	1	3	6	5	3	145	2	1	3	1	4
20	20	4	1	3	37.5	0	1	2	1	2	2	2	2	2	2	215	116	12.4	39.5	3.6	99	63.0	216	120	130	1	1	2	1	1	2	2	2	1	1	2	3	4	3	2	135	2	1	3	2	8
21	21	3	1	1	36.2	2	1	2	2	1	2	2	2	2	2	238	109	12.9	40.9	3.7	103	64.5	286	130	130	1	1	1	1	2	1	2	1	1	1	1	3	1	1	2	130	2	1	3	2	0
22	22	5	1	1	48.9	3	1	2	1	2	2	1	2	2	2	250	125	14.0	44.1	4.2	97	65.0	221	130	130	1	2	1	1	1	4	2	2	2	2	1	3	6	1	1	60	2	2	3	2	0
23	23	6	2	2	22.5	0	2	2	2	2	2	2	2	2	2	210	105	12.9	39.1	3.7	102	67.0	289	120	120	2	1	1	2	2	2	2	2	1	1	1	3	1	3	2	130	2	2	3	2	0

OBS	PCTXS	INT	Q4DIFF	Q5FEEL	Q6PHYS	Q7SNK	Q8NDM	Q9DRDM	DRDO	STAR	VEG	FRT	DES	BEV	Q11SNK	Q12BG	Q13FREQ	Q17LIFE	Q13ICT	Q19BAL	Q20BK	Q21FSNK	Q22FF	Q23AWA	Q24REST	CHEW	VIT	WIRON	WMIN	MEALX	BEVH2O	COFF	TEA	SOFDK	DIETDK	WHMILK	LFMILK	FRTJC	BEER	CTDECAF	SDDECAF	CHSWA	PHYSFEEL	PSYFEEL	EATHAB	L_BOST	LBREG	MEATDL	MILKDAI	FRTVEG	BRDCER	JAN	_IQ	DKWAIT	DMFRED	VDMWHY
19	252.381	1	2	1	1	6	3	1	2	1	1	2	2	1	2	1	5	1	1	1	7	3	1	5	2	1	2	2	2	15	0	0	0	48	0	0	4	4	0	3	2	2	.	.	.	.	.	3	1	1	1	.	.	.	.	.
20	180.000	1	1	1	1	3	3	1	1	1	2	2	1	1	2	2	6	3	1	3	5	1	1	8	2	2	2	2	2	15	0	0	32	16	0	0	0	0	0	2	2	2	.	.	.	.	.	1	1	3	1	.	.	.	.	.
21	220.000	1	3	1	2	2	3	1	2	1	1	2	1	1	1	2	6	3	1	1	6	2	2	3	2	2	2	2	2	20	16	48	0	0	24	8	0	8	4	2	2	2	.	.	.	.	.	3	1	3	1	.	.	.	.	.
22	170.000	1	4	1	1	3	3	1	2	1	1	2	2	1	2	1	5	1	1	1	7	1	2	0	3	2	2	2	2	15	8	0	24	24	0	0	0	4	0	2	2	2	.	.	.	.	.	1	2	1	1	.	.	.	.	.
23	240.833	1	1	1	1	3	1	1	1	1	1	2	2	1	2	2	6	3	2	3	0	1	1	4	1	2	2	2	2	45	16	0	32	46	0	0	0	0	0	2	2	2	.	.	.	.	.	1	2	1	1	.	.	.	.	.

OBS	BOWEL	ENERG	SKIN	HAIR	GSSURC	NUPRO	MILK	EGG	CHEE	FISH	CHIX	BEEF	NUTS	YOG	MINDK	VITWK	CURWT	KCALTOT	CHOPCTD	PROPCTD	FATPCTD	KCALB	KCALL	KCALD	KCALSNK	PROPCTRD	CAPCTRDA	FEPCTRDA	APCTRDA	THPCTRDA	RIPCTRDA	NIPCTRDA	CPCTRDA	RCTEBW	LIQOZ	NUTSCORE	MEATMILK
19	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	265	2420	41.5	18.0	40.5	730	695	775	220	248	36	97	154	116	123	181	93	152.4	60	720.286	3
20	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	216	1899	51.2	16.0	32.8	420	545	934	0	173	23	56	27	64	117	188	35	80.0	56	430.000	1
21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	265	1847	51.1	20.1	28.7	299	330	921	299	211	141	65	73	86	175	86	58	120.0	108	634.285	3
22	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	221	2200	52.5	16.5	30.9	710	620	610	260	207	84	78	150	135	138	165	122	70.0	60	767.429	2
23	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	289	1043	56.8	16.1	27.1	0	661	383	0	95	44	31	44	39	68	75	37	140.8	94	306.285	2

SAS

OBS	SUBJ	OCC	REL	MARR	AGE	CHIL	WBLA	DIAB	HTN	GB	INS	DIUR	ANA	TAG	IND	CHOL	TRIG	HGB	HCT	ALB	FBS	HT	MAXWT	IBW	GOWT	Q1DP	Q1SID	Q1OTC	Q1PRE	Q1EX	Q2AGE	Q3IF	Q3CH	Q3ADO	Q14HOW	Q15WHY	Q16EX	Q34PRE	Q35INF	Q36HOW	Q37LBS	Q40HLTH	Q41SPC	Q43DIET	TOBAC	ALCO
1	1	6	1	2	[illegible]9.8	0	2	2	2	2	2	2	2	1	2	111	55	14.0	40.0	5.2	110	66.0	238.0	130	130	2	1	1	2	1	2	2	2	1	1	1	3	1	2	2	110	1	1	3	2	0
2	2	4	1	1	43.2	5	1	2	2	2	2	2	1	1	2	200	120	13.8	42.0	4.8	108	65.0	340.0	135	160	1	1	2	2	1	2	2	2	1	1	1	3	2	2	1	186	2	1	3	2	0
3	3	4	1	1	45.3	2	1	2	1	2	2	1	2	2	2	284	111	12.7	37.5	3.7	115	63.5	290.0	120	150	1	1	1	2	1	1	2	1	1	3	2	3	1	5	3	140	2	1	3	2	0
4	4	1	1	1	32.4	0	1	2	1	2	2	2	2	1	1	220	140	14.0	43.7	4.5	105	69.2	379.0	150	150	1	2	1	2	1	3	2	2	2	1	1	3	1	4	1	200	2	2	3	2	0
5	5	2	1	1	5[illegible].8	3	1	2	1	2	2	2	1	2	2	215	114	13.3	41.5	4.3	110	64.0	228.0	130	140	1	1	2	1	2	1	2	1	1	1	1	3	5	1	2	70	1	2	3	2	0
6	6	5	1	1	44.1	5	1	1	2	2	2	2	2	2	2	174	51	14.7	42.9	3.8	137	67.0	298.0	140	130	2	1	1	2	1	1	2	1	1	1	1	4	3	5	3	100	2	1	3	1	0
7	7	2	1	1	41.5	1	1	2	1	2	2	1	2	2	2	194	152	12.4	37.3	3.7	79	66.0	239.5	135	140	1	1	2	2	1	2	2	2	2	1	2	3	1	1	2	110	1	1	3	2	0
8	8	5	1	1	5[illegible].7	4	1	2	1	2	2	1	2	2	2	215	130	10.5	31.5	3.9	105	64.0	242.0	130	140	1	2	1	1	2	1	2	1	1	1	1	3	6	5	3	100	2	1	3	2	0
9	9	1	1	1	32.8	4	1	1	2	2	2	2	1	2	2	205	110	13.2	41.3	4.1	110	65.0	295.0	125	125	1	1	1	1	2	1	1	1	1	1	1	3	6	1	2	155	1	1	1	2	0

