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Differences in Nutritional Outcome Measures between Preadolescents and Adolescents with Anorexia Nervosa who received a Nasogastric Feeding Tube versus Oral Diet upon Hospital Admission

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ACCEPTANCE

This thesis, DIFFERENCES IN NUTRITIONAL OUTCOME MEASURES BETWEEN PREADOLESCENTS AND ADOLESCENTS WITH ANOREXIA NERVOSA WHO RECEIVED A NASOGASTRIC FEEDING TUBE VERSUS ORAL DIET UPON HOSPITAL ADMISSION, by Paige Herring was prepared under the direction of the Master's Thesis Advisory Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree Master of Science in the Byrdine F. Lewis School of Nursing and Health Professions, Georgia State University. The Master's Thesis Advisory Committee, as representatives of the faculty, certify that this thesis has met all standards of excellence and scholarship as determined by the faculty.

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ABSTRACT

DIFFERENCES IN NUTRITIONAL OUTCOME MEASURES BETWEEN PREADOLESCENTS AND ADOLECENTS WITH ANOREXIA NERVOSA WHO RECEIVED A NASOGASTRIC FEEDING TUBE VERSUS ORAL DIET UPON HOSPITAL ADMISSION

by

Paige E. Herring

Background: Anorexia nervosa (AN) is a disease defined by an extreme weight loss due to an intense fear of gaining weight, and it is the third most chronic disease in adolescent females. Hospitalizations are common among patients with AN due to the major consequences that can arise from this disease. Most of the complications can be resolved with significant weight gain, so hospitals have an implemented feeding protocols to optimize weight gain. Studies have shown that nasogastric (NG) feedings have resulted in a greater weight gain and reduced length of stay without significant side effects.

Objective: The purpose of this study is to examine the association between demographic and clinical characteristics and mode of nutrition therapy (oral feeding vs. NG tube feedings) in a population of pre-adolescents and adolescents with a hospital admission diagnosis of AN. The clinical outcome measures are length of stay (LOS), weight gain, and suspected refeeding syndrome.

Participants/Setting: The study sample includes 64 patients between the ages 9 and 20 years who have been admitted to Children's Healthcare of Atlanta between January 1, 2014 and December 31, 2015 for clinical treatment of AN. The demographic, anthropometric, mode of nutrition therapy and clinical characteristics of the patient population were obtained.

Statistical Analysis: Frequency statistics were used to describe demographic, anthropometric, mode of nutrition therapy and clinical characteristics of the patient population. A Student's t-test was used to examine differences in continuous variables by tube feeding status, while a Mann-Whitney U test was used for the non-normally distributed variables. A Chi-square test was used to examine differences in tube feeding status by categorical variables.

Results: Data were collected and analyzed for 64 patients, with a mean age of 14.6 ± 2.4 years, and the majority of the population being female (93.8%) and Caucasian (92.2%). Approximately half (n=30, 47%) of the population received an NG tube during the admission. Mean discharge BMI was significantly higher in those who received an oral diet vs. NG tube (16.67 vs. 17.08, respectively; p=0.042) while weight change was significantly lower (1.3 kg vs. 2.1 kg, respectively; p=0.012) and LOS shorter (8 days vs. 11 days, respectively; p=0.002)
There were no significant differences in other characteristics by mode of nutrition therapy.

Conclusion:

NG tube feeding is an effective method for feeding hospitalize adolescent patients with AN to yield greater weight gain results. Future studies are necessary to determine the amount of time exclusively on the NG tube, reasons for choosing NG vs. oral feedings, and other variables associated with weight gain and length of stay.

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ABBREVIATIONS

AAP	American Academy of Pediatrics
AN	Anorexia Nervosa
DSM-5	Diagnostic and Statistical Manual of Mental Disorders
BMI	Body Mass Index
bpm	Beats Per Minute
BUN	Blood Urea Nitrogen
CHOA	Children's Healthcare of Atlanta
cm	Centimeter
EHR	Electronic Health Record
g	Gram
HR	Heart Rate
IBW	Ideal Body Weight
IRB	Institutional Review Board
Kcal	Kilocalorie
kg	Kilogram
L	Liter
LOS	Length of Stay
M	Meter
mBMI	Mean BMI
mEq	Milliequivalent
Mg	Milligram

mmHG	Millimeter of Mercury
NG	Nasogastric
PN	Parenteral Nutrition
SD	Standard Deviation
SPSS	Statistical Package for the Social Sciences
WtChange	Weight Change

Chapter I

Differences in Nutritional Outcome Measures between Preadolescents and Adolescents with Anorexia Nervosa who received a Nasogastric Feeding Tube versus Oral Diet upon Hospital Admission

Introduction

The fifth edition of *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5), includes diagnostic description of six eating disorders including pica, ruminant disorder, avoidant/restrictive food intake, anorexia nervosa (AN), bulimia nervosa, and binge-eating disorder.[1] Anorexia nervosa and bulimia nervosa account for approximately 80% of all diagnosed eating disorders.[1] AN is a disease defined by an extreme weight loss due to an intense fear of gaining weight.[2] The population most commonly diagnosed with AN are female adolescents with an estimated prevalence of 0.5% in the United States.[3] AN is the third most chronic disease in adolescent females,[4] with a mean mortality rate of approximately 2-5%.[1,5] The condition peaks in early- to mid-adolescence,[5] and has a lifetime prevalence of 0.9 to 2.3% in the United States.[6]

Hospitalizations are common among patients with AN due to the major consequences that can arise from having the disease.[7] Complications include renal impairment, dental problems, gastrointestinal, metabolic and respiratory impediments, heart complications and neuroendocrine changes,[1] in addition to growth retardation and decreased brain function.[5] Most of these problems can be resolved with significant weight gain. Although treatment often focuses on the restoration of weight and nutrition status, it is important to closely monitor the clinical response to treatment to avoid metabolic complications, such as refeeding syndrome, that can occur from a rapid influx of calories in patients who are severely malnourished..[1] Treatment options include outpatient

therapy, partial hospitalization with continued outpatient therapy, residential treatment centers, and inpatient hospitalization.[3]

Inpatient hospitalization is indicated when there is a serious medical need and is also considered to be a last resort treatment option after failure to gain proper weight in an outpatient setting.[3] An interdisciplinary approach is used in hospital settings utilizing a team of pediatricians, mental health specialists and registered dietitians.[8] Criteria for hospital treatments are dependent upon the medical status and compliance of the patient. If oral feeding does not result in weight restoration, treatment may include implementation of nasogastric (NG) tube feedings.[3] Some hospitals have implemented supplemental nocturnal NG tube feeding, cyclic NG tube feeding, and continuous NG tube feeding protocols. Potential risk factors related to the implementation of enteral nutrition support during an inpatient hospitalization for AN have not yet been determined. Although the use of an NG tube feeding has resulted in greater weight gain, the results of studies that have examined the effect of enteral nutrition support on other outcome measures such as length of stay have been inconsistent.[4,9,10] The purpose of this study is to examine the association between demographic and clinical characteristics and mode of nutrition therapy in a population of pre-adolescents and adolescents with AN admitted to Children's Healthcare of Atlanta (CHOA) between January 1, 2014 and December 31, 2015. In addition, the association between initiation of an NG tube feeding and outcome measures including length of stay (LOS), weight gain, and clinical treatment for the prevention of refeeding syndrome will be determined.

Specific Aim 1: Describe the demographic and anthropometric characteristics of pre-adolescents and adolescents (ages 9-20) with AN admitted to CHOA by mode of nutrition therapy (NG tube feeding vs. oral diet).

Research Hypothesis 1A: Patients with AN who were categorized upon admission as having a severe or extreme BMI classification will be more likely to have received an NG tube during the admission vs. those with a mild or moderate BMI classification.

Null Hypothesis 1A: The number of patients with AN who received an NG tube feeding during the admission will not differ by admission BMI classification.

Specific Aim 2: Examine the differences in outcome measures including weight gain and length of stay (LOS) between preadolescents and adolescents with AN admitted to CHOA who received an NG tube vs. those who received an oral diet with high-energy liquid supplements.

