Bridging the Gap: USDA Dietary Guidelines vs. Refeeding Diet for Anorexia Nervosa

Unstructured Abstract

USDA dietary guidelines are drastically different from the dietary guidelines for refeeding individuals with anorexia nervosa (AN). While the refeeding guidelines are set to promote maximum safe weight gain during hospitalization, they achieve this goal with high fat, high sugar, and energy dense foods—foods that dietitians strongly discourage for most other populations. An extensive literature review suggests that the current refeeding diet may be predisposing patients with AN to unfavorable biological changes, such as hypercholesterolemia and dyslipidemia. Furthermore, the speed and transition of refeeding must be reevaluated, as should the increasingly frequent use of novel antipsychotics that promote weight gain. Clinical recommendations are to promote weight gain using healthier alternatives, and when not possible, to incorporate nutrition counseling sessions that include transitioning from a refeeding diet to the general USDA Guidelines when weight maintenance becomes the therapeutic goal. Further research on healthy inpatient refeeding diets for AN is recommended.

Introduction

Anorexia nervosa (AN) is characterized by low body weight and overvaluation of shape and weight; leading to rigid restriction of food intake, fear of weight gain, and body image disturbances (1). The pathophysiology of AN, as well as other eating disorders, remains incompletely understood, and AN continues to have the highest mortality rate of any psychiatric disorder (1). According to the Diagnostic and

Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) of the American Psychiatric Association to be released May 2013, the new diagnosis of AN will require fulfillment of the following diagnostic criteria: restriction of energy intake leading to significantly low body weight in the context of age-dependent developmental trajectory, intense fear of weight gain, and severe body image disturbance (2). Within AN, there are two subtypes: restricting type and binge eating/purging type. Restricting-type AN is the absence of binge/purge cycles, whereas binge/purge-type AN is characterized by recurrent binge eating and acts of self-induced vomiting, laxative use, diuretics, or enemas within the last three months (2). Unresolved AN may lead to pulmonary, nutritional, cardiovascular, gastrointestinal, and endocrine complications (1).

Guidelines for appropriate weight gain during treatment vary across sources (3). The National Institute for Clinical Excellence (2004) recommends a 0.5 kg gain per week in outpatient settings (3). Inpatient weight gain parameters are 1 kg per week, which equates to approximately 7000 kcal to be consumed in excess of normal energy requirements per week, or 1000 extra kcal/day (3). In order to achieve this significant increase in calories, dietitians may resort to high-calorie supplement drinks, high-calorie food options, or both (3). Such high-calorie food options include chocolates, ice creams, pastries, sugary beverages, and other non-nutrient dense baked products (3). While this meal prescription will achieve the desirable weight gain, these recommendations contradict the dietary guidelines laid out by the USDA, NZ Ministry of Health, and other leading healthcare bodies that advocate for weight

gain by consuming healthy foods instead of sugar-laden sweets and beverages (4). Therefore, it is proposed that rather than adopting an approach for individuals with AN that differs from authoritative guidelines, that dietitians should focus on promoting a well-balanced diet by reincorporating food groups that were previously eliminated (3). Patients should be encouraged to meet energy needs with a variety of foods, modeling normal eating habits, rather than with only carbohydrate and fat sources. Weight gain with a low-fat diet would be difficult due to the high food volume that would be needed to satisfy increased caloric requirements. Thus, a more realistic approach is to emphasize the importance of balance, variety, and moderation with all food groups, with the end goal of returning to a healthy weight and more normalized healthy eating.

USDA Dietary Guidelines and Recommendations

Due to the steadily escalating obesity epidemic (5), recent government and public health efforts have been designed to promote improved nutrition and increased physical activity. According to the *2010 Dietary Guidelines for Americans*, Americans are encouraged to consume more healthy foods like fruits, vegetables, whole grains, fat-free and low-fat dairy products, and seafood, and to consume less sodium, saturated and trans fats, added sugars, and refined grains (6). Furthermore, the USDA recommends adhering to the 'plate method' (making half of the plate fruit and vegetables), avoiding oversized portions, and consuming approximately 2,000 kcal each day (7). A healthier lifestyle, according to the American Cancer Society, includes choosing primarily whole vegetables and fruits instead of juices (8).

Furthermore, the Dietary Reference Intake committee has determined that in order to provide adequate nutrients and reduce chronic disease, the ideal composition of a diet is 45-65 percent total kilocalories from carbohydrate, 20-35 percent from fat, and 10-35 percent from protein (9).