OBS	PCTXS	INT	Q4DIFF	Q5FEEL	Q6PHYS	Q7SNK	Q8NOM	Q9PROM	PRDO	STAR	VEG	FRT	DES	BEV	Q11SNK	Q12BG	Q13FREQ	Q17LIFE	Q18ACT	Q19BAL	Q20BK	Q21FSNK	Q22F	Q23AWAT	Q24REST	CHEW	VIT	WIRON	WMIN	MEALX	BFVH2O	COFF	TEA	SOFDK	DIETDK	WHMILK	LFMILK	FRTJC	BEER	CTDECAF	SDDECAF	CHSWA	PHYSFEEL	PSYFEEL	EATHAB	LBLOST	BREG	MEATTOL	MILKDAI	FRTVEG	BRDCER	QUAN	LIQ	D<WAIT	VOMFREQ	VOMWHY
1	183.077	1	1	1	1	6	3	1	2	1	1	1	1	1	2	1	3	3	3	1	5	2	3	9	2	2	2	2	2	30	24	0	0	24	0	48	0	16	0	3	2	2	.	.	.	.	.	1	1	1	1	.	.	.	.	.
2	251.852	1	1	1	1	4	2	1	2	1	1	2	1	1	4	2	6	3	1	1	1	1	2	1	2	2	2	2	2	60	32	0	8	48	0	0	0	8	0	2	2	1	.	.	.	.	.	1	1	1	1	.	.	.	.	.
3	241.667	1	1	1	1	4	2	1	2	1	1	2	2	1	3	1	4	3	1	3	3	2	2	3	1	2	2	2	2	30	16	16	0	48	0	4	0	8	0	2	2	2	.	.	.	.	.	1	1	1	1	.	.	.	.	.
4	252.667	1	3	1	1	2	3	1	1	1	1	2	1	1	2	2	6	2	1	4	7	3	2	0	3	2	2	2	2	20	16	8	0	32	0	4	0	4	0	2	2	2	.	.	.	.	.	1	1	3	1	.	.	.	.	.
5	175.385	1	1	1	1	6	3	1	1	1	2	2	2	1	2	2	6	3	2	1	7	1	4	7	2	2	2	2	2	30	8	24	8	0	32	0	0	0	0	2	2	2	.	.	.	.	.	1	1	3	1	.	.	.	.	.
6	212.857	1	2	1	1	6	1	1	2	1	2	2	1	1	3	2	6	4	2	4	2	1	1	0	3	2	2	2	2	20	16	16	16	0	64	0	0	0	0	2	2	2	.	.	.	.	.	3	1	1	1	.	.	.	.	.
7	177.407	1	3	1	2	4	3	1	2	1	1	2	2	1	3	1	5	3	1	1	7	2	4	2	1	2	1	2	2	30	8	32	16	0	0	0	0	8	0	2	2	1	.	.	.	.	.	1	1	3	1	.	.	.	.	.
8	186.154	1	1	1	1	2	2	1	2	1	1	2	2	1	1	2	6	3	1	2	2	2	3	5	2	2	1	1	1	30	8	48	0	0	0	8	0	0	0	1	2	2	.	.	.	.	.	1	1	3	1	.	.	.	.	.
9	236.000	1	3	1	1	2	4	1	1	1	1	2	2	1	1	1	5	2	2	2	6	4	1	0	3	2	2	2	2	30	40	0	16	16	0	0	0	4	0	2	2	2	.	.	.	.	.	1	2	1	1	.	.	.	.	.

OBS	BOWEL	LNERG	SNKIN	HAIR	GSSURG	NSOPRO	MILK	EGG	CHEE	FISH	CHIX	BEPK	NJTS	YOG	MINDK	VITW<	CURWT	KCALTOT	CHOPCTD	PROPCTD	FATPCTD	KCALB	KCALL	KCALD	KCALSNK	PROPCTRD	CAPCTRDA	FEPCTRDA	APCTRDA	THPCTRDA	RIPCTRDA	NIPCTRDA	CPCTRDA	PCTEBW	LIQOZ	NUTSCORE	MEATMI_<
1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	238	3273	34.1	14.4	51.5	900	1063	1165	145	258	225	69	227	182	267	172	245	83.1	112	1177.00	1
2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7	340	1929	62.0	14.5	23.5	0	801	458	671	159	22	51	45	43	65	164	45	151.9	96	396.43	1
3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	290	2628	48.1	13.7	38.2	477	679	862	610	205	47	75	257	115	103	196	223	141.7	92	825.85	1
4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	379	3177	47.7	11.3	41.0	720	628	1037	723	205	121	77	159	103	157	105	283	152.7	64	762.43	1
5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	228	2052	45.6	14.8	39.6	262	673	793	325	173	63	74	244	115	71	123	45	75.4	72	697.43	1
6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	298	1373	45.4	9.0	45.5	275	371	467	260	70	30	33	33	50	52	49	23	112.9	112	250.29	3
7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7	239	1815	39.7	15.4	44.9	155	758	385	517	159	62	54	102	105	88	147	375	77.4	64	511.57	1
8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7	242	1448	35.1	16.3	45.6	0	592	536	320	134	84	47	203	84	112	105	52	35.2	64	643.43	1
9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	295	1825	49.3	15.3	35.3	569	835	421	0	159	96	92	417	144	128	97	122	136.0	76	991.43	2