Research Hypothesis 2A: Patients who received an NG tube during the admission will have a greater weight gain during admission than patients who were orally fed.

Null Hypothesis 2A: Weight gain during admission will not differ by mode of nutrition therapy.

Research Hypothesis 2B: Patients who received an NG tube will have had a shorter LOS than the patients who were orally fed.

Null Hypothesis 2B: Length of stay will not differ by mode of nutrition therapy.

Chapter II

Literature Review

Diagnostic Criteria for Anorexia Nervosa

The *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) criteria for diagnosis of AN includes the following: amplified drive for thinness, intense fear of gaining weight or becoming fat,[8] restriction of energy intake relative to requirements, engaging in persistent behavior that interferes with weight gain, and lack of recognition.[11] This criteria also includes the role of context such as sex, age, and developmental status in determining if an individual as a significantly low weight.[11] If a patient does not state a fear of gaining weight, the diagnosis can still be made if he/she exhibits any type of behavior that interferes with weight gain.[1] The major change in diagnostic criteria from the older DSM-IV version was the removal of the amenorrhea criteria because there was a lack of clinical use.[1] DSM-5 diagnostic criteria uses body mass index (BMI) to further diagnose levels of severity within this population. The diagnostic levels of BMI for AN are as follows: extreme (BMI < 15 kg/m^2), severe (BMI 15–15.99 kg/m^2), moderate (BMI 16–16.99 kg/m^2) and mild (BMI > 17 kg/m^2).[11] For children and adolescents, it is more accurate for clinicians to use BMI percentiles. The percentiles are defined as thinness grade 2 (<3rd percentile), thinness grade 1(3rd-16th percentile), normal weight (16th-85th percentile), overweight (85th–95th percentile), and obesity (BMI >95th percentile).[12] There are two sub classifications of AN, restrictive type and binge-eating/purging type. Restrictive type is classified as restricting oral intake with or without compulsive exercise, and binge eating/purging type is classified as exhibiting episodes of uncontrolled overeating concurrent with vomiting, laxative, or diuretic misuse.[5]

The pediatrician plays an important role in the screening process for AN by examining height and weight trends.[3] The pediatrician can also utilize questionnaires about eating patterns and body satisfaction to further diagnose the presence of an eating disorder. Pediatricians are among the most common health care providers to diagnose children and adolescents with an eating disorder. Once a patient is diagnosed with AN, the pediatrician typically determines the severity of the disease from evaluation of medical and nutrition laboratory values. It is recommended that pediatricians look at heart rate, blood pressure, complete blood cell count, electrolyte measurements, liver function tests, thyroid-stimulating hormone tests, and urinalysis test.[3]

Complications Associated with Anorexia Nervosa

If AN is not diagnosed early in the course of the disease or treatment is not initiated in a timely manner, major complications can arise. These complications are in part why many adolescents are hospitalized and need immediate treatment.[13] Some complications include renal abnormalities such as increased blood urea nitrogen (BUN) values, increased risk of renal stones, polyuria, and sodium and potassium depletion.[3] Patients may also experience gastrointestinal problems such as delayed gastric emptying, slowed gastrointestinal motility, constipation, bloating, and hypercholesterolemia.[3] Patients with AN may experience dental enamel erosion, metabolic, and respiratory impediments,[1] in addition to growth retardation and decreased brain function.[5] One of the most serious, yet most common, concern for adolescents diagnosed with AN is the neuroendocrine changes that affect bone metabolism and reproductive functioning. Increased bone metabolism can result in an increased risk for bone fractures[1] and later risks for osteoporosis.[5] Osteopenia is prevalent in 90% of adolescents and young adults with AN, and this is so concerning because the effects of osteopenia are not completely reversible.[14] Reproductive function can be inhibited due to calorie restriction in female adolescents causing amenorrhea.[3] Resumption of menses can occur with a weight restoration of approximately 90% of ideal body

weight.[14] Cardiac events such as heart failure and cardiac arrest are also major concerns within this patient population, and these problems can become so severe that the patient can endure a coma or even dealth.[1] In addition to the effects on bone metabolism, most of the aforementioned problems can be resolved with significant weight gain.

In a malnourished state, resting energy expenditure can decrease by 50-70% of predicted estimated needs; therefore, the initial calorie requirement is very low.[14] One common complication that can occur when increasing the calorie intake of patients with malnutrition is refeeding syndrome. Refeeding syndrome occurs with an influx of calories creating a major shift in electrolytes and fluids. These shifts in electrolytes can cause hypokalemia, hypophosphatemia, and hyponatremia, which can result in muscle weakness[4] and cardiac, neurological, or hematological issues resulting in coma and death in most severe cases.[15] The diagnosis of refeeding syndrome based upon plasma levels of phosphorous, potassium, and magnesium (Table 1).

Table 1. Laboratory Criteria used in the Diagnosis of Refeeding Syndrome[16]

Electrolytes	**Normal levels**	**Levels at risk for refeeding syndrome**
Serum phosphorus	2.5-4.5 mg/dL	<2.5 mg/dL
Serum potassium	3.5-5.2 mEq/L	< 3.5 mEq/L
Serum magnesium	1.6-2.4 mEq/L	<1.6 mEq/L

Fluid overload can cause edema and even cardiac failure. The more malnourished the patient is, the higher the risk for refeeding syndrome upon hosptalization.[4] Six to seven percent of patients with AN experience refeeding syndrome, and patients who are typically <70% IBW, experience hypophosphatemia in the first two weeks of hospitalization.[15]

Another issue arising from feeding malnourished patients is the change in body composition. Most of the weight gained during refeeding, especially in an inpatient setting, is fat mass.[14] The majority of the weight that is gained during the first couple of months appears to be lean muscle and the closer to ideal body weight that the patient reaches, the greater the ratio of fat to lean muscle is gained. Research has shown that the fat mass that is accumulated does not exceed that of healthy controls is appropriate for rehabilitation purposes.[14] Conversely, if calorie administration is initially too low, than the patient may be underfed which may result in further weight loss and increase the risk for cardiac problems.[4] Underfeeding and overfeeding can cause serious issues in malnourished patients; therefore, many studies have looked at different calorie prescriptions to determine the initial nutrition prescription at admission to avoid developing refeeding syndrome or other complications.

Treatment Options for Anorexia Nervosa

Treatment options for AN must be individualized for each patient. Treatment is most successful with the utilization of a multidisciplinary team approach including physicians, psychologists/psychiatrists, and dietitians.[8] The role of the dietitian is to utilize the Nutrition Care Process to identify nutrition diagnoses and establish a strategy for proper weight restoration.[8] The most simple, minimally invasive treatment option is outpatient care. The main goal for outpatient care is weight restoration of 0.2-0.5 kg per week to prevent severe complications from arising.[14] For patients either not gaining weight or not complaint with outpatient therapy, treatment may resort to more intense options such as partial hospitalization, inpatient hospitalization, or residential treatment centers.[13]

Partial hospitalization may be required for immediate care for patients that have not succeeded with outpatient care but are not in a severe enough state that they need 24 hour hospitalization.[3] Partial hospitalization monitors meals during the day, provides therapy (i.e., psychological and medical nutrition therapy), and engages the patients in activities with other

patients with AN. This type of treatment can last a few hours a day for 2-4 days up to 4-5 days of 8 hour supervision.[3] Inpatient hospitalization is required for patients with AN who exhibit acute medical instability (i.e., low blood pressure, severe bradycardia etc.). Inpatient hospitalization focuses on weight restoration, metabolic recovery to an anabolic state,[14] corrections of electrolyte balance, and reversal of any damage done from malnutrition.[6] Weight restoration is achieved by steadily increasing calorie intake to obtain a weight gain of 0.9-1.4 kg/week.[14] Calorie requirements in a patient that is malnourished may be as low as 1000-1400 kcals/day, however, it is the goal of treatment facilities to increase this amount every 24-48 hours to achieve an intake approximately 130% of estimated needs for metabolic recovery.[14] All treatment options are dependent on the patient's immediate needs and level of health, and rehabilitation should be tailored individually.

