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Original article

Evaluation of a Nutrition Rehabilitation Protocol in Hospitalized Adolescents With Restrictive Eating Disorders

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A B S T R A C T

Purpose: Nutritional rehabilitation is an essential part of inpatient treatment for adolescents with restrictive eating disorders (ED). The purpose of this study was to examine weight gain, prevalence of refeeding syndrome, and nutritional composition of the diet in hospitalized adolescents with anorexia nervosa (AN) and eating disorder not otherwise specified (EDNOS), restrictive type, on a structured nutrition rehabilitation protocol (NRP).

Methods: An evidence-based NRP was implemented on the inpatient eating disorders unit at the Hospital for Sick Children in June 2011. Adolescents 12–18 years of age with AN or EDNOS, an ideal body weight (IBW) of 70% or greater, no clinical or metabolic signs of refeeding syndrome, and on their first admission were assigned to the NRP. A retrospective chart review between June 2011 and June 2012 was completed. A repeated measures analysis was used to determine the mean rate of weight gain. Mean cumulative % change in body mass index (BMI) was plotted against days to assess daily weight trajectory.

Results: Twenty-nine patients, mean age of 14.7 (SD ± 1.5) years, were included in the study. A total of 3.5% developed hypophosphatemia on day 1. Mean weight gain was .24 kg/day ($p < .0001$) and 1.7 kg/week. An increase in mean cumulative % change in BMI was observed from days 2–14. Actual caloric intake was 98%–113% of the prescribed intake. Macronutrient distribution was within acceptable limits based on dietary reference intakes.

Conclusions: The NRP is considered effective, efficient, and safe. Further research is needed to explore the effectiveness and safety of NRPs in other populations.

IMPLICATIONS AND CONTRIBUTION

This study evaluated a newly developed nutrition rehabilitation protocol in 29 hospitalized adolescents with anorexia nervosa and eating disorder not otherwise specified, restrictive type, and demonstrated a mean weight gain of 1.7 kg/week with minimal adverse events. The study supports an efficient, effective, and safe approach to oral nutritional rehabilitation in this population.

Nutritional rehabilitation is an essential component of inpatient treatment for underweight or medically compromised adolescents with anorexia nervosa (AN) [1]. The goals of nutritional rehabilitation are to restore weight, normalize eating patterns, and correct the physical and psychological complications of malnutrition [1–7]. However, one of the medical

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complications that can occur when reintroducing nutrition for severely malnourished patients is refeeding syndrome. Refeeding syndrome is described as the potentially life-threatening shift in fluid and electrolytes (particularly phosphate) from the extracellular to intracellular spaces upon refeeding [8]. Therefore, one of the main concerns when initiating nutrition for adolescents with AN and eating disorder not otherwise specified (EDNOS), restrictive type, is to minimize or prevent refeeding syndrome from occurring.

There are currently no published data on the most effective inpatient method of refeeding adolescents with AN or EDNOS, restrictive type. Current practice for nutritional rehabilitation in adolescents is based primarily on experience and general consensus [9,10]. Nutritional guidelines are based on the premise of starting nutrition at a low caloric level and increasing slowly to avoid refeeding syndrome. However, there is recent evidence to suggest that if patients' nutrition is started at a low-energy intake and advanced too slowly, they may develop "underfeeding syndrome," which can also result in severe complications, including death [9]. Further, refeeding slowly also delays medical stabilization and lengthens hospital stay [11].

Because of this lack of scientific evidence and risks of under- and overfeeding, researchers have started to investigate feeding regimes in hospitalized adolescents with AN. Garber et al. [11] used a conservative oral refeeding protocol with 35 subjects and found a weight loss trend in the first week of admission. Eighty-three percent of patients initially lost weight on the protocol and weight gain was not seen until protocol day 8. Nutrition was initiated at a mean intake of 1,205 kcal/d (range of 800–2200 kcal/day) depending on the 24-hour recall and advanced by 200 kcal every other day. Twenty percent of patients had low serum phosphorus and received supplementation. Garber et al. [11] concluded that more aggressive feeding protocols are required for adolescents with AN to encourage faster and more consistent weight gain to stabilize patients as well as shorten hospital stays.