OBS	SUBJ	OCC	REL	MARR	AGE	CHIL	WBA	DIAB	HTN	GB	INS	DIUR	ANA	TAG	IND	CHOL	TRIG	HGB	HCT	ALB	FBS	HT	MAXWT	IBW	GOWT	Q1DP	Q1SID	Q1OTC	Q1PRE	Q1EX	Q2AGE	Q3IF	Q3CH	Q3ADO	Q14HOW	Q15WHY	Q16EX	Q34PRE	Q35INF	Q36HOW	Q37LBS	Q40HLTH	Q41SPC	Q43DIET	TOBAC	ALCO
10	10	5	3	3	37.3	4	1	2	1	2	2	2	2	2	2	260	160	12.8	14.1	4.3	85	61.0	243	115	120	2	1	2	1	2	3	2	2	2	1	2	3	5	1	2	100	2	1	2	2	8
11	11	1	1	1	37.3	2	1	2	2	2	2	2	1	2	2	270	150	14.9	44.4	3.5	218	65.0	396	125	150	1	1	2	1	1	1	2	1	1	2	2	3	5	1	1	130	1	2	3	1	0
12	12	4	1	3	30.7	0	2	2	2	2	2	2	2	2	2	250	140	13.2	40.5	4.4	96	61.5	230	110	130	1	1	2	1	1	3	2	2	2	1	1	3	1	5	3	100	2	2	3	2	0
13	13	1	1	1	33.1	0	1	1	1	2	2	1	1	1	1	260	150	11.6	36.3	3.8	135	63.0	250	115	130	2	1	2	1	2	3	2	2	2	1	3	3	6	1	2	114	2	1	2	1	4
14	14	2	3	1	32.7	0	1	1	1	2	2	1	2	2	2	240	135	12.8	40.4	4.1	91	63.0	200	115	120	1	1	1	1	1	2	2	2	2	1	1	4	5	5	3	50	2	2	2	2	4
15	15	2	1	1	39.8	0	1	2	1	2	2	2	2	2	2	280	112	12.7	38.2	3.7	97	63.5	251	120	125	1	2	1	1	2	3	2	2	2	1	2	3	6	1	1	100	1	2	3	2	0
16	16	6	3	1	26.1	0	1	2	2	2	2	2	2	2	2	241	142	12.4	37.4	3.4	89	65.0	243	125	130	1	2	1	1	1	2	2	2	1	1	3	3	4	2	1	110	2	2	3	2	4
17	17	1	1	1	28.7	2	1	2	1	1	2	1	2	2	2	250	126	11.4	36.6	3.9	99	63.8	280	120	130	1	1	2	1	1	1	1	1	1	1	2	3	1	1	2	150	2	2	2	2	0
18	18	2	1	1	41.2	0	1	1	1	2	1	2	2	2	2	260	138	15.1	46.6	3.9	165	65.0	275	125	130	1	1	1	2	2	2	2	2	1	1	3	3	6	1	2	110	2	1	1	1	0

OBS	PCTXS	INT	Q4DIFF	Q5FEEL	Q6PHYS	Q7SNK	Q8NOM	Q9PROM	PROD	STAR	VEG	FRT	DES	BEV	Q11SNK	Q12BG	Q13FREQ	Q17LIFE	Q18ACT	Q19BAL	Q20BK	Q21SNK	Q22FF	Q23AWA	Q24REST	CHEW	VIT	WIRON	WMIN	MEALX	BEVH2O	COFF	TEA	SODK	DIETDK	WHMILK	FMILK	FRTJC	BEER	CTDECAF	SDDECAF	CHSWA	PHYSFEEL	PSYFEEL	EATHAB	BLOST	LBREG	MEATO_	MILKDAI	FRTVEG	BRDCER	QUAN	LIQ	OKWAIT	VOMFREQ	VOMWHY
10	211.304	1	1	1	1	3	1	1	2	1	2	2	2	1	4	2	6	3	2	1	1	5	2	1	1	2	2	2	2	15	24	0	24	16	0	0	0	4	0	2	2	2	.	.	.	.	.	1	2	2	1	.	.	.	.	.
11	316.800	1	2	1	1	4	2	1	2	1	1	1	1	1	1	2	6	2	2	1	2	1	3	0	3	2	2	2	2	45	32	64	0	0	0	0	0	0	0	2	2	2	.	.	.	.	.	1	3	1	1	.	.	.	.	.
12	209.091	1	2	4	2	1	2	1	2	1	1	2	2	1	1	2	6	3	2	4	0	1	2	6	1	2	2	2	2	30	16	0	24	32	0	4	0	0	0	2	2	2	.	.	.	.	.	1	1	3	1	.	.	.	.	.
13	217.391	1	4	1	1	3	2	1	2	1	2	2	1	1	3	2	6	3	1	1	0	2	1	1	1	1	2	2	2	20	48	0	0	0	0	24	0	8	0	2	2	1	.	.	.	.	.	1	1	1	1	.	.	.	.	.
14	173.913	1	4	2	2	1	2	1	2	1	1	1	2	1	1	2	6	1	2	1	0	3	1	4	2	2	2	2	2	20	16	0	0	24	0	0	0	8	0	3	2	2	.	.	.	.	.	1	2	1	1	.	.	.	.	.
15	209.167	1	3	2	2	2	2	1	2	1	1	2	2	1	5	2	6	3	1	4	7	2	1	7	1	4	2	2	2	30	8	0	24	32	0	0	0	0	0	2	2	2	.	.	.	.	.	1	2	1	1	.	.	.	.	.
16	194.400	1	3	1	1	6	3	1	2	1	1	2	2	1	2	2	6	1	2	2	5	1	2	1	1	2	2	2	2	15	8	0	32	8	0	0	0	0	0	2	2	2	.	.	.	.	.	1	2	1	1	.	.	.	.	.
17	233.333	1	1	1	1	3	2	1	2	1	1	2	1	1	5	1	1	5	2	3	1	1	1	1	1	2	2	2	2	30	8	0	24	8	0	0	0	0	0	2	2	2	.	.	.	.	.	1	1	1	1	.	.	.	.	.
18	220.000	1	3	1	2	1	2	1	1	1	2	1	2	1	2	2	6	2	1	2	7	1	1	3	1	1	2	2	2	15	8	0	0	0	48	0	0	8	4	3	2	2	.	.	.	.	.	1	1	1	1	.	.	.	.	.

OBS	BUWEL	ENERG	SKIN	HAIR	GSSURG	NOPRO	MILK	EGG	CHEE	FISH	CHIX	BEPK	NJTS	YCG	MINDK	VITWK	CURWT	KCALTOT	CHOPCTD	PROPCTD	FATPCTD	KCALB	KCAL_	KCALD	KCALSNK	PROPCTRD	CAPCTRDA	FEPCTRDA	APCTRDA	THPCTRDA	RIPCTRDA	NIPCTRDA	CPCTRDA	PCTEBW	LIQOZ	NUTSCORE	MEATMILK
10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	243	699	31.5	17.2	51.4	0	90	609	0	68	4	25	10	24	28	66	37	111.3	76	152.235	2
11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	396	845	33.1	30.7	36.2	0	234	378	235	143	24	33	22	30	64	81	23	216.8	96	257.286	3
12	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	230	813	44.3	28.0	27.7	158	252	404	0	130	16	52	49	56	48	104	58	109.1	76	334.714	1
13	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	244	2308	45.2	10.7	44.0	0	1023	935	350	141	98	44	57	67	106	68	19	117.4	84	442.571	1
14	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	200	1717	46.8	13.5	39.7	280	670	768	0	132	14	50	58	209	61	108	117	73.9	52	516.714	2
15	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	251	2171	53.4	16.4	30.2	270	694	828	380	202	21	86	43	90	80	192	127	109.2	64	520.143	2
16	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	243	1804	37.7	15.5	46.8	470	483	511	340	159	57	64	71	124	103	87	33	94.4	52	510.714	2
17	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	280	2074	37.8	13.1	49.1	0	702	692	680	155	45	63	35	63	55	112	58	133.3	40	391.286	1
18	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	275	1397	49.5	14.0	36.4	158	540	558	141	111	116	31	60	44	78	60	30	120.0	68	393.286	1

