Journal of Adolescent Health 59 (2016) 104–109

ELSEVIER

JOURNAL OF ADOLESCENT HEALTH

www.jahonline.org

Original article

Daily Laboratory Monitoring is of Poor Health Care Value in Adolescents Acutely Hospitalized for Eating Disorders

Kathryn K. Ridout, M.D., Ph.D. [a,b,*], Jonathan Kole, M.D. [c], Kelly L. Fitzgerald [d], Samuel J. Ridout, M.D., Ph.D. [a,b], Abigail A. Donaldson, M.D. [c,e], and Brian Alverson, M.D. [c,f]

[a] *Department of Psychiatry and Human Behavior, Mood Disorders Research Program, Laboratory for Clinical and Translational Neuroscience, Butler Hospital, Providence, Rhode Island*

[b] *Department of Psychiatry and Human Behavior, Alpert Medical School of Brown University, Providence, Rhode Island*

[c] *Department of Pediatrics, Alpert Medical School of Brown University, Providence, Rhode Island*

[d] *Department of Medical Education, Alpert Medical School of Brown University, Providence, Rhode Island*

[e] *Department of Pediatrics, Division of Adolescent Medicine, Hasbro Children's Hospital, Providence, Rhode Island*

[f] *Department of Pediatrics, Division of Hospitalist Medicine, Hasbro Children's Hospital, Providence, Rhode Island*

Article history: Received November 24, 2015; Accepted March 14, 2016

Keywords: Refeeding syndrome; Anorexia nervosa; Bulimia; Eating disorders; Health care value; Electrolytes; Liver function tests

A B S T R A C T

Purpose: This study investigates how the clinical practice guideline–recommended laboratory monitoring for refeeding syndrome impacts management and outcomes of adolescents with eating disorders hospitalized for acute medical stabilization and examines the value of laboratory monitoring (defined as the patient health outcomes achieved per dollar spent).

Methods: A retrospective chart review of medical admissions in a children's hospital between October 2010 and February 2014 was performed. Encounters were identified using International Classification of Diseases, Ninth Revision codes of eating disorders as primary or secondary diagnoses. Exclusion criteria included systemic diseases associated with significant electrolyte abnormalities. Chart abstraction was performed using a predetermined form. Costs were estimated by converting hospital-fixed Medicaid charges using a statewide cost-to-charge ratio.

Results: Of the 196 patient encounters, there were no cases of refeeding syndrome. A total of 3,960 key recommended laboratories were obtained; 1.9% were below normal range and .05% were critical values. Of these, .28% resulted in supplementation; none were associated with a change in inpatient management. Total laboratory costs were $269,250.85; the calculated health care value of this monitoring is 1.04×10^{-8} differential outcomes per dollar spent.

Conclusions: This study provides evidence to suggest that daily laboratory monitoring for refeeding syndrome is a poor health care value in the management of adolescents hospitalized for acute medical stabilization with eating disorders. This initial analysis suggests that starting at a relatively low caloric level and advancing nutrition slowly may negate the need for daily laboratory assessment, which may have important implications for current guidelines.

IMPLICATIONS AND CONTRIBUTION

When refeeding adolescent patients with eating disorders, daily laboratory monitoring minimally impacted patient management or outcomes but was associated with a significant cost, suggesting a poor health care value.

Refeeding syndrome is a rare preventable phenomenon resulting from a rapid calorie increase in a previously calorically deprived individual. It is defined as cardiovascular, neurologic, and hematologic complications resulting from fluid and electrolyte shifts during nutritional rehabilitation and often manifests as a

Conflicts of Interest: The authors have no conflicts of interest or financial disclosures to report. Dr. Kathryn Ridout wrote the first draft of the manuscript and none of the authors received honorarium, grant, or other form of payment was given to anyone to produce the manuscript.

* Address correspondence to: Kathryn K. Ridout, M.D., Ph.D., Butler Hospital, 345 Blackstone Blvd., Providence, RI 02906.

E-mail address: Kathryn_Ridout@Brown.edu (K.K. Ridout).

1054-139X/
http://dx.doi.org/10.1016/j.jadohealth.2016.03.015

rapid decline in phosphate, potassium, and magnesium, resulting in a potentially life-threatening complications including cardiac arrhythmia [1]. Further possible fatal sequelae reported in association with refeeding syndrome include heart failure, respiratory failure, and seizures [2,3]. The phenomenon was first characterized during World War II when starved prisoners developed cardiac abnormalities and peripheral edema on nutritional rehabilitation and was further detailed in the Minnesota Starvation Study [4]. Since that time, the importance of refeeding syndrome as a possible sequelae of eating disorder treatment has been recognized, with an estimated incidence of 0%–6% among adolescent patients acutely hospitalized for treatment of anorexia nervosa. Eating disorders are estimated to affect 5%–6% of the adolescent population [5,6] and are the third most common chronic illness in adolescent females [7]; intention to prevent refeeding syndrome is a significant motivator for inpatient admission when refeeding adolescent patients with eating disorders [8–10].