In contrast, a retrospective chart review by Whitelaw et al. [12] demonstrated that using an aggressive oral refeeding approach, initiating nutrition at a minimum of 1,900 kcal/d and increasing up to 2,200 kcal on day 3 and 2,700 kcal on day 5 (with further increments of 300 kcal as required) resulted in appropriate weight gain, but 37% of patients required phosphate supplementation for hypophosphatemia.

Based on the current literature, the Eating Disorders Program at the Hospital for Sick Children (SickKids) developed and evaluated an oral nutrition rehabilitation protocol (NRP) (Figure 1) [1–12]. The purpose of this study was to examine the rate of weight gain, the prevalence of refeeding syndrome, and nutritionally analyze the prescribed oral diet in hospitalized adolescents with AN and EDNOS, restrictive type, on a structured NRP during the first 2 weeks of hospitalization on a specialized pediatric eating disorder ward.

Methods

Study setting and design

The NRP was implemented in June 2011 on the eating disorders inpatient unit at SickKids. A retrospective chart review was completed on all inpatients who were started on the NRP between June 2011 and June 2012. Initial descriptive data were collected from their first full day of admission (day 1).

Subjects

Subjects included adolescents between 12 and 18 years of age who met the strict Diagnostic and Statistical Manual for Mental Disorders, Fourth Edition (DSM-IV) criteria for AN or EDNOS (restrictive type), were medically unstable as defined by the criteria outlined in the Society for Adolescent Health and Medicine position paper on adolescent eating disorders [1] and were on their first hospital admission. Patients were excluded from the NRP if they were below 70% of their ideal body weight (IBW) or had any clinical or metabolic signs of refeeding syndrome on admission. IBW was determined for each patient using the patient's history of weight and height plotted on the Centers for Disease Control and Prevention (CDC) growth curves, 50th percentile body mass index (BMI)-for-age using the CDC growth curves, menstrual threshold weight, and body composition values.

A total of 98 patients were admitted to the inpatient eating disorders program between June 2011 and June 2012. Of these patients, 29 participated in this study. The remaining patients were excluded because they were under the age of 12 ($n = 21$); were below 70% of their IBW ($n = 11$); had a previous hospital admission ($n = 23$); did not meet the DSM-IV criteria for AN or EDNOS, restrictive type ($n = 3$); were mistakenly not started on the NRP ($n = 6$); or the clinicians did not correctly follow the NRP as delineated ($n = 5$).

This study was reviewed and approved by the Research Ethics Board at SickKids.

Inpatient nutrition rehabilitation protocol

An evidence-based NRP was developed and implemented on the inpatient eating disorders unit at SickKids in June 2011 [1–12]. The NRP was initiated on the first full day of admission at 1,500 kcal, with three meals and three snacks, each 250 kcal. All meals and snacks were provided as food and taken orally. The prescribed nutrition was advanced 250 kcal on days 2 and 3 and 250 kcal every other day up until day 7 when the patient was receiving 2,500 kcal per day (Figure 1). Thereafter, nutrition was increased as required based on a minimum weight gain of 1.0 kg per week; nutritional increases were given for maintenance of weight or weight loss in increments of 250 kcal. Inpatients were supported through all meals and snacks by parents with the support of frontline staff or by frontline staff alone. An oral nutritionally complete liquid supplement was given to replace a food item that was refused (total caloric equivalent replacement). The protocol required that any subject needing nasogastric supplementation was to be removed from the study.

Patients were placed on set nonselective menus during the first 2 weeks of admission. Nonselect menus are predetermined menus based on energy (kcal) and food group requirements. These set menus were analyzed for macronutrient composition using Computrition Hospitality Suite NCM Select software v.17.5 (Computrition, Inc, Chatsworth, CA). Calcium, vitamin D, and a multivitamin were provided to all patients as part of standard treatment (Figure 1).

During the first 2 weeks of hospitalization, patients were either on bed rest or participated in minimal activity, which included walking to and from meals and therapeutic groups on the inpatient unit.

Data collection

Data were collected from a retrospective review of patients' medical records. Dietitians (A.L., T.T., and K.S.) reviewed the charts