OBS	SUBJ	OCC	REL	MARR	AGE	CHIL	WBA	DIAB	HTN	GB	INS	DIUR	ANA	TAG	IND	CHOL	TRIG	HGB	HCT	ALB	FBS	HT	MAXWT	IBW	GOWT	Q1DP	Q1SID	Q1OTC	Q1PRE	Q1EX	Q2AGE	Q3IF	Q3CH	Q3ADO	Q14HOW	Q15WHY	Q16EX	Q34PRF	Q35IVF	Q36HDW	Q37LBS	Q40HLTH	Q41SPC	Q43DIET	TOBAC	A_CD
19	19	3	1	1	39.5	2	1	2	1	2	2	2	2	2	2	243	120	13.3	41.3	4.0	107	59.5	265	105	120	1	1	2	1	1	2	2	2	1	1	1	3	5	5	3	145	2	1	3	1	4
20	20	4	1	3	37.5	0	1	2	1	2	2	2	2	2	2	215	116	12.4	39.5	3.6	99	63.0	216	120	130	1	1	2	1	1	2	2	2	1	1	2	3	4	3	2	135	2	1	3	2	4
21	21	3	1	1	36.2	2	1	2	2	1	2	2	2	2	2	238	109	12.9	40.9	3.7	103	64.5	286.	130	130	1	1	1	1	2	1	2	1	1	1	1	3	1	1	2	130	2	1	3	2	0
22	22	5	1	1	48.9	3	1	2	1	2	2	1	2	2	2	250	125	14.0	44.1	4.2	97	65.0	221	130	130	1	2	1	1	1	4	2	2	2	2	1	3	6	1	1	60	2	2	3	2	0
23	23	6	2	2	22.5	0	2	2	2	2	2	2	2	2	2	210	105	12.9	39.1	3.7	102	67.0	289	120	120	2	1	1	2	2	2	2	2	1	1	1	3	1	3	2	130	2	2	3	2	0

OBS	PCTXS	INT	Q4DIFF	Q5FEEL	Q6PHYS	Q7SNK	Q8NOM	Q9PROM	PROR	STAR	VERG	FRT	DES	BEV	Q11SNK	Q12BG	Q13FREQ	Q17LIFE	Q18ACT	Q19BAL	Q20BK	Q21FSNK	Q22FF	Q23AWA	Q24REST	CHEW	VIT	WIRON	WMIN	MEALX	BFVH2O	COFF	TEA	SOFDK	DIETDK	WHMILK	LFMILK	FRTJC	BEER	CTDECAF	SDDECAF	CHSWA	PHYSFEEL	PSYFEEL	E&THAB	L3_DST	_3REG	MEATOL	MILKDAI	FRTVEG	BRDCER	QUAN	LIQ
19	252.381	2	1	1	1	1	3	1	2	1	1	2	2	2	1	2	6	1	2	2	7	2	3	5	2	1	1	1	1	10	24	0	0	0	24	0	0	4	0	3	1	2	1	1	3	63	0	2	1	3	2	1.25	3
20	180.000	2	3	1	1	4	3	2	1	1	1	2	2	1	1	2	6	2	1	2	7	3	4	2	2	2	1	1	1	15	8	0	24	24	0	0	0	16	0	2	2	1	1	1	1	53	0	3	1	3	2	1.00	2
21	220.000	2	4	1	1	6	3	2	1	1	2	1	2	2	1	2	6	1	2	2	6	6	4	5	2	2	2	2	2	20	16	32	0	0	24	0	0	8	0	2	2	2	1	1	1	50	0	2	1	3	1	1.25	2
22	170.000	2	4	2	1	7	3	2	1	1	1	2	2	1	1	2	6	1	2	3	6	5	4	0	3	1	1	1	1	20	24	32	0	8	0	4	0	0	0	2	2	1	1	1	1	55	0	3	1	1	3	0.75	8
23	240.833	2	1	1	1	1	2	1	1	1	2	2	2	1	1	2	6	1	2	3	0	1	3	3	1	2	1	1	1	30	24	0	24	24	0	0	0	8	4	2	2	2	1	1	1	65	0	3	2	1	1	1.00	8

OBS	DKWAIT	VOMFREQ	VOMWHY	BOWEL	ENERG	SKIN	HAIR	GSSURG	NOPRO	MILK	EGG	CHEE	FISH	CHIX	BEPK	JTS	YOG	MINDK	VITWK	CURWT	KCALTOT	CHOPCTD	PROPCTD	FATPCTD	KCALB	KCALL	KCALD	KCALSNK	PROPCTRDA	CAPCTRDA	FEPCTRDA	APCTRDA	THPCTRDA	RIPCTRDA	NIPCTRDA	CPCTRDA	PCTEBW	LIQOZ	NUTSCORE	MEATMILK
19	15	3	4	1	1	3	3	1	2	2	1	1	2	2	1	2	2	40	5	202	715	34.1	18.0	49.0	153	332	231	0	73	24	29	77	53	51	53	145	92.3	56	307.714	3
20	30	4	3	1	1	3	3	1	3	2	2	1	2	2	2	2	1	30	4	163	1279	70.0	12.8	17.4	355	249	675	0	93	86	25	192	63	73	42	232	36.0	76	514.143	3
21	5	3	3	8	1	3	2	1	3	2	2	1	1	1	2	2	2	5	0	236	757	51.3	25.4	22.3	235	207	187	128	114	63	16	58	48	63	37	258	82.0	80	331.857	3
22	0	3	3	1	1	1	3	1	2	1	1	1	1	2	2	1	2	30	7	166	485	64.3	16.5	19.2	114	279	93	0	45	67	13	41	26	41	11	42	28.1	68	205.000	3
23	0	6	5	8	1	3	1	1	2	2	1	1	1	2	1	1	2	10	2	224	575	53.1	25.4	21.1	0	249	419	0	86	12	25	5	22	27	46	3	87.1	84	137.429	3