Inpatient Hospitalization Criteria and Protocols

According to the American Academy of Pediatrics,[3] the patient must be diagnosed with AN and exhibit one of the following symptoms for inpatient hospitalization: severe malnutrition where the patient is <75% of the average body weight for height, and gender, dehydration, electrolyte disturbances such as hypophosphatemia, hypokalemia, and hypomagnesemia, or cardiac dysrhythmias. In addition, a patient diagnosed with AN meets admission criteria if they show signs of physiological instability such as severe bradycardia (HR <50 bmp during daytime, <45 bpm during nighttime), low blood pressure (<80/50), low temperature (<96^{0}F), or a change in pulse or blood pressure by >20 bpm or 10 mmHg, respectively. Acute medical conditions such syncope, seizures, cardiac failure, and pancreatitis can also warrant the need for hospitalization. Furthermore, patients with AN may be admitted if outpatient treatment was not successful, if patients are exhibiting slowed physiological development, refusing food, or displaying signs of depression or suicidal tendencies. In addition to a weight restoration goal of 0.9-1.4 kg/week,[13] the healthcare team also focuses on normalizing eating patterns and correcting physiological

problems pertaining to malnutrition.[17] After admittance to the hospital, the healthcare team will determine the mode of feeding and the initial nutrition prescription.[14] The healthcare team will also frequently monitor nutrition labs and increase the calorie prescription every 24 to 48 hours as tolerated until the patient is stabilized enough for discharge.[5,14]

Nutrition Treatment Options

When a patient is hospitalized for AN, it is up to the healthcare team to decide which type of feeding would be most beneficial for the patient to yield proper weight restoration and normalize eating behaviors. The different types of feeding patterns that have been studied are oral diet with food and high-energy supplement drinks, nasogastric tube feeding, and parenteral nutrition (PN).[14] Research has shown that there are many benefits and disadvantages to each type of feeding mechanism.[18] When choosing a form of feeding mechanism, the decision is based upon recommendations by the healthcare team and desires of the patient and family. After the age of 18 patients are able to make their own healthcare decisions.

Oral feeding

Oral feeding is one of the most common feeding mechanisms used in medical inpatient treatment facilities for AN.[18] The advantages of oral feeding is that it acts as a teaching skill for normalizing eating behaviors, it is easier to manage by the healthcare team, and it is the least invasive treatment option.[18] On the other hand, less energy may be provided from food when compared to NG feeding or parenteral nutrition, because patients may continue to refuse food and weight restoration is slowed.[18] The Academy of Nutrition and Dietetics recommends that calorie prescriptions should be initiated at 1200 kcals/day and progressed based on tolerance.[19] According to the Children's Healthcare of Atlanta Clinical Practice Guidelines (Appendix A), calorie recommendations for patients receiving NG feedings begin at 30-40 kcals/kg and increase over time as tolerated. For example, for a patient weighing 40kg, the initial caloric prescription

would be ~1200-1600kcals/day. Few studies have examined oral diet administration and the impact of different calorie levels on weight restoration, length of stay, and prevalence of refeeding syndrome. However, some of these studies have evaluated an initial calorie prescription greater than 1200 kcals and the impact on outcomes.[15,17,19]

Golden et al (2013)[15] looked at adolescents and young adults, ages 10 to 21 years, that were admitted to the hospital for AN. This study assessed patients that were started at a prescription diet of >1400 kcals/day compared to those given <1400 kcals/day. Both groups had caloric increases of 200 kcals every 24-48 hours. The researchers decided to use this calorie range based on the evidence that refeeding syndrome occurs with calorie initiation >1400 kcals/day in malnourished patients. They found that starting patients at an average of 1500 kcals a day resulted in a shorter length of stay (13.0$\pm$7.3 days vs. 16.0$\pm$9.0 days; p=<0.0001). There were no differences in total weight gain between the lower calorie group (3.6 kg $\pm$2.3) and the higher calorie group (2.9 kg $\pm$1.9; p= .01) and rate of change in mean BMI (mBMI) was not significantly different. No subjects experienced refeeding syndrome; however 15.8% of the patients developed hypophosphatemia, 15.2% developed hypomagnesemia, and 20% developed hypokalemia. There were no significant electrolyte differences between the low and higher calorie groups.[15]

Garber et al (2013)[19] also compared lower calorie diets (800-1200 kcals) to higher calorie diets (1400-2400 kcals) and found similar results. Calorie prescription was advanced by 122 $\pm$ 8 kcals per day for the higher calorie group, and 98 $\pm$ 6 kcals per day for the lower calorie group. The rate of weight gained nearly doubled in the higher calorie group (0.27 kg $\pm$ 0.03) in comparison to the lower calorie group (0.14 kg $\pm$ 0.02) per day (p < .001). The patients with AN who received the lower calorie diet initially lost weight and did not start gaining weight until day 8 of their hospital stay. The higher calorie group also had a shorter length of stay (5.7 days shorter; p < 0.001), with a higher calorie prescription at discharge (250 kcals greater). In both groups there were no signs of refeeding syndrome. However, 45% of the patients had low serum

phosphorus levels, but there was no significant difference between the two diet prescription groups.[19]

Whitelaw et al (2010)[20] and reported that initiating nutrition at 1900 kcals a day was effective for weight restoration, but 37% required phosphate supplement. Therefore, Leclerc et al (2013)[17] conducted a study that initiated nutrition at 1500 kcals/day. The calorie prescription was advanced by 250 kcals on days two and three, and every other day until day seven. He observed that there was an average weight gain of 0.24 kg/day and only 3.5% of the patients needed a phosphate supplement. No patients experienced refeeding syndrome, no other electrolyte imbalances were observed, and average weight restoration was 1.7 kg/week.[17] From these studies, it appears that oral feeding can yield effective and beneficial results if calories are initiated at approximately 1500 kcals per day and progressed as tolerated.[15,17,19]

Enteral Feeding

Due to the complications associated with oral feeding such as food refusal and slow rate of weight gain, some hospitals have initiated NG tube feeding as a mechanism for feeding patients with AN. NG tube feeding has a history of effective use in treating conditions such as cancer, cystic fibrosis, and Crohn's disease and has also been considered to be a proper treatment option for AN.[9] Different types of NG tube feeding regimens have been studied, including continuous, nocturnal, and cyclic administration.[4,9,10] Agostino et al (2013)[4] examined continuous NG tube feeding (NG group) averaging an initial calorie intake of 1617 kcals/day compared to oral intake (bolus-fed group) averaging 1069 kcals upon admission. Of the patients receiving the NG tube, 94% of the subjects were female. NG calorie administration started between 1500-1800 kcal/day and increased by 200 kcals per day until the maximum calorie intake was achieved or patients had completed seven days on the NG tube. The bolus-fed group was started at 1000-1200 kcals/day, and increased by 150 kcals/day. This study found that the NG group had an average weight gain rate of 1.22 kg/week in the first week vs. 0.08 kg/week for bolus-fed group. Fifty-one

percent of the bolus group either lost weight or gained no weight during the first week, and only 6% in the NG group lost or gained no weight. The length of stay was also significantly lower in the NG group (33.8 ± 11 days) compared to the bolus group (50.9 ± 24 days; p=0.0002). There were no incidences of refeeding syndrome in either group.[4]

Robb et al (2002)[9] compared female patients with AN that were fed orally during the day with supplemental nocturnal NG feeding to those receiving only oral feedings during the day. Males were excluded from this study because of the limited number of males with AN. Orally fed patients were given a calorie prescription designed to promote weight gain of 1 to 2 kg/week. NG supplementation was given at a rate of 1.5 kcal/ml. On the first night the patients were receiving 600 kcals from the NG tube in addition to the daily oral feedings. The second night provided 1080 kcals and the third and all other succeeding nights supplemented the patient with 1200 kcals until discontinuation. NG feeding was ceased if the patient had reached 95% of his or her ideal body weight or 3 to 4 days prior to discharge. Despite both groups having similar lengths of stay (22.3 ± 13.5 days for NG group vs 22.1 ± 9.4 days for oral group), the NG supplemented group had a greater weight gain (5.4 ± 4 kg vs. 2.4 kg ± 1.8 kg; p= 0.0001).[9]