The Refeeding Diet for Anorexia Nervosa

In contrast, the refeeding regimen for AN centers around energy dense foods in order to promote maximum weight gain while hospitalized (10). During the refeeding phase, patients' resting energy expenditure markedly increases due to metabolic and hormonal effects (11). During this hypermetabolic phase, higher than normal energy intake may be necessary for weight restoration (11). Furthermore, the restricting subtype of AN requires more energy to promote weight gain than the binge eating/purging type during refeeding and subsequent post-weight restoration phases (11). Literature regarding exact energy requirements for refeeding is inconclusive but typically, for an adolescent thirteen years or older, a diet of 2700-3000 kcal/day is recommended (3). This takes into account resting energy expenditure, thermal expenditure, insensible losses, and weight gain (3). A 5000-7000 kcal excess is needed for the recommended 0.5-1kg/wk-weight gain (3). Some inpatient programs even recommend attaining an intake of 4000-5000 kcal/day, while others peak at 3000-3600 kcal/day (3). In order to achieve the recommended weight gain prior to discharge, clinicians and dietitians involved in the refeeding process may turn to high calorie, non nutrient-dense foods, but there is little evidence to support that this current diet composition is actually desirable.

Research supports nutritional rehabilitation centered on a wide variety of foods and encouragement of regular eating patterns in order to ensure that food intake is adequate (3).

Refeeding Too Quickly?

In addition to the question of diet composition, the issues of time and transition of refeeding must be addressed. Typically, a target weight goal is determined and a weight gain of 2-3 pounds/week for inpatients and 1-2 pounds/week for outpatients is recommended (12). However, this weight gain should not be initiated too rapidly, as refeeding syndrome (a potentially fatal shift in fluid and electrolytes) must be taken into consideration for many malnourished eating disorder patients (13). Moreover, depletion of phosphorus as well as fluxes in magnesium, potassium, sodium, and other vitamins like thiamine, can deleteriously affect several different organ systems (13). Additional alterations in glucose metabolism and fluid resuscitation can cause cardiopulmonary dysfunction, respiratory failure, and neuromuscular, gastrointestinal, and renal complications (13). With AN, extreme weight loss and intentional starvation reduce cardiac mass, leading to mitral valve prolapse (13). Thus, patients with AN commonly display electrocardiographic changes, such as a prolonged Q-T interval, seizures, and cardiac arrhythmias (13). With total body and cardiac mass depletion, patients with AN become highly susceptible to refeeding syndrome and its associated complications (13). The optimal method to avoid refeeding syndrome is not certain but previously, recommendations for initial refeeding were to start at a low level of energy

replacement (800-1000 kcal/day) and increase by 300-400 kcal every 3-4 days (13). However, in a small, unreplicated study on adolescents, Garber et al. indicate that the "start low, go slow" recommendation may actually be contraindicated (11). While low-calorie diets avoid refeeding syndrome, they may be too conservative to produce rapid and significant weight gain (11).

Again, the optimal dietary intervention for effecting sufficient weight gain in AN is unknown. Fluid repletion should be carefully monitored to prevent fluid overload (10). Little research has been done to identify the optimal duration and pace of refeeding that would promote sustained long-term recovery. In a recent study by Pike et al., recovery time ranged from 57-79 months (14). In New Zealand, the average length of inpatient stay for anorexia nervosa is 72 days (15) and throughout Europe, inpatient stays span from 62.3 days (Czech Republic) to 197.4 days (Netherlands) (16). In this United States, however, average inpatient stay is a short 26 days due to privatized health care and lack of hospital funding (17, 18). Thus, maximizing weight gain in the shortest time frame is an externally imposed necessity. Yet, if weight gain and psychotherapy are rushed, long-term recovery may not be achieved and patients will be readmitted, which will ultimately drive healthcare costs up in the long run.

Program Evaluation: South Island Eating Disorders Service

A small-scale program evaluation of South Island Eating Disorders Service (SIEDS) in Christchurch, NZ consisted of a nutritional analysis of the inpatient menu. All patient meals provided by the hospital catering service fell within recommended

dietary guidelines. However, inpatients receive a supplemental snack regimen, which when combined with the standard meal plan, exceed USDA recommendations for saturated fat and sugar, and are high in total fat (See Table 1) (19). While this diet will undoubtedly promote rapid weight gain, the components of the diet as well as the method and speed of refeeding need to be reevaluated. At SIEDS, if there are no signs of refeeding syndrome, patients are quickly moved into a 3,000 kcal meal and snack plan, which includes 750 mL of juice, 250 mL flavored milk, and at least one baked good and dessert daily. Patients are not gradually exposed to these foods, nor are they consuming them in recommended daily quantities (19). Further research is recommended to determine if it is possible to achieve the same weight gain trajectory while minimizing the amount of these non-nutritious food items.