OBS	SUBJ	OCCL	REL	MARR	AGE	CHIL	WBA	DIAB	HTN	GB	INS	DIJR	ANA	TAG	IND	CHOL	TRIG	HGB	HCT	ALB	FBS	HT	MAXWT	IBW	GOWT	Q1DP	Q1SID	Q1OTC	Q1PRE	Q1EX	Q2AGE	Q3IF	Q3CH	Q3ADD
1	1	6	1	2	29.8	0	2	2	2	2	2	2	2	1	2	111	55	14.0	40.0	5.2	110	66.0	238.0	130	130	2	1	1	2	1	2	2	2	1
2	2	4	1	1	43.2	5	1	2	2	2	2	2	1	1	2	200	120	13.8	42.0	4.8	108	66.0	340.0	135	160	1	1	2	2	1	2	2	2	1
3	3	4	1	1	45.3	2	1	2	1	2	2	1	2	2	2	284	111	12.7	37.5	3.7	115	63.5	290.0	120	150	1	1	1	2	1	1	2	1	1
4	4	1	1	1	32.4	0	1	2	1	2	2	2	2	1	1	220	140	14.0	43.7	4.5	105	69.2	379.0	150	150	1	2	1	2	1	3	2	2	2
5	5	2	1	1	5[illegible].8	3	1	2	1	2	2	2	1	2	2	215	114	13.3	41.5	4.3	110	64.0	228.0	130	140	1	1	2	1	2	1	2	1	1
6	6	5	1	1	44.1	5	1	1	2	2	2	2	2	2	2	174	51	14.7	42.9	3.8	137	67.0	298.0	140	130	2	1	1	2	1	1	2	1	1
7	7	2	1	1	41.5	1	1	2	1	2	2	1	2	2	2	194	152	12.4	37.3	3.7	79	66.0	239.5	135	140	1	1	2	2	1	2	2	2	2
8	8	5	1	1	5[illegible].7	4	1	2	1	2	2	1	2	2	2	215	130	10.5	31.5	3.9	105	64.0	242.0	130	140	1	2	1	1	2	1	2	1	1
9	9	1	1	1	32.8	4	1	1	2	2	2	2	1	2	2	205	110	13.2	41.3	4.1	110	65.0	295.0	125	125	1	1	1	1	2	1	1	1	1
10	10	5	3	3	37.3	4	1	2	1	2	2	2	2	2	2	260	160	12.8	14.1	4.3	85	61.0	243.0	115	120	2	1	2	1	2	3	2	2	2
11	11	1	1	1	37.3	2	1	2	2	2	2	2	1	2	2	270	150	14.9	44.4	3.5	218	65.0	396.0	125	150	1	1	2	1	1	1	2	1	1
12	12	4	1	3	30.7	0	2	2	2	2	2	2	2	2	2	250	140	13.2	40.5	4.4	96	61.5	230.0	110	130	1	1	2	1	1	3	2	2	2
13	13	1	1	1	33.1	0	1	1	1	2	2	1	1	1	1	260	150	11.6	36.3	3.8	136	63.0	250.0	115	130	2	1	2	1	2	3	2	2	2
14	14	2	3	1	32.7	0	1	1	1	2	2	1	2	2	2	240	135	12.8	40.4	4.1	91	63.0	200.0	115	120	1	1	1	1	1	2	2	2	2
15	15	2	1	1	39.8	0	1	2	1	2	2	2	2	2	2	280	112	12.7	38.2	3.7	97	63.5	251.0	120	125	1	2	1	1	2	3	2	2	2
16	16	6	3	1	26.1	0	1	2	2	2	2	2	2	2	2	241	142	12.4	37.4	3.4	89	65.0	243.0	125	130	1	2	1	1	1	2	2	2	1
17	17	1	1	1	26.7	2	1	2	1	1	2	1	2	2	2	250	126	11.4	36.6	3.9	99	63.8	280.0	120	130	1	1	2	1	1	1	1	1	1
18	18	2	1	1	41.2	0	1	1	1	2	1	2	2	2	2	260	138	15.1	46.6	3.9	165	65.0	275.0	125	130	1	1	1	2	2	2	2	2	1
19	19	3	1	1	39.5	2	1	2	1	2	2	2	2	2	2	243	120	13.3	41.3	4.0	107	59.5	265.0	105	120	1	1	2	1	1	2	2	2	1

OBS	Q14HOW	Q15WHY	Q16EX	Q34PRE	Q35INF	Q36HDW	Q37LBS	Q40HLTH	Q41SPC	Q43DIET	TOBAC	ALCO	PCTXS	INT	Q4DIFF	Q5FEEL	Q6PHYS	Q7SNK	Q8NOM	Q9PROM	PROD	STAR	VEG	FRT	DES	BEV	Q11SNK	Q12BG	Q13FREQ	Q17LIFE	Q18ACT	Q19BAL	Q20BK	Q21FSNK	Q22FF	Q23AWA	Q24REST	CHEW	VIT	WIRON	WMIN	MEALX	BEVH2O
1	1	1	3	1	2	2	110	1	1	3	2	0	183.077	3	4	2	1	7	2	2	1	1	1	2	2	1	2	2	2	3	3	2	3	1	1	3	2	2	1	1	1	25	48
2	1	1	3	2	2	1	186	2	1	3	2	4	251.852	3	2	1	1	1	2	1	2	1	1	2	2	1	4	2	6	3	2	3	0	1	4	2	2	2	2	2	2	45	24
3	3	2	3	1	5	3	140	2	1	3	2	0	241.667	3	2	1	2	1	2	1	1	1	1	2	1	1	2	2	6	2	2	3	4	4	2	1	2	2	1	1	1	20	32
4	1	1	3	1	4	1	200	2	2	3	2	0	252.567	3	6	1	1	5	3	1	1	1	1	2	2	2	1	2	6	1	2	5	1	2	2	1	2	3	1	1	1	15	80
5	1	1	3	6	1	2	70	1	2	3	2	0	175.385	3	2	1	1	2	3	1	1	1	2	2	2	1	1	2	6	1	1	1	6	6	3	3	2	2	1	1	1	30	32
6	1	1	4	3	5	3	100	2	1	3	1	4	212.857	3	3	2	1	3	2	1	1	1	1	2	1	1	3	2	6	4	3	4	0	2	2	1	2	2	1	1	1	15	0
7	1	2	3	1	1	2	110	1	1	3	2	0	177.407	3	2	2	1	1	3	2	1	1	1	2	2	1	2	2	6	3	2	1	7	1	4	1	2	1	2	2	2	20	16
8	1	1	3	6	5	3	100	2	1	3	2	0	186.154	3	3	1	2	5	3	1	1	1	1	2	2	1	2	2	6	2	1	2	5	2	1	1	1	3	1	1	1	20	16
9	1	1	3	6	1	2	155	1	1	1	2	0	236.000	3	3	1	1	4	3	2	1	1	1	2	2	1	1	2	6	2	1	3	6	3	4	1	2	2	1	1	1	20	55
10	1	2	3	6	1	2	100	2	1	2	2	8	211.304	3	3	2	2	3	3	1	1	1	2	1	1	1	3	1	5	3	1	3	2	2	4	0	3	1	2	2	2	15	16
11	2	2	3	6	1	1	130	1	2	3	1	0	316.800	3	3	1	1	6	3	1	1	1	1	2	2	2	0	2	6	1	1	2	3	6	4	0	3	2	1	1	1	20	32
12	1	1	3	1	5	3	100	2	2	3	2	4	209.091	3	6	1	1	4	2	2	1	1	1	2	2	1	3	2	6	2	2	3	2	1	3	5	2	2	1	1	1	20	0
13	1	3	3	6	1	2	114	2	1	2	1	0	217.391	3	5	1	1	7	2	1	2	1	1	2	2	1	2	2	6	3	1	2	3	2	4	0	3	3	2	2	2	10	24
14	1	1	4	5	5	3	50	2	2	2	2	4	173.913	3	5	1	1	3	2	1	1	1	2	2	2	1	3	1	5	4	2	4	4	2	3	1	1	2	2	2	2	20	16
15	1	2	3	6	1	1	100	1	2	3	2	0	209.167	3	1	1	1	4	1	2	1	1	1	2	2	2	3	2	6	1	1	3	0	3	4	5	2	3	1	1	1	30	15
16	1	3	3	4	2	1	110	2	2	3	2	4	194.400	3	3	2	2	7	2	1	1	1	1	2	2	1	3	2	6	3	2	3	0	5	3	3	2	2	1	2	2	20	24
17	1	2	3	1	1	2	150	2	2	2	2	0	233.333	3	1	1	1	2	3	1	1	1	1	2	2	2	0	2	6	1	1	1	7	2	3	1	2	2	1	1	1	25	24
18	1	3	3	6	1	2	110	2	1	1	1	0	220.000	3	5	1	1	1	3	1	1	1	2	2	2	1	0	2	6	1	1	3	7	7	4	0	3	2	1	1	1	15	8
19	1	1	3	6	5	3	145	2	1	3	1	4	252.381	3	1	1	1	4	2	1	2	1	1	2	1	2	1	2	6	1	2	3	7	2	4	5	2	1	1	1	1	15	8