Rigaud et al (2007)[10] studied a supplemental cyclic NG regimen in addition to oral feedings and compared this group to only orally fed patients. Of the patients receiving cyclic NG regimen, 97% of the patients were female. Both groups were randomized to treatment with the main weight gain goal set at 1 kg/week. The cyclic NG group received cyclic enteral nutrition in the morning and/or afternoon hours. The cyclic NG group had better results concerning rate of weight gain (194 ± 14 g/day vs. 126 ± 19 g/day), weight gain (1.0 vs. 0.77 kg/week), and fat-free mass gain (56% vs. 49%; $p < 0.01$). This study did not examine LOS between the two groups.[10]

NG feeding is more invasive than oral feedings and patients may have trouble maintaining the weight they gained once the tube is removed. NG tube feeding also increases the risk for aspiration, nasal bleeding, reflux, and sinusitis.[18] However, from the aforementioned

studies, NG tube feeding can be a more effective and efficient mechanism for weight restoration, but there is always a risk for refeeding syndrome.[4,9,10,21]

Parenteral Nutrition

Several studies have evaluated the effectiveness of PN on weight restoration in patients with AN. Diamanti et al (2008)[22] examined patients with AN that were given 40 kcal/kg/day of PN, increasing to 60 kcal/kg/day by the end of week 1. Once the patients were receiving 50 kcal/kg/day, they were tapered off of the PN and given oral food. These patients were compared with a group of patients who were exclusively oral fed. Weekly weight gain was greater for the PN group (714.5 $\pm$ 13.4 g/week vs. 531.0 $\pm$ 8.2 g/week; $p<0.0001$) and the maximum caloric intake was also greater for those receiving PN (2175 $\pm$ 25.63 kcals vs. 2078 $\pm$ 37.15 kcals; $p<0.0001$). Even though the PN group sustained a greater weekly weight and higher calorie intake, the number of complications was also significantly higher than the oral fed group ($p=0.004$). All complications were resolved; however, some patients on PN experienced dangerous hypophosphatemia, hypopotassemia, leg edema, infections, and increases in liver enzyme levels. In addition to complications, the cost of the PN treatment was almost double the cost of oral treatment.[22]

Hotta et al (2014)[23] looked at PN for treating patients at home after they were discharged from the hospital. They found that the most common problems with PN was the rate of infections (4 out of 7 case reports) and the expense of the treatment was costly.[23] PN is rarely used in a clinical setting for patients with AN because of medical complications associated with this treatment such as infection, cardiac arrhythmias, changes in vascular endothelium, and arterial injury.[18] This is a very medically invasive and expensive treatment option without many proven benefits in this population.[18]

Other variables that were collected from the EHR included race, anthropometric measures (admission height in cm, admission weight in kg), calculated admission BMI, admission BMI category, and at risk for refeeding syndrome. Treatment for the prevention of refeeding syndrome was determined by those who were given any supplements (potassium, phosphorus, magnesium) to treat refeeding symptoms, whether or not refeeding syndrome was diagnosed. Admission BMI was categorized as Mild (BMI $\geq$17), Moderate (16-16.99), Severe (15-15.99) and Extreme (<15). De-identified patient data will be recorded onto a Microsoft Excel spreadsheet. Each patient was assigned a numeric identification code chosen at random. Exempt approvals from the IRB at Georgia State University and CHOA were obtained.

Statistical Analysis

The demographic, anthropometric, mode of nutrition therapy and clinical characteristics of the patient population were described using frequency statistics. Normality statistics was conducted on continuous variables (age, weight, height, LOS) to determine the appropriate descriptive measure of central tendency. A Student's t-test was used to examine differences in continuous variables by tube feeding status. For non-normally distributed data, a Mann-Whitney *U* test was conducted. The Chi-square test was used to examine differences in tube feeding status by categorical variables (gender, race, BMI category, treatment to prevent refeeding syndrome). All statistical analyses were performed using SPSS (version 23.0, SPSS, Inc., Chicago, IL). A p-value of <0.05 is considered statistically significant.

Chapter III

Methods

Sample Population

The study sample includes pre-adolescents and adolescents between the ages 9 and 20 years of age who were admitted to CHOA for clinical treatment of AN. All patients have been clinically diagnosed using the American Psychiatric Association's diagnostic classification under DSM-5 criteria. Patients with the Restricting Type and Binge-Eating/Purging Type of AN were included. Exclusion criteria include patients diagnosed with an eating disorder other than AN, including bulimia nervosa or binge eating disorder. Children with these conditions were excluded as they exhibit symptoms other than energy restriction alone, such as binging, purging, and laxative use. Patients whose length of stay was less than 2 days were also excluded from this study. This sample population consists of children with AN who were admitted between January 1, 2014 and December 31, 2015.

CHOA Inpatient Protocol

The protocol for treating patients with AN upon admission at CHOA is adapted from Texas Children's Hospital protocol. This protocol begins with initiating an oral diet to promote weight restoration > 90g per day for a minimum of four days (0.9-1.4 kg/week) (Appendix A). The diet order is a Regular Diet with no diet products, no caffeine and no food labels. If a patient does not achieve any weight gain within 48 hours of admission, then an NG tube feeding should be administered. For patients between the ages of 1-13 years old, Pediasure Enteral formula is generally used and for patients >14 years old, Osmolite may be used. NG caloric prescription is usually initiated at 30-40 kcals/kg taking age and percent of ideal body weight into consideration.

Caloric requirements and the enteral feeding rate (mL/hour) are determined by a Registered Dietitian. Initially, caloric administration is started lower than the recommended hourly rate and increased by 10 mL/hr every 4 hours until the goal rate is reached. Caloric intake is increased over time based on the dietitian's clinical judgment.

The NG group received a continuous NG infusion beginning 48 hours after admission if there was no weight gain. For example, the NG feeding regimen for a patient weighing 40 kg would be as follows: (40 kg x 30 kcals/kg = 1200 kcals/day. 1200 kcals divided by 24 hours = 50 mL of Osmolite (for patients > 14 years of age). For patients who are severely malnourished, NG administration may begin lower than the goal rate and increased by 10 mL/hr. The control group received food and high-energy supplements. Both NG and control groups were put on a 30-40 kcal/kg diet upon admission, and the calorie prescription was increased as tolerated.

Patients with AN were considered ready for discharge if their overnight heart rate was > 45 bpm, systolic blood pressure was > 90 and orthostatic heart rate changes were < 30 bpm. Additional discharge criteria included the patient must be asymptomatic, electrolyte imbalances must be corrected, the patient no longer needs a phosphate supplement, and the NG tube feeding must be discontinued 1-2 days prior to discharge. Follow up psychiatric care must also established before discharge is approved.

Study Design

This study is a retrospective medical record review of patients diagnosed with AN who were admitted to CHOA between January 1, 2014 and December 31, 2015. Data were extracted from the CHOA electronic health record (EHR). Variables included demographic characteristics (age in years, gender), LOS, and mode of nutrition therapy.

Chapter IV

Results

Data were collected and analyzed for 64 patients, with a mean age of 14.6 ± 2.4 years (range, 9 to 20 years). The majority of the population was female (93.8%) and Caucasian (92.2%) (Table 1). The median length of stay was 9 days (range, 3 to 35 days). The data distributions for age, admission weight, discharge weight, admission BMI, and discharge BMI were normally distributed while length of stay, height, and weight change were skewed.