Several professional societies have published clinical practice guidelines (CPGs) to aid clinicians in preventing refeeding syndrome in adolescents receiving treatment for eating disorders by identifying signs of the syndrome early and preemptively treating those patients. To accomplish this, most CPGs recommend daily laboratory evaluation of electrolytes, liver function tests (LFTs), and other laboratories and stabilization of these values as criteria for discharge from the hospital [8,9,11–13]. On closer examination of the literature, most CPGs used retrospective chart studies and case reviews in children and adolescents as the basis for these recommendations, with limited prospective studies in adults as evidence. In such prospective studies, electrolyte abnormalities affecting clinical outcomes are often seen in patients with additional risk factors [3,14,15] and, when caloric goals are carefully measured or electrolytes are supplemented, there is little evidence that refeeding syndrome occurs, bringing into question the value of daily laboratory monitoring [16–18].

In this era of health care reform, value in health care, defined as the patient health outcomes achieved per dollar spent, has grown from a concept to central tenant [19,20]. Examining value in health care integrates many goals of health care systems, including quality, safety, patient satisfaction and outcomes, and cost containment [20]. Value increases when outcomes are improved at the same or lower costs or when equivalent outcomes are achieved at lower cost [20]. CPGs contribute to improving health care value by systematically developing statements that guide decision-making, thereby streamlining care [19]. Examination of CPGs and CPG performance has successfully improved health care value for large drivers of pediatric inpatient care, including asthma, bronchiolitis, and pneumonia [19,21,22]. To date, there have been no studies assessing the value of the current CPGs regarding laboratory screening for refeeding syndrome among adolescent patients with eating disorders.

The objectives of the present study were, first, to assess whether daily laboratory monitoring impacted the inpatient management and outcomes of acutely hospitalized adolescents with eating disorders in a well-established inpatient eating disorder treatment program and, second, to analyze the costs incurred with daily laboratory assessment for refeeding syndrome in this population. We hypothesized that the incidence of refeeding syndrome would be low in our patient population and that daily laboratory monitoring is not a significant driver of inpatient management and thus outcomes. In addition, we hypothesized that costs associated with obtaining daily laboratories are substantial, contributing to a lower health care value.

Methods

Study design

This retrospective case review was conducted using the Strengthening the Reporting of Observational Studies in Epidemiology guidelines [23].

Setting

Charts reviewed were of patients admitted to the Adolescent Medicine Service of Hasbro Children's Hospital, a tertiary academic medical center in Providence, Rhode Island. The Adolescent Medicine team uses a long-standing, evidence-informed inpatient treatment protocol for the medical management of eating disordered patients and admits approximately 100 patients per year for acute medical stabilization. The treatment protocol changed during the course of the study period. The older protocol started patients at 500 kcal/day based on CPGs in the early 2000s. The protocol was updated to start patients at 1,500 kcal/day after review of the recent evidence showing that higher starting caloric intake reduces length of hospitalization with no increased rate of refeeding [16,24,25]. Laboratory monitoring follows recommendations of CPGs and are generally checked daily for the first 5 days and then every other day thereafter. Dates of inclusion were October 2010 to April 2014, coinciding with the introduction of the electronic medical record to allow for more efficient, consistent chart review. The Rhode Island Hospital Institutional Review Board approved this study.

Participants

To be included in the study, patients must have been hospitalized October 2010 to April 2014 and treated by one of the attending physicians in the Adolescent Medicine Division. Potential encounters were identified using International Classification of Diseases, Ninth Revision (ICD-9) codes of eating disorders as primary or secondary diagnoses, specifically 307.1 (anorexia nervosa), 307.5 (eating disorder not otherwise specified), or 307.51 (bulimia nervosa). These specific ICD-9 codes were chosen a priori after discussion with the Adolescent Medicine Division regarding their billing and coding practices for these patients. Exclusion criteria included systemic diseases associated with significant electrolyte abnormality: Addison's disease, chronic kidney disease, parathyroid illness, diabetes mellitus, X-linked hypophosphatemic rickets, Albright's hereditary osteodystrophy, a history of chemotherapy, or known genetic abnormality. The mean age of subjects was 15.9 ± 2.3, and 87% of the subjects were identified as female in the medical record (Table 1).

Variables

Biometric data included weight (initial and discharge), height, and minimum recorded values of heart rate and blood pressure. The presence of orthostatic vital signs was defined as a change in heart rate >20 beats/min and/or change in blood pressure (change in systolic >20 mmHg, diastolic >10 mmHg) between supine and upright positioning. Additional clinical data extracted were duration of illness, weight loss before acute hospitalization, presence/frequency of purging/laxative/diuretic use, and a history of eating disorder treatment. The patient's weight status was evaluated using the percent of expected body mass index (BMI)