SAS

OBS	COF=	TEA	SODK	DIETDK	WHMILK	LFMILK	FRTJC	BEER	CTDECAF	SDDECAF	CHSWA	PHYSFEEL	PSYFEEL	EATHAB	LBLOST	LBREG	MEATDL	MILKDAI	FRTVEG	BRDCER
1	0	0	32	0	24	0	8	0	3	2	2	3	1	1	106	0	3	1	3	2
2	0	32	48	0	0	0	8	0	2	2	1	1	1	2	100	0	1	2	3	1
3	24	0	0	24	4	0	16	0	2	2	2	1	1	1	57	0	3	1	3	1
4	0	32	12	0	4	0	8	8	2	2	2	1	1	3	169	0	1	1	1	1
5	0	32	4	0	4	0	0	0	2	2	2	1	1	3	78	0	3	1	3	1
6	8	0	0	64	0	0	0	0	2	2	1	3	1	2	88	0	3	2	1	1
7	32	0	0	32	0	0	4	0	1	1	1	1	1	1	55	0	3	1	1	1
8	40	0	24	0	8	0	0	0	2	2	2	1	1	3	72	0	3	1	3	1
9	0	16	16	0	0	0	8	0	2	2	2	1	1	3	93	0	3	2	3	3
10	0	24	16	0	0	0	8	0	2	2	2	1	1	1	50	15	3	3	1	1
11	32	16	0	0	8	0	4	0	2	2	2	1	1	3	103	0	3	1	1	1
12	0	32	0	24	4	0	8	0	2	2	2	1	1	2	45	0	3	1	1	1
13	0	24	0	0	8	0	0	0	2	2	1	1	1	3	90	0	3	1	1	1
14	0	0	24	0	8	0	4	0	3	2	2	3	3	2	10	0	1	2	1	1
15	0	32	32	0	0	0	0	0	2	2	2	1	1	3	80	0	3	2	3	1
16	0	0	12	0	8	0	15	0	2	2	2	3	1	1	75	0	3	2	3	1
17	0	40	0	0	0	0	8	0	2	2	2	1	1	3	73	0	3	2	3	2
18	0	0	0	96	8	0	4	0	3	2	2	1	1	1	101	0	3	1	1	1
19	0	0	40	12	0	0	4	0	3	1	2	1	1	3	87	0	3	1	3	1

OBS	QJAN	LIQ	DKWAIT	VOMFREQ	VOMWHY	BOWEL	ENERG	SKIN	HAIR	GSURG	NOPRO	MILK	EGG	CHEE	FISH	CHIX	BEPK	NUTS	YOG	MINDK	VITWK
1	0.25	3	30	2	5	8	2	3	3	3	2	1	1	1	2	2	2	2	2	5	7
2	1.00	8	10	3	2	8	1	3	2	3	2	2	2	1	2	1	1	1	2	5	0
3	1.00	4	15	4	1	8	1	3	3	1	2	1	2	1	2	2	1	1	2	15	7
4	1.50	4	10	6	1	8	1	3	3	1	2	1	1	1	2	1	2	2	2	5	7
5	1.25	4	10	4	2	1	1	3	3	1	3	1	1	1	1	1	2	1	2	10	3
6	1.00	6	5	3	4	8	2	3	3	2	1	2	2	1	1	2	1	1	2	20	3
7	1.25	6	10	5	4	1	1	3	3	2	2	2	2	1	1	2	2	2	1	25	0
8	1.00	2	20	3	4	8	1	1	2	1	2	2	2	1	2	2	1	2	2	5	7
9	1.00	2	5	4	4	5	1	1	2	1	2	2	1	1	1	2	1	2	2	5	7
10	1.00	2	10	5	2	8	1	3	2	1	3	2	1	1	1	1	1	2	2	15	7
11	1.25	4	40	5	3	1	1	3	2	1	2	2	1	1	2	2	1	2	2	10	3
12	1.00	4	30	3	3	8	1	3	3	1	2	1	2	1	2	2	2	1	2	15	0
13	1.25	4	10	4	4	1	1	3	3	2	2	1	1	1	1	2	2	2	2	10	0
14	2.00	8	10	6	5	8	2	1	3	2	2	1	2	2	2	2	1	2	2	10	0
15	1.00	2	30	5	4	1	1	3	3	1	2	2	2	1	1	2	2	1	2	25	7
16	0.75	4	5	5	4	6	2	3	2	2	1	2	1	1	1	2	2	2	1	15	2
17	0.75	0	30	6	5	5	1	3	3	1	3	2	1	1	1	2	2	2	2	45	7
18	1.00	2	60	6	2	8	1	2	3	1	2	2	1	1	2	1	1	2	2	10	7
19	0.50	4	10	5	4	1	1	3	3	1	2	2	1	1	2	1	1	2	2	15	2