Table 1. Demographic and Anthropometric Characteristics for the Total Population

Characteristic	Total Population (N=64)
Gender [n (%)]	
Female	60 (93.8)
Male	4 (6.3)
Race [n (%)]	
Caucasian	59 (92.2)
African American	1 (1.6)
Other	1 (1.6)
Unknown	3 (4.7)
Age (years)*	14.6± 2.4
Admission Weight (kg)*	41.3±9.26
Discharge Weight (kg)*	43.4±9.33
Height (cm)**	159.6 (154, 165)
Length of Stay (days)**	9.0 (6, 12.75)
Admission BMI (kg/m^2)*	16.03±2.44
Discharge BMI (kg/m^2)*	16.89±2.38
Weight Change (kg)**	1.7 (0.7, 3.1)

BMI – body mass index, kg – kilogram, cm – centimeter, m - meter
*Mean ± SD; **Median (Interquartile range 25%, 75%)

The demographic and anthropometric characteristics by mode of nutrition therapy are shown in Table 2. Approximately half (n=30, 47%) of the population received an NG tube during

the admission. Mean discharge BMI was significantly higher in those who received an oral diet vs. NG tube (16.67 vs. 17.08, respectively; p=0.042) while weight change was significantly lower (1.3 kg vs. 2.1 kg, respectively; p=0.012) and LOS shorter (8 days vs. 11 days, respectively; p=0.002). There were no significant differences in other characteristics by mode of nutrition therapy.

Table 2. Demographic and Anthropometric Characteristics by Mode of Nutrition Therapy

Characteristic	**Oral**	**NG Tube**	***P* value**
Age (years)*	14.7±2.25	14.5±2.64	0.418
Admission Weight (kg)*	42.4±8.75	39.94±9.79	0.306
Discharge Weight (kg)*	43.8±8.75	42.9±10.25	0.291
Admission BMI kg/m^2)*	16.5±2.16	15.5±2.66	0.087
Discharge BMI (kg/m^2)*	17.08±2.07	16.67±2.71	**0.042**
Length of Stay (days)**	8 (5%, 9.3%)	11 (7%, 21%)	**0.002**
Admission Height (cm)**	159.5 (154%, 165.6%)	159.75 (153.6%, 164.1%)	0.93
Weight change (kg)**	1.3 (0.4%, 2.3%)	2.1 (1.4%, 4%)	**0.012**

NG – nasogastric, BMI – body mass index, kg – kilogram, cm – centimeter, m – meter
*Mean ± SD; **Median (Interquartile range, 25%, 75%)

Differences in mode of nutrition therapy by categorical variables (gender, race, BMI category, treatment to prevent refeeding syndrome) are shown in Table 3. Treatment to prevent refeeding syndrome was determined by those who were given any supplements (potassium, phosphorus, magnesium) to treat symptoms, whether or not refeeding syndrome was diagnosed. The number of days on an NG tube was significantly greater in children and adolescents who were being treated for the prevention of refeeding syndrome vs. those who were not receiving mineral supplementation (8.5 vs. 5.5 days, respectively, p= 0.046). Forty-one patients (64.1%) received at least one supplement.

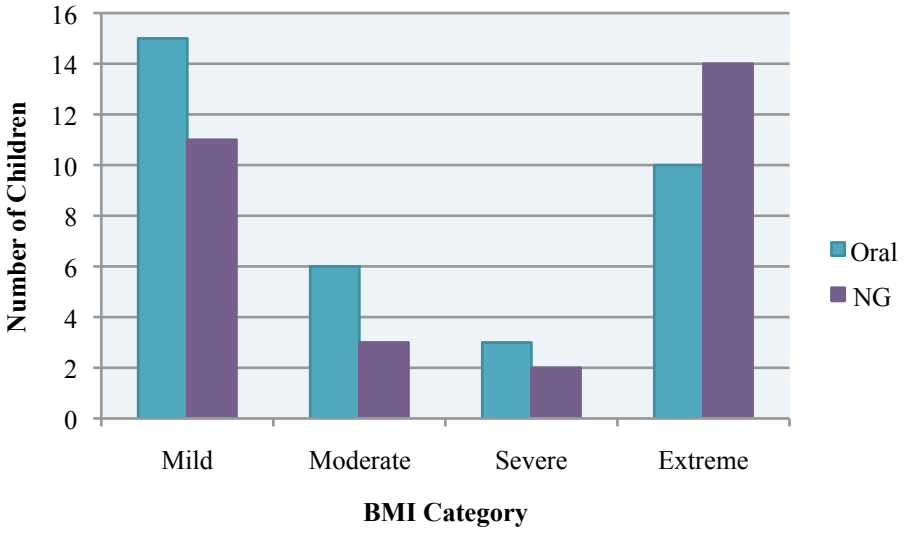
Table 3. Demographic and Anthropometric Frequencies by Mode of Nutrition Therapy

Characteristics	Oral (n)	NG Tube (n)	*P* Value
Gender			
Male	2	2	
Female	32	28	0.897
Race			
Caucasian	31	28	
African American	1	0	
Other	0	1	0.366
Admission BMI Category*			
Mild	15	11	
Moderate	6	3	
Severe	3	2	
Extreme	10	14	0.524
Discharge BMI category*			
Mild	19	12	
Moderate	5	4	
Severe	1	5	
Extreme	9	9	0.248
Treatment to Prevent Refeeding Syndrome			
Yes	21	20	
No	13	10	0.683

NG- nasogastric, BMI – body mass index
*BMI Category- Mild: BMI > 17 kg/m^2, Moderate: BMI 16–16.99 kg/m^2, Severe: BMI 15–15.99 kg/m^2, Extreme: BMI < 15 kg/m^2

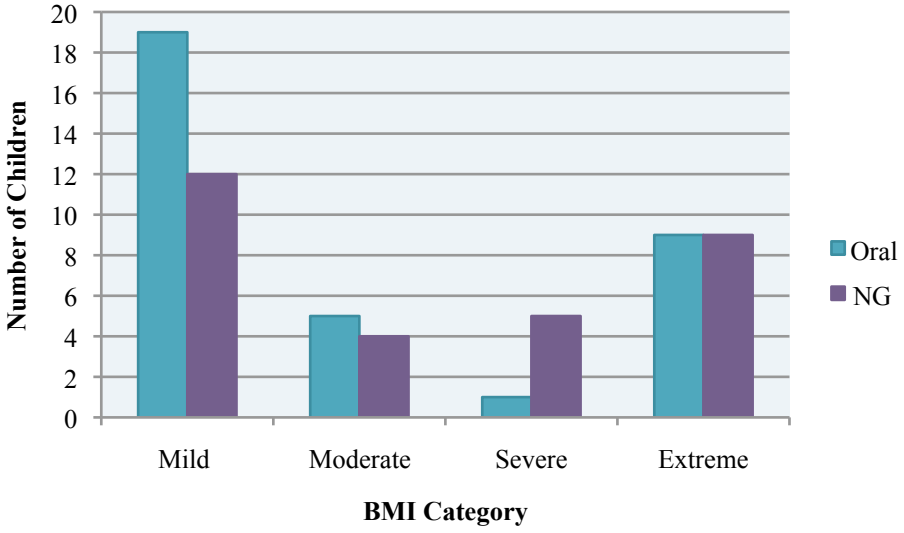
The degree of malnutrition (Mild, Moderate, Severe, and Extreme) upon admission and discharge by mode of nutrition therapy are shown in Figures 1-2. There was no significant difference between the BMI categories and the mode of nutrition therapy received by the patient.

Figure 1. Admission Body Mass Index Category by Mode of Nutrition Therapy



BMI – body mass index, NG - nasogastric

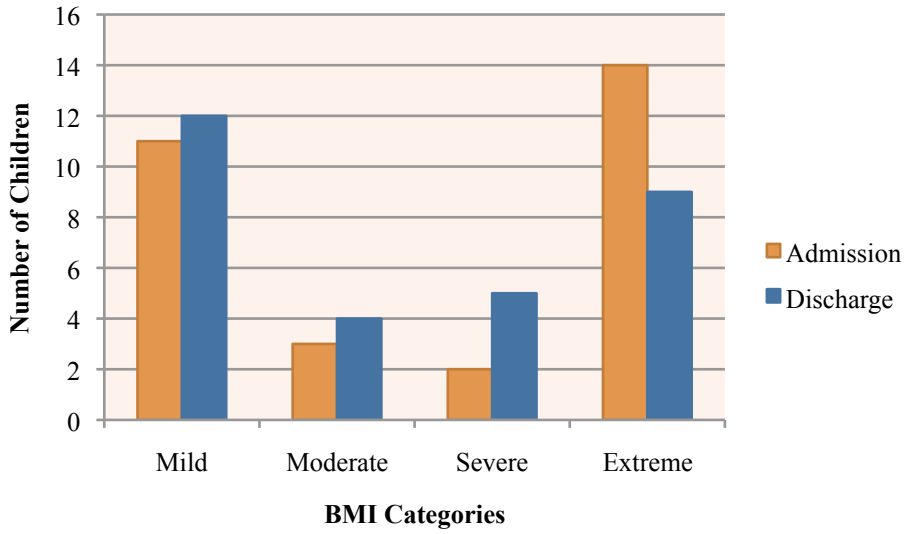
Figure 2. Discharge Body Mass Index Category by Mode of Nutrition Therapy



BMI – body mass index, NG - nasogastric

The differences between the admission BMI categories and discharge BMI categories for those patients only receiving the NG tube are shown in Figure 3. No significant difference between admission and discharge BMI categories was observed.