Table 1: Nutritional Analysis of S.I.E.D.S. Inpatient Snack Menu

	Average snack quantity/day	**Average meal + snack quantity/day**	**USDA Guidelines (age 19-70)**
Total fat	33 g	31% of total kcal/day	20-35% of total kcal/day
Saturated fat	15 g	13% of total kcal/day	<10% of total kcal/day

Sugars	111 g	31% of total kcal/day	5-15% of total kcal/day*

*Added sugars and solid fats should not exceed 5-15% of total kcal/day; 31% of SIEDS diet comes from added sugars alone. (6)

Shift in Biological and Neurological Parameters

Patients with AN present with altered metabolism, endocrine function, and neurological changes, as an effort to preserve essential body functions in the context of starvation (20). Fortunately, most of these clinical and laboratory abnormalities are reversible with weight restoration (20). For example, patients who engage in dietary restriction typically present with hypercholesterolemia as a consequence of thyroid abnormalities (20). Vitamin deficiencies are also a result of inadequate dietary intake and poor nutrition status (20). These parameters may be improved over time as weight is restored.

While the literature underscores that patients should 'normalize' their diets and weight gain should eventually stabilize during recovery, it is not uncommon to have patients discharged before ideal body weight is achieved (21). This means that patients are still moving along the weight gain trajectory and are discharged while continuing to be encouraged to eat energy dense, non-nutritive foods. Half of the patients who are discharged on this refeeding diet maintain weight while the other half lose weight and relapse (22). This suggests that the refeeding diet is unsustainable in the long-term and anxiety provoking for patients who have not fully recovered. Furthermore, if patients continue on the recovery diet regimen, they will be at risk for developing chronic conditions like hypercholesterolemia,

dyslipidemia, cancer, type 2 diabetes, and cardiovascular disease (23). Diets containing excessive intake of saturated and trans fats, like most inpatient diets, contribute to the development of high blood pressure, impaired glucose tolerance, and dyslipidemia (23). However, improvement in diet and increased physical activity can reduce the risk of diabetes by 58% over four years. Other population studies have shown that up to 80% of coronary heart disease, 90% of type 2 diabetes, and one-third of cancer cases could be avoided through adopting a healthier lifestyle that includes maintaining a normal weight, eating a healthy balanced diet, and being physically active (23). Thus, an important aspect of refeeding inpatients is to aid in the transition from a weight restoration diet to a healthy, well balanced, and moderate lifestyle. This shift towards a normal, healthier diet should be gradual, so as to help the patient taper from a refeeding diet only after metabolism has stabilized. Kaye et al. suggests that increased caloric intake in people with anorexia who are weight-recovered may contribute to poor long-term outcomes (24). Weight maintenance may be difficult after weight recovery with elevated energy requirements; so lower caloric intake after weight stabilization and recovery may enable patients to maintain weight long-term, return to healthy eating patterns, and gradually normalize caloric intake, activity, and neuroendocrine function (24). This process can take years after discharge; so ongoing nutritional counseling is a critical piece of outpatient therapy.

Another possible implication for refeeding with high calorie and energy dense foods is that the current diet regime could be contributing to the development of bulimia nervosa (BN) or binge eating disorder (BED) in patients who previously suffered

from AN. Prior history of AN is a risk factor for BN (1). Approximately 50% of patients with AN cross over to BN (25). This shift from AN to BN/BED might be explained by the onset of rebound binge eating after severely restrictive eating. Moreover, individuals with AN are deficient in the neurotransmitter serotonin due to decreased availability of its essential amino acid precursor tryptophan (26). Tryptophan depends on both sufficient dietary intake as well as an insulin-mediated decrease in plasma levels of other neuro amino acids that compete with tryptophan for its transport across the blood-brain barrier (26). Excessive diet restriction, malnutrition, and decreased post-prandial insulin secretion associated with AN lead to unavailable tryptophan for the rate-limiting enzyme associated with serotonin biosynthesis (26). Thus, individuals with AN experience decreased tryptophan, brain serotonin stores, and serotonin neurotransmission at postsynaptic sites secondary to lack of tryptophan. Serotonin is involved in the regulation of carbohydrate consumption—enhanced serotoninergic neurotransmission leads to a decrease in carbohydrate intake (26). Conversely, low serotonin levels during restrictive eating can lead to unregulated excessive carbohydrate intake. Increased tryptophan, serotoninergic transmission, and regulation are only achieved after excessive carbohydrate consumption (26). Typically, when an animal consumes a meal rich in carbohydrates, the subsequent meal will contain proportionately more protein due to brain serotonin regulation (26). However, prolonged carbohydrate deprivation may suppress this biological response and carbohydrate binging may ensue (26). Thus, low-carbohydrate, ketogenic diets, as seen in AN, lead to enhanced

carbohydrate intake, which may contribute to the crossover of individuals with AN to BN or BED (26).