OBS	CURWT	KCA_TOT	CHOPCTD	PROPCTD	FATPCTD	KCALB	KCA_L	KCALD	KCALSNK	PROPCTRD	CAPCTPDA	FEPCTRDA	APCTRDA	THPCTRDA	RIPCTRDA	NIPCTRDA	CPCTRDA	OCTE3W	IQOZ	NUTSCORE	MEATMILK
1	132.0	1645	50.5	12.1	30.0	385	555	405	290	109	130	29	207	82	135	42	257	1.5	112	661.714	3
2	236.0	1135	47.2	10.0	43.3	0	477	137	521	61	16	42	15	164	28	59	25	74.9	116	327.571	2
3	231.5	977	73.7	11.1	15.3	300	100	430	147	61	41	28	110	36	53	48	53	92.5	100	323.571	3
4	209.5	748	46.5	21.4	32.1	90	0	618	40	91	46	29	26	31	51	43	35	39.3	144	231.000	1
5	150.0	1133	32.1	19.4	48.8	215	322	380	216	125	79	32	66	55	101	25	2	15.3	72	358.286	3
6	168.0	791	71.1	12.0	18.1	0	467	324	0	116	24	19	249	35	32	55	38	20.0	75	419.429	3
7	184.5	807	47.1	12.4	41.0	338	542	265	0	57	43	22	126	45	46	33	85	36.3	84	327.143	3
8	159.8	916	63.7	10.4	26.1	350	280	287	0	55	34	16	15	17	30	27	65	22.3	89	148.286	3
9	202.0	701	66.2	6.3	27.5	166	80	200	255	25	14	20	502	38	23	35	67	61.6	96	641.571	3
10	193.0	602	53.2	18.0	29.0	0	315	288	0	61	7	22	19	29	30	87	35	68.0	72	199.000	3
11	293.0	945	33.1	25.4	42.0	300	416	230	0	136	45	31	43	76	67	135	10	134.4	92	398.429	3
12	185.0	1358	45.4	12.1	43.1	13	238	1107	0	93	128	30	234	34	126	53	37	68.2	72	610.286	3
13	154.0	728	33.1	14.8	52.2	198	255	168	100	61	12	25	36	42	39	44	43	34.0	56	204.143	3
14	190.0	1577	50.3	12.0	38.0	300	545	467	265	114	80	41	35	52	93	93	38	65.2	55	399.429	2
15	171.0	1469	73.5	10.0	17.1	290	635	494	0	82	43	12	17	18	62	42	17	42.5	80	196.429	3
16	168.0	720	67.2	13.9	18.9	100	360	260	0	57	40	18	13	25	47	52	152	34.4	64	216.714	3
17	206.0	328	32.9	15.5	52.1	170	295	363	0	73	19	26	61	50	43	70	140	71.5	72	289.000	3
18	174.0	778	37.0	16.5	47.0	238	305	235	0	73	85	17	66	28	58	10	100	39.2	115	278.286	3
19	178.0	453	51.2	10.6	38.2	235	168	50	0	27	7	9	17	31	11	37	212	69.5	53	142.286	3

SAS

OBS	SUBJ	UCC	REL	MARR	AGE	CHIL	WBA	DIAB	HTH	CO	INS	DIUR	ANA	TAG	IND	CHOL	TRIG	HGB	HCT	ALB	FBS	HT	MAXWT	IBW	GOWT	Q1DP	Q1SID	Q1UTC	Q1PRI	C1X	Q2AGE	Q3IF	Q3CH	Q3ADO	Q14HDW	Q15WHY	Q16FX	Q34PPF	Q35INF	Q35HOW	Q37LBS	Q40HLTH	Q41SPC	Q43DIET	TOBAC	ALCO
20	20	4	1	3	37.5	0	1	2	1	2	2	2	2	2	2	215	116	12.4	39.5	3.6	99	63.0	216	120	130	1	1	2	1	1	2	2	2	1	1	2	3	4	3	2	135	2	1	3	2	4
21	21	3	1	1	36.2	2	1	2	2	1	2	2	2	2	2	238	109	12.9	40.9	3.7	103	64.5	286	130	130	1	1	1	1	2	1	2	1	1	1	1	3	1	1	2	130	2	1	3	2	[illegible]
22	22	5	1	1	48.9	3	1	2	1	2	2	1	2	2	2	250	125	14.0	44.1	4.2	97	65.0	221	130	130	1	2	1	1	1	4	2	2	2	2	1	3	6	1	1	60	2	2	3	2	[illegible]
23	23	6	2	2	22.5	0	2	2	2	2	2	2	2	2	2	210	105	12.9	39.1	3.7	102	67.0	289	120	120	2	1	1	2	2	2	2	2	1	1	1	3	1	3	2	130	2	2	3	2	[illegible]

OBS	PCTAS	INT	Q4DIFF	Q5FFL	Q6PHYS	Q7SNF	Q8HOM	Q9PROM	PFUO	STAF	VEG	FRT	DLS	BEV	Q11SNK	Q12BG	Q13FFEG	Q17LIFE	Q18ACT	Q19SA_	Q20BK	Q21FSNK	Q22FF	Q23AWA	Q24FEST	CHEW	VIT	AIFON	WMIN	MFALX	BFVH2O	COFF	TEA	SODK	DIETDK	WHMI_K	LFMI_K	FRTJC	BEEF	CTDECAF	SDDECAF	CHSWC	PHYSFEEL	PSYFEEL	EATHAB	LBLOST	_BREG	MEATTOL	MILKDAI	FRTVEG	BRDCER	QUAN	_IQ	DKWAIT
20	180.000	3	3	1	2	5	3	1	1	1	1	2	2	1	1	2	6	2	1	3	6	3	4	1	2	1	1	1	1	25	8	0	24	48	0	0	0	16	0	2	2	1	1	1	1	68	0	3	1	1	1	1.0	2	30
21	220.000	3	1	1	1	6	3	1	1	1	1	1	2	2	1	1	5	2	1	2	6	2	4	3	2	2	1	1	1	30	24	40	0	0	32	8	0	8	4	2	2	2	1	1	1	45	5	1	1	1	1	2.0	8	5
22	170.000	3	6	1	1	6	3	2	1	1	1	1	2	1	1	2	6	1	2	3	5	3	4	0	3	1	1	1	1	20	16	16	0	16	0	6	0	6	0	2	2	1	1	1	1	75	0	3	1	1	3	1.5	8	[illegible]
23	240.833	3	6	1	1	5	2	1	1	1	1	2	1	1	2	2	6	1	3	3	0	1	2	4	1	2	1	1	1	15	16	0	32	0	24	0	0	15	12	2	2	2	1	1	1	84	5	1	2	1	1	2.0	8	[illegible]

OBS	VJJFREQ	VUMWHY	UUWEL	ENERG	SKIN	HAIF	GSURG	NUPRO	MILK	EGG	CHEE	FISH	CHIX	BFPK	NUTS	YOG	MINDK	VITWK	CLFWT	KCALTOT	CHOPCTD	PROPCTD	FATPCTD	KCALB	KCALL	KCALD	KCALSNK	PRCPCTRD	CAPCTRDA	FAPCTRDA	APCTRDA	THPCTRDA	FIPCTRDA	NIPCTRDA	CPCTRDA	PCTEBW	LIQOZ	NUTSCORE	METMI_K
20	5	4	8	1	3	3	1	3	2	1	1	1	1	2	2	1	20	4	148	1255	56.8	16.6	27.1	418	298	538	0	118	187	48	200	109	185	61	598	23.3	100	845.857	3
21	6	4	8	1	3	3	1	3	1	2	1	2	1	1	2	2	5	4	241	1345	43.4	15.1	41.0	215	670	550	100	120	90	49	38	115	97	84	107	85.3	116	488.286	1
22	2	3	1	1	1	3	1	3	1	1	1	1	2	2	1	2	30	7	146	1281	43.1	19.4	38.1	251	345	685	0	141	67	55	25	72	73	129	18	12.3	6[illegible]	423.571	3
23	3	2	8	1	3	1	1	2	2	1	1	1	2	1	1	2	5	3	295	1437	25.3	18.1	57.1	0	619	660	158	143	55	61	63	42	68	115	78	70.8	100	415.143	2

