



## Editorial

## Refeeding Hospitalized Adolescents With Anorexia Nervosa: Is “Start Low, Advance Slow” Urban Legend or Evidence Based?

Weight restoration and nutritional management of adolescents with anorexia nervosa (AN) are essential parts of treatment. Without it, adolescents may face serious or even fatal medical complications [1]. Starvation-induced cognitive deficits make it challenging to do psychological intervention. Therefore, one cannot effectively treat adolescents with AN without first restoring their body weight. Although this is a fundamental component of treatment, the principles of nutritional rehabilitation have received little attention, and current practice is based largely on experience and consensus rather than on published evidence.

During the past 8 years, a number of professional organizations have published nutritional treatment guidelines [2–14]; very few have focused specifically on children and adolescents [5,8]. The Committee on Adolescents at the American Academy of Pediatrics published a policy statement on *Identifying and Treating Eating Disorders* that documented that the “refeeding syndrome can occur in severely malnourished patients who receive nutritional replenishment too rapidly” and recommended that “slow refeeding with the possible addition of phosphorous supplementation, is required to prevent development of the refeeding syndrome in severely malnourished children and adolescents” [5]. The Society for Adolescent Health and Medicine published a position paper on eating disorders in adolescents and recommended that “the risk of refeeding syndrome should be avoided through gradual increase of caloric intake and close monitoring of weight, vital signs, fluid shifts and serum electrolytes” [8]. In both these pediatric-focused articles, no specific approaches to refeeding were provided [5,8]. Unfortunately, current practice guidelines, position statements, and position papers lack scientific evidence to support their recommendations [2–14].

In this issue of *Journal of Adolescent Health*, Garber et al [15] provide the first study to document and evaluate the daily weight trajectory of hospitalized adolescents with AN, based on a recommended refeeding protocol for nutritional rehabilitation [2–4]. The recommended and conservative protocol examined in this study demonstrated a mean weight gain of almost 2.42 kg or .15 kg/d during the hospital stay of 17 days. Importantly, more than 80% of subjects experienced a significant initial weight loss, with weight gain not observed until day 8 of hospitalization.

Interpreting the weight changes observed during the first week of refeeding in this patient population is complex. The protocol started with an oral intake of approximately 1,200 kcal depending on the 24-hour recall; those with lower calorie intake before admission started at a lower calorie intake, and all patients were advanced 200 kcal every other day. Based on the results of this study, it is clear that starting a starved, hypometabolic adolescent with AN on 1,200 kcal is insufficient to meet the young person’s resting energy expenditure, physical activity, thermal effect of food, and insensible losses. This, coupled with the slow increase in caloric intake over time (200 calories every other day), contributed to the observed weight loss. Further, some of the weight loss during the first week of hospitalization could also be attributed to the fluid status of the patients at the time of admission. Some adolescents admitted to hospital are volume depleted, whereas others may have significant increases in fluid due to aggressive intravenous or oral repletion or water loading. Even with judicious and slow initiation of caloric intake, the most medically compromised adolescents may experience fluid shifts, with weight gain initially and diuresis on refeeding [16]. Further, the evidence suggests that patients with AN may have impaired osmoregulation caused by a number of factors, including abnormalities in osmoregulation of vasopressin, intrinsic renal defects, and the influence of antidepressants often used in the treatment of patients with AN [16]. Together, these complex pathophysiological processes can make it difficult to understand and interpret the weight changes observed in the first several weeks of hospitalization.

In addition, the aforementioned tested refeeding protocol [2–4] with the concomitant weight loss may contribute to the prolongation of medical instability of these already very sick adolescents with AN. Importantly, a report from the Management of Really Sick Patients with Anorexia Nervosa working group described cases where overzealous application of current refeeding guidelines resulted in death due to underfeeding [10]. This newly reported phenomenon referred to as the “underfeeding syndrome” occurs when nutrition is increased too slowly. Because of these case reports, the Management of Really Sick

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Patients with Anorexia Nervosa guidelines clearly articulate that the inpatient medical team should avoid the “underfeeding syndrome” caused by overly cautious rates of refeeding.

A study by Garber et al [15] has stimulated thought and raised questions. The edict “start low, advance slow,” as it relates to nutritional rehabilitation of hospitalized adolescents with AN, clearly needs to be challenged. Starting low and advancing slow, as per the protocol implemented in this study, resulted in weight loss in the first week, prolonged hospitalization, and delayed nutritional repletion. What is clear from Garber et al’s study is that the best possible dietary intervention for effecting safe weight gain, especially in the first week of hospitalization, is unknown; the optimal refeeding regime remains to be determined. Efficient, effective, and safe refeeding protocols that maximize safe weight gain should result in shorter periods of medical instability and briefer hospital stays. Shorter hospitalizations and weight restoration should also minimize disruption to the adolescent’s family, education, and social life, and allow for patients and families to engage in outpatient treatments such as family-based treatment that reduce costly inpatient stays [17].

Garber et al [15] have set the stage for further exploration. Randomized trials are needed to compare refeeding protocols for safety and efficiency throughout the course of hospitalization. Dietary composition, in particular, macronutrient and micronutrient distribution, its impact on refeeding, and the safety and efficacy with which refeeding occurs in hospitalized adolescents with AN need to be studied. Other refeeding techniques such as enteral or parenteral nutrition used alone or as adjunctive methods also need to be compared with oral nutritional rehabilitation for safety, efficacy, and tolerability. As a start, a recent study [18,19] found that initial refeeding with continuous nasogastric tube feedings at a minimum of 2,000 kcal/d (40% of total energy from carbohydrates), graduating to intermittent daytime oral feeds with phosphate supplementation (20–25 mg/kg daily; divided into 2 doses), resulted in > 2.1 kg weight gain in the first week. The authors reported no difficulties in reestablishing an oral diet. Further, clinical trials that examine the optimal approach to refeeding and explore the relationship between biological and psychological factors to weight gain need to be performed.

The time has come for us to challenge the edict “start low, advance slow,” as it pertains to refeeding hospitalized adolescents with AN. But before we can confidently debunk this claim, we need more scientific evidence. Thanks to Garber et al [15], we are on our way!

Debra K. Katzman, M.D., F.R.C.P.(C)

*Division of Adolescent Medicine*

*Department of Paediatrics*

*The Hospital for Sick Children and University of Toronto  
Toronto, Canada*

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