Novel Antipsychotics and Weight Gain

Further exacerbating the weight increases surrounding refeeding are the effects of novel antipsychotics on weight gain. Atypical antipsychotics, such as olanzapine, are commonly prescribed to individuals with AN to reduce anxiety, obsessional thinking, and agitation experienced during the refeeding process (27). However, evidence for specific application of these medications for AN is inconsistent and unimpressive (27). A recent systematic review and meta analysis on the influence of atypical antipsychotics on BMI, eating disorder, and psychiatric symptoms in individuals with AN reveals that compared with placebo, atypical antipsychotics are associated with nonsignificant increase in BMI, drive for thinness, body dissatisfaction, anxiety, and eating disorder symptomology (28). The majority of studies report no difference between olanzapine and placebo on psychological outcomes such as body image, obsessionality, and compulsivity, but olanzapine was associated with significant weight gain (27). In normal weight populations, 80% of individuals using olanzapine experienced undesirable extreme weight gain (27). Kluge et al. showed that second-generation antipsychotics, such as olanzapine, significantly increase BMI, leptin, and cytokine levels (TNF-alpha, sTNFR-2, sIL-2R), which are all contributing factors associated with weight gain (22). This poses the problem of continued weight gain post-recovery. Weight-restored individuals with AN who are discharged on olanzapine may continue to gain weight, leading to an

increased BMI and possible health complications associated with obesity, such as metabolic syndrome.

Summary and Recommendations

Evidence supports that adhering to USDA Dietary Guidelines can promote improved health and reduce risk for major chronic diseases (4). Why, then, are our dietary recommendations for individuals with AN so drastically different? Is our current refeeding regimen in the best interest of the patient's long-term health and wellbeing or is it a necessary adaptation given the constraints placed on us by third-party payers? Are high-sugar and energy dense recommendations sustainable in the long run or are they, in fact, doing more harm than good from a biological and neuroendocrine standpoint? These questions should be addressed in order to develop optimal refeeding regimens for individuals with AN.

My clinical recommendations are to bridge the gap between dietary guidelines for the general public and the current refeeding diet guidelines for AN. This is possible by promoting weight gain using healthier food alternatives as opposed to excessive juice consumption and baked products high in saturated fat, trans fat, added sugars, and refined grains. The Academy of Nutrition and Dietetics found that it is possible to promote weight gain using healthier food alternatives, as evidenced in their 3016 kcal sample meal plan, with 150 g total fat, 125 g total protein, 310 g total carbohydrate, and all vitamin/minerals at or above the DRI (29). Instead of eating for weight loss or weight gain, utilizing nutritional counseling strategies to promote overall wellbeing and a healthy lifestyle will hopefully provide an easier transition

from inpatient to outpatient settings as well as be more sustainable long term. Focusing on healthy weight gain may help reduce obsession on energy calculation and promote a more healthy relationship with food while avoiding the shift to BN or BED.

It is recommended, however, that further studies be done within this new framework of refeeding for AN to validate these claims as well as future studies on the prevalence of crossover between AN to BN and BED. I would also recommend that dietitians working with patients with AN incorporate "transition" sessions with their inpatient clientele. Moreover, the shift from consumption of primarily energy dense foods to a more balanced diet must be addressed, and these conversations may be lacking within inpatient treatment programs. If the dietary recommendations for inpatients with AN are to be so divergent from general health guidelines, dietitians have a responsibility to counsel the patient on transitioning from the weight gain diet to the USDA Dietary Guidelines. It's equally as important to offer nutritional counseling to family members who may fall susceptible to weight gain by also eating these prescribed calorically-dense foods with their recovering loved ones at meal time. Yet more importantly, it is recommended to bridge the gap between these varying dietary guidelines, hopefully reducing BN and BED crossover rates as well as other biological alterations. Lastly, careful long-term evaluation of the impact of prolonged use of novel antipsychotics on metabolism and weight is essential in determining the safety profile of these medications in the treatment of AN.

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