

# A Higher-Calorie Refeeding Protocol Does Not Increase Adverse Outcomes in Adult Patients with Eating Disorders

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## ARTICLE INFORMATION

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## ABSTRACT

**Background** Patients with eating disorders (EDs) are often considered a high-risk population to refeed. Current research advises using “start low, go slow” refeeding methods (~1,000 kcal/day, advancing ~500 kcal/day every 3 to 4 days) in adult patients with severe EDs to prevent the development of refeeding syndrome (RFS), typically characterized by decreases in serum electrolyte levels and fluid shifts.

**Objective** To compare the incidence of RFS and related outcomes using a low-calorie protocol (LC) (1,000 kcal) or a higher-calorie protocol (HC) (1,500 kcal) in medically compromised adult patients with EDs.

**Design** This was a retrospective pre-test–post-test study.

**Participants/setting** One hundred and nineteen participants with EDs, medically admitted to a tertiary hospital in Brisbane, Australia, between December 2010 and January 2017, were included (LC: n=26, HC: n=93). The HC refeeding protocol was implemented in September 2013.

**Main outcome measures** Differences in prevalence of electrolyte disturbances, hypoglycemia, edema, and RFS diagnoses were examined.

**Statistical analysis performed**  $\chi^2$  tests, Kruskal-Wallis H test, analysis of variance, and independent *t* tests were used to compare data between the two protocols.

**Results** Descriptors were similar between groups (LC: 28±9 years, 96% female, 85% with anorexia nervosa, 31% admitted primarily because of clinical symptoms of exacerbated ED vs HC: 27±9 years, 97% female, 84% with anorexia nervosa, 44% admitted primarily because of clinical symptoms of exacerbated ED,  $P>0.05$ ). Participants refeed using the LC protocol had higher incidence rates of hypoglycemia (LC: 31% vs HC: 10%,  $P=0.012$ ), with no statistical or clinical differences in electrolyte disturbances (LC: 65% vs HC: 45%,  $P=0.079$ ), edema (LC: 8% vs HC: 6%,  $P=0.722$ ) or diagnosed RFS (LC: 4% vs HC: 1%,  $P=0.391$ ).

**Conclusions** A higher-calorie refeeding protocol appears to be safe, with no differences in rates of electrolyte disturbances or clinically diagnosed RFS and a lower incidence of hypoglycemia. Future research examining higher-calorie intakes, similar to those studied in adolescent patients, may be beneficial.

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**P**ROLONGED INADEQUATE CALORIE INTAKE AND LOW body weight are well-known consequences of eating disorders (EDs), with admission to the hospital necessitated when life is threatened.<sup>1</sup> Nutritional treatment of patients with this condition is complicated with many known medical risks, including the potential development of hypophosphatemia, defined as serum values less than 2.51 mg/dL (0.81 mmol/L), and refeeding syndrome (RFS), typically characterized by serum electrolyte decreases (phosphate, potassium, and/or magnesium) with possible fluid shifts.<sup>2,3</sup> During the initial 7 to 10 days of nutritional rehabilitation, these patients are

considered at high risk for development of the condition because of their high level of malnutrition.<sup>3,4</sup> For the purpose of minimizing risk, most current eating disorder guidelines for adult patients recommend “starting low and going slow,” initiating intake at 1,000 kcal/day or 5 to 20 kcal/kg/day.<sup>3,5-8</sup> However, these recommendations are based on narrative reviews and the advice of experts only. Recent studies examining the outcomes of initiating calorie intake at higher rates, of 1,700 to 2,000 kcal/day, in adolescent patients with EDs have demonstrated no impact on the frequency of RFS, electrolyte disturbances, hypoglycemia, or edema.<sup>9-14</sup> With no increased rates of adverse

## RESEARCH

outcomes, patients were also more likely to gain weight and have shorter lengths of stay.<sup>10,11,13</sup>

Interpretation of the current literature is complicated by the use of a range of outcome measures. Although hypophosphatemia is often considered a hallmark of RFS,<sup>2</sup> various signs and symptoms have been employed in different studies. In an attempt to ensure accuracy in the diagnosis of RFS, Rio and colleagues<sup>15</sup> have created a three-facet diagnostic tool, integrating at least one episode of a severely low serum electrolyte level (potassium, phosphate, and/or magnesium), edema, and organ dysfunction; however, this tool has only been used in two published studies focusing on patients with anorexia nervosa.<sup>13,16</sup> Parker and colleagues<sup>13</sup> used the tool to examine prevalence in adolescent patients fed a high-calorie diet, whereas Hofer and colleagues<sup>16</sup> examined adult patients consuming a diet in which calorie intake was conservative. No episodes of RFS were identified in either study. Similarly, only low rates (<3%) of associated adverse outcomes, including severe electrolyte decreases and edema, were observed.