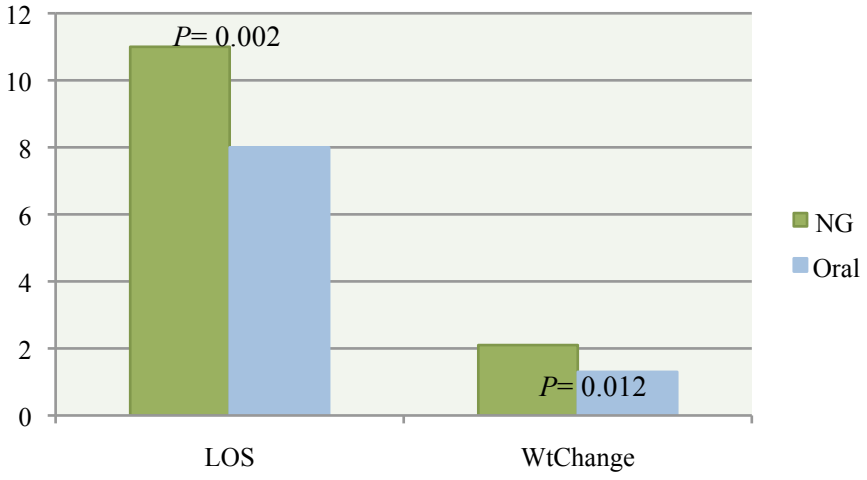
Figure 3. Admission and Discharge Body Mass Index Category for Children with a Nasogastric Tube



BMI – body mass index

Length of stay and weight change differed significantly by mode of nutrition therapy with both variables being lower in patients who received an oral diet vs. NG tube during admission (8 days vs. 11 days, respectively; p=0.002 and 1.3 kg vs. 2.1 kg, respectively; p=0.012) (Figure 4).

Figure 4. Length of Stay and Weight Change by Mode of Nutrition Therapy



LOS – length of stay; WtChange – Weight Change

Chapter V

Discussion

This study examined the association between demographic, clinical and anthropometric characteristics by feeding method (NG vs. oral) in a population of hospitalized children and adolescents diagnosed with anorexia nervosa. We found no significant difference in age, race, gender or admission or discharge anthropometrics by the mode of nutrition therapy received. We did observe a significantly longer LOS in those who received an NG tube. Patients who received an NG tube also showed a significant greater weight gain over the course of the admission compared to the exclusively orally fed group. This difference in weight change could be due to the NG group having a greater LOS, and therefore more opportunity to gain weight. Length of stay was not correlated with admission anthropometric measurements. Those that had a more severe admission BMI category did not have a greater length of stay nor differ in mode of nutrition therapy received. This could have been the result of some patients being discharged to long-term care and rehabilitation facilities soon after they were stabilized, and weight gain status and mode of nutrition was not representative of their full recovery. We observed no difference in the number of patients who were treated for the prevention of refeeding syndrome by mode of nutrition therapy. However, within the group of patients who received an NG tube, those who received supplementation had a significantly greater number of days on the NG tube. We fail to reject the null hypothesis that the number of patients who received an NG tube feeding during the admission differed by admission BMI classification. We also fail to reject the null hypothesis that LOS will not differ by mode of nutrition therapy. However, we do reject the null hypothesis that weight gain during admission would not differ by mode of nutrition therapy.

Our findings are consistent with those of Agostino et al. (2013), Robb et al. (2002), and Rigaud et al. (2007)[4,9,10], where patients who were receiving an NG tube had an overall greater weight gain than the orally fed group. However, our results differed in observed LOS from previous studies. Agostino found a shorter LOS in the NG group (33.8 $\pm$ 11 days vs. 50.9 $\pm$ 24 days) and Robb found similar lengths of stay between the NG and oral groups (22.3 $\pm$ 13.5 vs. 22.1 $\pm$ 9.4 days, respectively), where in the current study we observed a greater length of stay in the NG group.

This study has several limitations. Our sample size was small and the study population was comprised of predominately Caucasian females. Accordingly, the results may not be generalizable to the general population of adolescents with eating disorders. Treatment for the prevention of refeeding syndrome was assumed given mineral supplementation but no medical diagnosis data were available. This is problematic because supplementation can be dependent on other factors that do not necessarily lead to an association with refeeding syndrome.

Previous researchers have studied the importance of calorie administration at certain levels and nutrition prescription advancement in the patient population with AN. In comparison to the CHOA tube feeding protocol, not many studies have explained in depth the protocols used for nutrition advancement. CHOA's weigh gain goal was 0.9-1.4 kg per week in comparison to Rigaud et al. (2007) 1kg/week and Robb et al. (2002) 1-2 kg/week weight gain goal.[10,9] Riguad used an indirect calorimetry to estimate needs, Agostino et al (2013) estimated needs anywhere between 1000-1800 kcals based on age and mode of nutrition, and CHOA's protocol estimated needs around 30-40 kcals/kg.[4] For our population, this calorie administration averages between 1200 and 1600 kcals. In Robb's study, nutrition protocol was not discussed. With the limited protocol information and the slight differences in nutrition prescriptions, it is challenging to compare results in the effectiveness of one protocol over another.

Future studies should include multiple centers to achieve a greater sample size and a more diverse population. Future research also needs to examine daily weight gain trends to

observe weight gain difference and differences in caloric intake between days on the NG tube versus days exclusively orally fed. It would also be beneficial to follow patients' weight gain process through other facilities such as rehabilitation facilities to monitor full progress. The results of this study support initiation of an NG tube as part of the medical nutrition therapy plan for hospitalized preadolescents and adolescents diagnosed with anorexia nervosa to yield a greater weight gain outcome.