KEY TO COMPUTER-CODED DATA

OBS	=	number of observations
SUBJ	=	code number for each subject (01 - 23)
OCC	=	occupation 1 = homemaker, unemployed outside 2 = clerical 3 = white collar 4 = technical 5 = student
REL	=	religion 1 = protestant 2 = catholic 3 = none
MARR	=	marital 1 = married 2 = single, never married 3 = divorced, widowed
AGE	=	age in years plus months to the decimal point
CHIL	=	number of children
WBA	=	weight bearing arthritis? 1 = yes, 2 = no (is it currently present?)
DIAB	=	diabetes?
HTN	=	hypertension?
GB	=	gall bladder disease?
INS	=	is insulin taken?
DIUR	=	are diuretics used?
ANA	=	are analgesics used on a regular basis?
TAG	=	is Tagamet (cimetidine) used?
IND	=	is Inderal (propranolol hydrochloride) used?
CHOL	=	cholesterol, mg/dl
TRIG	=	triglyceride, mg/dl
HGB	=	hemoglobin, g/dl
HCT	=	hematocrit, mm/100mm
ALB	=	albumin, serum g/dl
FBS	=	fasting blood sugar, mg/dl
HT	=	height,in

MAXWT	=	weight upon hospital admission,lb
IBW	=	ideal weight,lb
GOWT	=	patient's goal weight (what weight she would like to be)
Q1DP	=	diet program? (question No. 1, initial interview)
Q1SID	=	self-imposed diet?
Q1OTC	=	over-the-counter pills?
Q1PRE	=	prescribed pills or injections?
Q2AGE	=	question no. 2, initial interview age category of obesity
Q3IF	=	question no. 3, initial interview overweight as an infant?
Q3CH	=	overweight as a child?
Q3ADO	=	overweight as an adolescent?
A14HOW	=	question no. 14, initial interview
Q15WHY	=	question no. 15, initial inverview
Q16EX	=	question no. 16, initial interview
Q34PRE	=	question no. 34, initial interview
Q35INF	=	question no. 35, initial interview
Q36HOW	=	question no. 36, initial interview
Q37LBS	=	question no. 37, initial interview
Q40HLTH	=	question no. 40, initial interview
Q41SPC	=	question no. 41, initial interview
Q43DIET	=	question no. 43, initial interview
TOBAC	=	tobacco used?
ALCO	=	alcohol consumed? 1 = frequently 2 = occasionally 3 = no
PCTXS	=	percent of ideal body weight
INT	=	interview, 1 = initial interview (0 month) 2 = interview at 4 months 3 = interview at 8 months
Q4DIFF	=	question no. 4, interviews at 4 and 8 months
Q5FEEL	=	question no. 5, interviews at 4 and 8 months
Q6PHYS	=	question no. 6, interviews at 4 and 8 months
Q7SNK	=	question no. 7, interviews at 4 and 8 months
Q8NOM	=	question no. 8, interviews at 4 and 8 months

09PROM	=	question no. 9, interviews at 4 and 8 months
PROO	=	protein source included in usual meal? question no. 9, interviews at 4 and 8 months
STAR	=	starch included?
VEG	=	vegetable included?
FRUIT	=	fruit included?
DES	=	dessert included?
BEV	=	beverage included?
Q11SNK	=	number of snacks, question no. 11, interviews at 4 and 8 months
Q12BG	=	binge eat?, question no. 12, interviews at 4 and 8 months
Q13FREQ	=	question no. 13, interviews at 4 and 8 months
Q17LIFE	=	question no. 17, interviews at 4 and 8 months
Q18ACT	=	question no. 18, interviews at 4 and 8 months
Q19BAL	=	question no. 19, interviews at 4 and 8 months
Q20BK	=	question no. 20, interviews at 4 and 8 months
Q21FSNK	=	question no. 21, interviews at 4 and 8 months
Q22FF	=	question no. 22, interviews at 4 and 8 months
Q23ACT	=	question no. 23, interviews at 4 and 8 months
Q24REST	=	question no. 24, interviews at 4 and 8 months
CHEW	=	question no. 45, interviews at 4 and 8 months
VIT	=	question no. 48, interviews at 4 and 8 months
WIRON	=	question no. 48, interviews at 4 and 8 months
WMIN	=	question no. 48, interviews at 4 and 8 months
MEALX	=	length of meal,min (largest meal of day)
BEVH2	=	question nos. 30 and 31, water consumption
COFF	=	coffee consumption
TEA	=	tea consumption
SOFDK	=	soft drink consumption
DIETDK	=	diet soft drink consumption
WHMILK	=	whole milk consumption
FRTJC	=	fruit juice consumption
BEER	=	beer consumption
CTDECAF	=	question no. 32, decaffeinated coffee/tea?
SDDECAF	=	question no. 33, decaffeinated soft drinks?

CHSWA	=	question no. 44, chewing, swallowing problems?
PHYSFEEL	=	question no. 4
PSYFEEL	=	question no. 5
EATHAB	=	question no. 6
LBLOST	=	question no. 7
LBREG	=	question no. 7
MEATTOL	=	question no. 9 (food intolerances)
MILKTOL	=	question no. 9
FRTVEG	=	question no. 9
BRDCER	=	question no. 9
QUAN	=	question no. 13
LIQ	=	question no. 15
DKWAIT	=	question no. 16
VOMFREQ	=	question no. 17
VOMWHY	=	question no. 18
BOWEL	=	question no. 21
ENERG	=	question no. 22
SKIN	=	question no. 23
HAIR	=	question no. 24
GSSURG	=	question no. 51
NOPRO	=	question no. 34
MILK	=	question no. 35, consumption of milk?
EGG	=	egg consumption?
CHEE	=	cheese consumption?
FISH	=	fish consumption?
CHIX	=	chicken consumption?
BEPK	=	beef/pork consumption?
NUTS	=	nuts, seeds and peanut butter consumption?
YOG	=	yogurt consumption?
MINDK	=	question no. 29
VITWK	=	frequency of taking vitamins per week
CURWT	=	current weight status,lb
KCALTOT	=	total calories for a day
CHOPCTD	=	percentage of energy from carbohydrate
PROPCTD	=	percentage of energy from carbohydrate

FATPCTD	=	percentage of energy from fat
KCALB	=	energy,kcal from breakfast
KCALL	=	energy,kcal from lunch
KCALD	=	energy,kcal from dinner
KCALSNK	=	energy,kcal from snacks (afternoon or evening)
PROPCTRD	=	percent of RDA for protein
CAPCTRDA	=	percent of RDA for calcium
FEPCTRDA	=	percent of RDA for iron
APCTRDA	=	percent of RDA for vitamin A
THPCTRDA	=	percent of RDA for thiamin
RIPCTRDA	=	percent of RDA for riboflavin
NIPCTRDA	=	percent of RDA for niacin
CPCTRDA	=	percent of RDA for vitamin C
PCTEBW	=	percent of excess body weight
LIQOZ	=	total no. of liquid,oz consumed in 1 day
NUTSCORE	=	nutrient score (this value contains the values for greater than 100% of RDA which were deleted later for statistical analysis)
MEATMILK	=	tolerance of both meat and milk? 1 = yes 2 = no 3 = sometimes

VITA

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Candidate for the Degree of

Master of Science

Thesis: DIETARY PATTERNS AND EATING BEHAVIORS AFTER GASTRIC STAPLING

Major Field: Food, Nutrition and Institution Administration

Biographical:

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