In other studies examining the incidence of RFS in adult patients with EDs, investigators have found rates varying from 0%<sup>1,17-20</sup> to 10%.<sup>21</sup> However, the incidence of hypophosphatemia ranges from <10%<sup>1,20</sup> to 45%.<sup>17,21-25</sup> No study, to the authors' knowledge, has examined higher-calorie intakes in medically compromised adult patients with EDs and the incidence of RFS and RFS-related outcomes. Hence, the aim of this study was to compare the incidence of RFS and RFS-related outcomes in a low-calorie refeed group of medically compromised adult patients with EDs and a similar group treated with a higher-calorie refeeding protocol. It was hypothesized that there would be no differences in the incidence of RFS. A secondary hypothesis was that there would be no differences in nutritional and clinical outcomes, including biochemical markers, edema, and cardiac function.

## METHODS

### Setting

This study was conducted in a tertiary referral hospital, located in Brisbane, Australia. Patients with an ED diagnosis presenting to this hospital can be admitted to medical inpatient units when at least one of the criteria detailed in [Table 1](#) is satisfied. Within this setting, medical management is supported by a specialist ED consultation service, which provides advice regarding refeeding. Patients are treated to achieve (in order of priority) medical stabilization, prevention and resolution of RFS, weight restoration, and reversal of cognitive effects of starvation before discharge and initiation of outpatient therapy.

### Study Design

This was a retrospective observational study examining clinical outcomes experienced by patients with a diagnosed ED, admitted for medical stabilization to hospital medical units from December 2010 to January 2017. Patients treated with the low-calorie refeeding protocol (December 2010 to early September 2013) were used as historic control subjects for comparison with patients treated with the higher-calorie refeeding protocol (from late September 2013 to January 2017). Approval was obtained from The Prince Charles Hospital Human Research Ethics Committee (HREC/14/TPCH/32)

## RESEARCH SNAPSHOT

**Research Question:** Do medically compromised adult patients with eating disorders experience higher rates of refeeding syndrome when commenced on a higher-calorie protocol (1,500 kcal/day) than those commenced on a protocol with current recommended feed rates (1,000 kcal/day)?

**Key Findings:** One hundred nineteen participants were included in this observational study. No significant differences were found in the incidence of refeeding syndrome, electrolyte disturbances, or edema. No cases of refeeding syndrome were observed in either group.

and the University of Queensland (2016001079) before data collection. Patient consent was not required.

### Eligibility Criteria

Patients admitted to medical units were eligible for inclusion in this study if they were 18 years of age or older at the time of admission, diagnosed with an ED (confirmed by a psychiatrist), and treated with the specified refeeding protocols. Patients with multiple admissions were included when there had been at least 12 months between subsequent admissions. Patients were excluded from the study if they were admitted from a psychiatric unit because the refeeding process may have already commenced or if they were admitted to an intensive care unit at any time during their medical admission because patients admitted to intensive care units are typically commenced on a feeding protocol specific to the intensive care unit. Patients were also excluded if they had renal conditions because of the possibility of preexisting issues with electrolyte levels or if they were pregnant. Patients whose hospital stay was less than 5 days were excluded because days 2 to 5 of admission are considered the period associated with the greatest risk for the development of RFS.<sup>2</sup>

**Protocol Descriptions.** From December 2010 to August 2013, refeeding protocols were based on a low-calorie (1,000 kcal) refeeding method. This protocol was replaced in September 2013 by a higher-calorie (1,500 kcal) refeeding method, based on the updated literature regarding treatment of adolescent patients.<sup>10,14,27-29</sup> The protocol was also updated to incorporate a continuous nasogastric feed, commencing within 24 hours of admission. The previous protocol provided for an oral diet, only allowing an upgrade to enteral feeds if a patient was not consuming an adequate intake.

**Eating Disorder Inpatient Refeeding Protocol—Low Calorie (2010 to August 2013).** In place from December 2010 to August 2013, the low-calorie protocol dictated that nutritional intake should be provided via oral intake (15% to 20% protein, 45% to 55% carbohydrate, and 30% to 35% fat). Nasogastric feeding (with the predominant feed composed of 16% protein, 50% carbohydrate, and 34% fat) was to be used if oral feeding was deemed unsuccessful. An initial oral diet, incorporating three meals and three snacks, of 875 to 1,000 kcal or an enteral feed with a rate of 1,000 kcal (no more or

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