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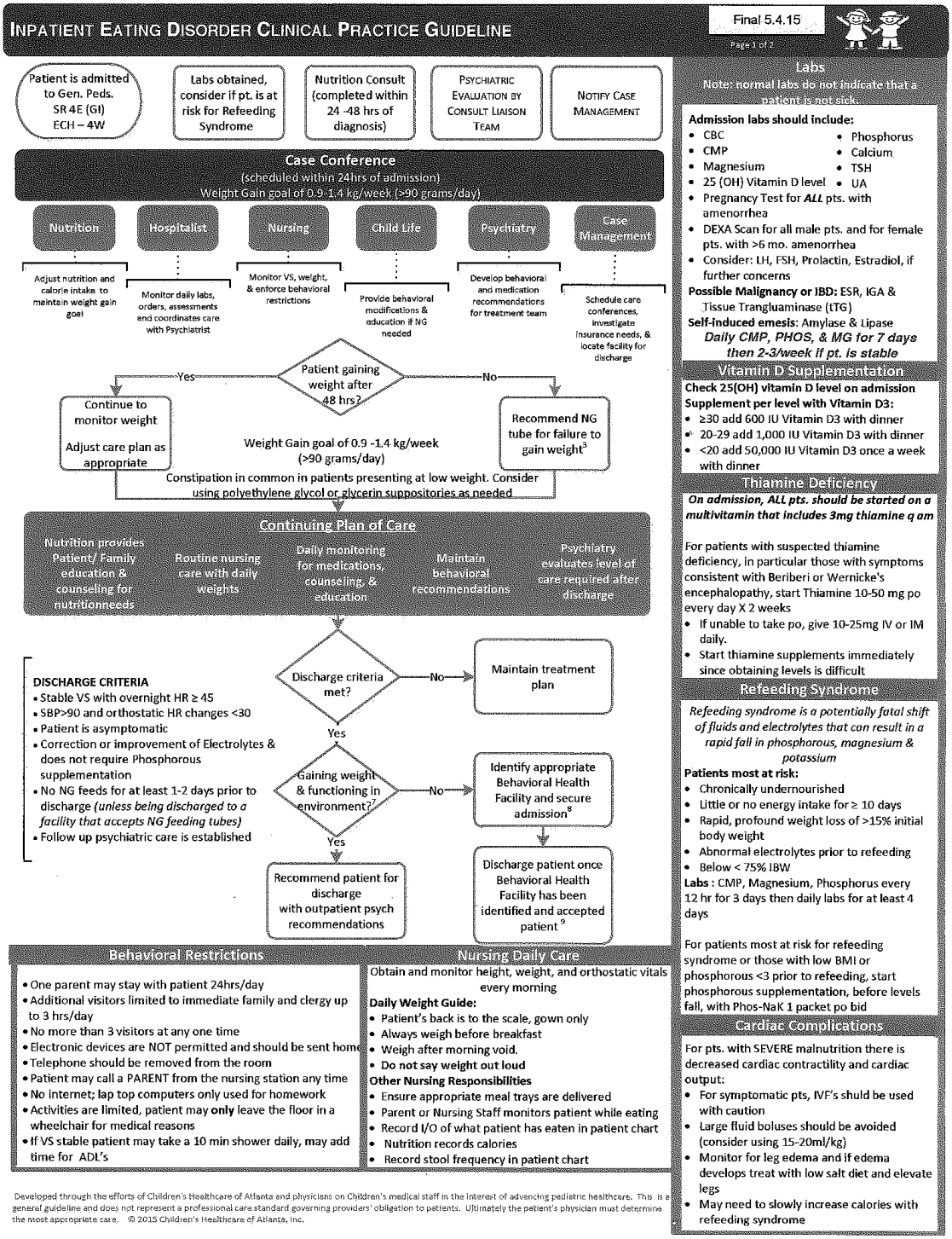
Appendix A


INPATIENT EATING DISORDER CLINICAL PRACTICE GUIDELINE
Final 5.4.15
Page 1 of 2
Patient is admitted to Gen. Peds. SR 4E (GI) ECH – 4W
Labs obtained, consider if pt. is at risk for Refeeding Syndrome
Nutrition Consult (completed within 24 -48 hrs of diagnosis)
PSYCHIATRIC EVALUATION BY CONSULT LIAISON TEAM
NOTIFY CASE MANAGEMENT
Case Conference
(scheduled within 24hrs of admission)
Weight Gain goal of 0.9-1.4 kg/week (>90 grams/day)
Nutrition
Hospitalist
Nursing
Child Life
Psychiatry
Case Management
Adjust nutrition and calorie intake to maintain weight gain goal
Monitor daily labs, orders, assessments and coordinates care with Psychiatrist
Monitor VS, weight, & enforce behavioral restrictions
Provide behavioral modifications & education if NG needed
Develop behavioral and medication recommendations for treatment team
Schedule care conferences, investigate insurance needs, & locate facility for discharge
Patient gaining weight after 48 hrs?
Yes
No
Continue to monitor weight
Adjust care plan as appropriate
Recommend NG tube for failure to gain weight[3]
Weight Gain goal of 0.9 -1.4 kg/week (>90 grams/day)
Constipation in common in patients presenting at low weight. Consider using polyethylene glycol or glycerin suppositories as needed
Continuing Plan of Care
Nutrition provides Patient/ Family education & counseling for nutritionneeds
Routine nursing care with daily weights
Daily monitoring for medications, counseling, & education
Maintain behavioral recommendations
Psychiatry evaluates level of care required after discharge
DISCHARGE CRITERIA
• Stable VS with overnight HR ≥ 45
• SBP>90 and orthostatic HR changes <30
• Patient is asymptomatic
• Correction or improvement of Electrolytes & does not require Phosphorous supplementation
• No NG feeds for at least 1-2 days prior to discharge (unless being discharged to a facility that accepts NG feeding tubes)
• Follow up psychiatric care is established
Discharge criteria met?
No
Maintain treatment plan
Yes
Gaining weight & functioning in environment?[7]
No
Identify appropriate Behavioral Health Facility and secure admission[8]
Yes
Recommend patient for discharge with outpatient psych recommendations
Discharge patient once Behavioral Health Facility has been identified and accepted patient [9]
Behavioral Restrictions
• One parent may stay with patient 24hrs/day
• Additional visitors limited to immediate family and clergy up to 3 hrs/day
• No more than 3 visitors at any one time
• Electronic devices are NOT permitted and should be sent home
• Telephone should be removed from the room
• Patient may call a PARENT from the nursing station any time
• No internet; lap top computers only used for homework
• Activities are limited, patient may only leave the floor in a wheelchair for medical reasons
• If VS stable patient may take a 10 min shower daily, may add time for ADL's
Nursing Daily Care
Obtain and monitor height, weight, and orthostatic vitals every morning
Daily Weight Guide:
• Patient's back is to the scale, gown only
• Always weigh before breakfast
• Weigh after morning void.
• Do not say weight out loud
Other Nursing Responsibilities
• Ensure appropriate meal trays are delivered
• Parent or Nursing Staff monitors patient while eating
• Record I/O of what patient has eaten in patient chart
• Nutrition records calories
• Record stool frequency in patient chart
Developed through the efforts of Children's Healthcare of Atlanta and physicians on Children's medical staff in the interest of advancing pediatric healthcare. This is a general guideline and does not represent a professional care standard governing providers' obligation to patients. Ultimately the patient's physician must determine the most appropriate care. © 2015 Children's Healthcare of Atlanta, Inc.
Labs
Note: normal labs do not indicate that a patient is not sick.
Admission labs should include:
• CBC
• CMP
• Magnesium
• 25 (OH) Vitamin D level
• Phosphorus
• Calcium
• TSH
• UA
• Pregnancy Test for ALL pts. with amenorrhea
• DEXA Scan for all male pts. and for female pts. with >6 mo. amenorrhea
• Consider: LH, FSH, Prolactin, Estradiol, if further concerns
Possible Malignancy or IBD: ESR, IGA & Tissue Trangluaminase (tTG)
Self-induced emesis: Amylase & Lipase
Daily CMP, PHOS, & MG for 7 days then 2-3/week if pt. is stable
Vitamin D Supplementation
Check 25(OH) vitamin D level on admission
Supplement per level with Vitamin D3:
• ≥30 add 600 IU Vitamin D3 with dinner
• 20-29 add 1,000 IU Vitamin D3 with dinner
• <20 add 50,000 IU Vitamin D3 once a week with dinner
Thiamine Deficiency
On admission, ALL pts. should be started on a multivitamin that includes 3mg thiamine q am
For patients with suspected thiamine deficiency, in particular those with symptoms consistent with Beriberi or Wernicke's encephalopathy, start Thiamine 10-50 mg po every day X 2 weeks
• If unable to take po, give 10-25mg IV or IM daily.
• Start thiamine supplements immediately since obtaining levels is difficult
Refeeding Syndrome
Refeeding syndrome is a potentially fatal shift of fluids and electrolytes that can result in a rapid fall in phosphorous, magnesium & potassium
Patients most at risk:
• Chronically undernourished
• Little or no energy intake for ≥ 10 days
• Rapid, profound weight loss of >15% initial body weight
• Abnormal electrolytes prior to refeeding
• Below < 75% IBW
Labs : CMP, Magnesium, Phosphorus every 12 hr for 3 days then daily labs for at least 4 days
For patients most at risk for refeeding syndrome or those with low BMI or phosphorous <3 prior to refeeding, start phosphorous supplementation, before levels fall, with Phos-NaK 1 packet po bid
Cardiac Complications
For pts. with SEVERE malnutrition there is decreased cardiac contractility and cardiac output:
• For symptomatic pts, IVF's shuld be used with caution
• Large fluid boluses should be avoided (consider using 15-20ml/kg)
• Monitor for leg edema and if edema develops treat with low salt diet and elevate legs
• May need to slowly increase calories with refeeding syndrome

Emergency Department: Guidelines for Patients Presenting with an Eating Disorder

Final 9.25.14

Patient referred to Emergency Department for Possible Admission for Medical Stabilization of an Eating Disorder

Patient presents to the Emergency Department with Symptoms Concerning for an Eating Disorder:
- Syncope
- Fatigue
- Dizziness
- Weight Loss

Is patient Suicidal?

YES → **INITIATE SUICIDE POLICY**

NO → **START MEDICAL EVALUATION FOR EATING DISORDERS PATIENTS**

Medical Evaluation for Eating Disorder Patient Includes:
- Check HR, BP, Temp
- Orthostatic VS
- Measure Height, Weight, BMI
- EKG

Labs: CBC, CMP, Phos, Mg, Calcium, Thyroid Function tests, add amylase if N/V
- UA
- Urine HcG (if amenorrheic)

IS PATIENT MEDICALLY STABLE?[1]

YES → **Discharge Home**
- Follow up with PCP within 48hrs
- Provide List of Local Eating disorder Resources

NO[1] → **Admit**

Consider Admission to PICU if: K<2.7, Phos. < 2.5 Mg <1.3, Ionized Ca < 3.0

Is HR < 40, Sys BP < 80 or QTc > 0.45?

YES to ANY → Admit to PICU

NO to ALL → Admit to General Care

CONTINUE ON INPATIENT EATING DISORDER GUIDELINE

INCLUSION CRITERIA

Potential Presenting Symptoms for Patients with Undiagnosed Eating Disorc
- Weight loss
- Fatigue
- Dizziness or syncope
- Seizures
- Constipation
- Dehydration
- Palpitations
- Chest pain
- Abdominal pain
- Spontaneous or low impact fractures

DIAGNOSTIC CRITERIA

If any patient has clinical or symptomatic instability as a result of any of the followin criteria AND a suspected or confirmed Eati Disorder consider that they may be medica unstable and need admission for medical stabilization.

Clinical Criteria to assess for a Medical Unstable Eating Disorder Patient:
- Pulse < 50
- Body Temp < 96 F
- Systolic BP < 90 mm Hg
- Corrected QT Interval > 0.45
- Orthostatic changes in pulse of > 20 bpm, Blood pressure change > 10 mm Hg
- Serum potassium ≤ 3.2 mmol/L
- Serum chloride < 88 mmol/L
- Renal compromise (elevation of baseline Creatinine)
- Hepatic compromise (elevated liver enzymes)
- Any other severe electrolyte abnormality
- GI bleeding, hematemesis, esophageal tears
- Dehydration, intractable vomiting
- Any patient with refusal to eat
- Suicidal

COMPLICATIONS

Even though these patients may not appear be overtly ill, they are in danger of severe medical complications including:
- Refeeding syndrome
- Cardiac dysrhythmias
- Severe hypotension
- Severe bradycardia (especially during sleep)
- Hepatic failure
- Hypokalemia
- Hypomagnesemia
- Hypophosphatemia
- Hypoglycemia
- Leukopenia
- Anemia
- Heart failure: *avoid IVFs or other large volumes of fluids*
- Pericardial Effusion
- SMA
- Sudden death

Children's Healthcare of Atlanta

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Eating Disorder Patient:

An eating disorder patient is defined as a patient who has been diagnosed with one of the following:
Pica
Rumination Disorder
Avoidant/Restrictive Food Intake Disorder
Anorexia Nervosa
Bulimia Nervosa
Binge Eating Disorder
Other Specified Feeding or Eating Disorder

- Atypical Anorexia Nervosa
- Bulimia Nervosa (of low frequency&/or limited Duration
- Purging disorder

Unspecified Eating Disorder

Recommendation of Caloric Intake:

Goal is for patient to achieve weight gain of > 90 grams per day for a minimum of 4 days (0.9-1.4 kg per week)

Reference:

American Psychiatric Association. (2006). *Practice Guidelines for the Treatment of Patients with Eating Disorders* (3rd Edition). American Journal of Psychiatry.
Pediatric Nutrition Reference Guide., 9th Edition. 2010. Texas Children's Hospital.

NG Tube Recommendation with Failure to Gain Weight:

- If Patient fails to achieve weight gain of > 90 grams per day, then an NG tube is recommended by the nutrition team
- CHOA uses the relevant formula product below for NG tube feeding. This standard formula is used unless the patient has a documented food allergy intolerance requiring a specialized formula.
- Pediasure Enteral: patients ages 1-13
- Osmolite: patients 14 years and above
- APA guidelines recommend starting NG feed at 30-40 cals/kg for a patient with an eating disorder and then increasing that over time.
- The nutritionist can increase or decrease that number based on their clinical judgment and many factors may be considered (i.e. If the patient has been starving themselves for several weeks prior to admission, fewer calories would be recommended initially and increased gradually. If the patient had started NG feeding in a different setting prior to admission, they could be started with more calories, etc.).
- The age of the patient and % of ideal body weight faction in determining the number of calories. In a standard scenario, a 40 kg patient would need 30cals/kg (40X 30 = 1200 calories). 1200 calories divided by 24hrs in a day = 50 ml of Osmolite Recommended to start with lower flow, such as 10 ml/hr. and advance by 10 ml/hr. every 4 hours to the goal rate.

Reference: *Pediatric Nutrition Reference Guide*., 9th Edition. 2010. Texas Children's Hospital.

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Participate in Behavioral Management:

- Motivational techniques for patient recovery
- Therapy (by MD or Clinical Nurse Specialist)

References:

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Washington, DC.

W. R. Miller & S. Rollnick, *Motivational interviewing: Preparing people for change* (2002, 2nd ed). New York: Guilford Press.

Develop Behavioral Recommendations for Treatment Plan:

- Inform other members of treatment team of special requirements for patient
- Typically patients under the recommended weight will be asked not to walk or exercise
- Patient is required to travel in a wheelchair so that they do not expend unnecessary energy/calories
- which they need to stabilize their weight

Reference:

American Psychiatric Association. (2000). *Practice Guidelines for the Treatment of Patients with Eating Disorders* (Revision). American Journal of Psychiatry, 152, 1070-1072.

Patterson, G. & Forgatch, M. *Parents and Adolescents Living Together, Part 1 and Part 2*. (1987). Castalia

Does Patient Require Medication?

Meds are required if patient has

- Depression interfering with treatment
- Anxiety interfering with treatment
- Psychosis interfering with treatment
- Disordered thoughts related to eating disorder
- Agitation interfering with treatment

Further Inpatient Psychiatric Care Required?

Indicators that patient may require Inpatient Psychiatric care:

- Failure to gain weight in acute inpatient setting or
- Failure to function in Med/Surg setting due to severity of Psychiatric conditions

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Identify Appropriate Behavioral Health Facility and Secure Admission:

- Review list of appropriate inpatient behavioral health facilities (in Addendum)
- Call the individual facilities to request a bed
- Send required paperwork to facility. Include patient medical record.

Behavioral Health Facility has Accepted Patient:

Patient has been accepted when the following items are in place:

- Verified Clinical Acceptance from Psychiatric Facility
- Verified Financial Agreement between facility and family

Is patient stable for discharge?

- Stable VS with overnight HR ≥ 45
- SBP>90 and orthostatic HR changes <30
- Patient is asymptomatic
- Correction or improvement of Electrolytes & does not require Phosphorous supplementation
- No NG feeds for at least 1-2 days prior to discharge *(unless being discharged to a facility that accepts NG feeding tubes)*
- Follow up psychiatric care is established

Execute Behavioral Plans for Patient (Child Life Specialists)- References:

Koller, Donna. *Child life Council Evidence-Based Practice Statement: Preparing Children and Adolescents for Medical Procedure*. November 2007. Child Life Council Executive Board.

Koller, Donna. *Child Life Assessment: Variables Associated with a Child's ability to Cope with Hospitalization.* August 2008. Child Life Council Executive Board.