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Clinical Potpourri

Elevated red cell distribution width at initiation of critical care is associated with mortality in surgical intensive care unit patients☆,☆☆

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ABSTRACT

Purpose: Recent evidence suggests that red cell distribution width (RDW) is associated with mortality in mixed cohorts of critically ill patients. Our goal was to investigate whether elevated RDW at initiation of critical care in the intensive care unit (ICU) is associated with 90-day mortality in surgical patients.
Methods: We performed a retrospective, single-center cohort study. Normal RDW was defined as 11.5%–14.5%. To investigate the association of admission RDW with 90-day mortality, we performed a logistic regression analysis, controlling for age, sex, race, body mass index, Nutrition Risk Screening 2002 score, Acute Physiology and Chronic Health Evaluation II score, hospital length of stay, as well as levels of creatinine, albumin, and mean corpuscular volume.
Results: 500 patients comprised the analytic cohort; 47% patients had elevated RDW and overall 90-day mortality was 28%. Logistic regression analysis demonstrated that patients with elevated RDW had a greater than two-fold increased odds of mortality (OR 2.28: 95%CI 1.20–4.33) compared to patients with normal RDW.
Conclusions: Elevated RDW at initiation of care is associated with increased odds of 90-day mortality in surgical ICU patients. These data support the need for prospective studies to determine whether RDW can improve risk stratification in surgical ICU patients.

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1. Introduction

In the United States, nearly 25% of healthcare resources are spent on 6% of people who die in a given year, with roughly 20% of all deaths occurring in the ICU or shortly thereafter [1–3]. As such, critical care is an expensive, yet important, setting that is a target for cost containment [4,5]. One approach to strategically improve the cost-effectiveness of ICU care has been the use of mortality prediction scores, such as the Acute Physiologic and Chronic Health Evaluation (APACHE) II [6], the Simplified Acute Physiology Score (SAPS) [7], and the Sequential-Related Organ Failure Assessment (SOFA) [8], to guide the utility of often resource-heavy interventions. These scoring tools attempt to quantify the degree of baseline comorbidities and acute organ dysfunction to create an individualized, objective assessment of mortality risk [9,10]. Given their potential to influence medical decision-making, the addition of variables or biomarkers to improve upon these predictive scores is of great interest to clinicians [11,12]. One such variable, which has lately received increasing attention, is red cell distribution width (RDW) [13,14].

RDW is widely available to clinicians, given that it is routinely reported as a part of the complete blood count (CBC) [15]. Typically only utilized either in the differential diagnosis of anemia [16,17], or thought of as a surrogate marker for systemic inflammation [15,18–20], elevated RDW has recently been shown to be associated with all-cause mortality in both community-dwelling individuals as well as hospitalized patients [15,19–21]. Furthermore, recent evidence suggests that RDW is

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associated with mortality in critically ill patients; however, these studies focused on either medical or mixed (surgical and medical) cohorts of intensive care unit (ICU) patients. While medical ICU patients typically have underlying chronic diseases that may confound the observed relationship between RDW and mortality (and which may be difficult to adequately adjust for in multivariable regression analyses), data on surgical patients, who generally have a lower burden of chronic illness, is sparse. Therefore, our goal was to investigate the association between RDW on ICU admission and 90-day mortality in a cohort of critically ill surgical patients.

2. Methods

2.1. Data Source

We performed a retrospective analysis of data from an ongoing Partners Human Research Committee (local Institutional Review Board) approved prospective study of nutrition in critical illness. Our cohort was comprised of patients from two, 18-bed surgical ICUs at the Massachusetts General Hospital (MGH) from 2012 to 2014. MGH is a 1054-bed, teaching hospital, which is a major referral center, providing tertiary care for the residents of eastern Massachusetts and the surrounding areas.

2.2. Inclusion and exclusion criteria

For the parent cohort, we included all adult patients (>17 years) admitted to the surgical ICU, who were expected to require >48 hours of critical care, and in whom the use of enteral and/or parenteral nutrition was anticipated. For the present study, we limited our analysis to include patients between October 01, 2012 through September 30, 2014, in whom a complete CBC was obtained within one hour of ICU admission (Fig. 1). All admissions originated either from the MGH operating rooms, emergency department, or were transferred from non-ICU floors. Only patients with RDW assessed within one hour of ICU admission were considered for study inclusion. Patients with a known history of chronic anemia (defined as either documented serial hematocrits <25% during outpatient care or a formal diagnosis of chronic anemia, iron deficiency anemia, or vitamin b12 deficiency anemia on the admission problem list) were excluded, given these common forms of anemia are associated with elevations in RDW [22,23]. We further excluded patients who were either pregnant, immediately post-partum, immediate post-transplant recipients, or had received any units of packed red blood cells (PRBCs) up to four hours before and after the time of ICU admission. Moreover, to minimize confounding from chronic illness or ongoing care in a healthcare facility, we excluded patients who had been transferred from another ICU, had another ICU admission within one year of the current hospitalization, were residents of a long-term care facility, or had been on chronic dialysis.

2.3. Primary exposure and outcomes

Our primary exposure of interest was RDW, measured within one hour of admission to the surgical ICU. Normal RDW was defined as 11.5%–14.5% [24]. Our primary outcome of interest was 90-day mortality after ICU admission, and was verified by review of individual medical records and cross-referencing each record with the Social Security Death Master File.

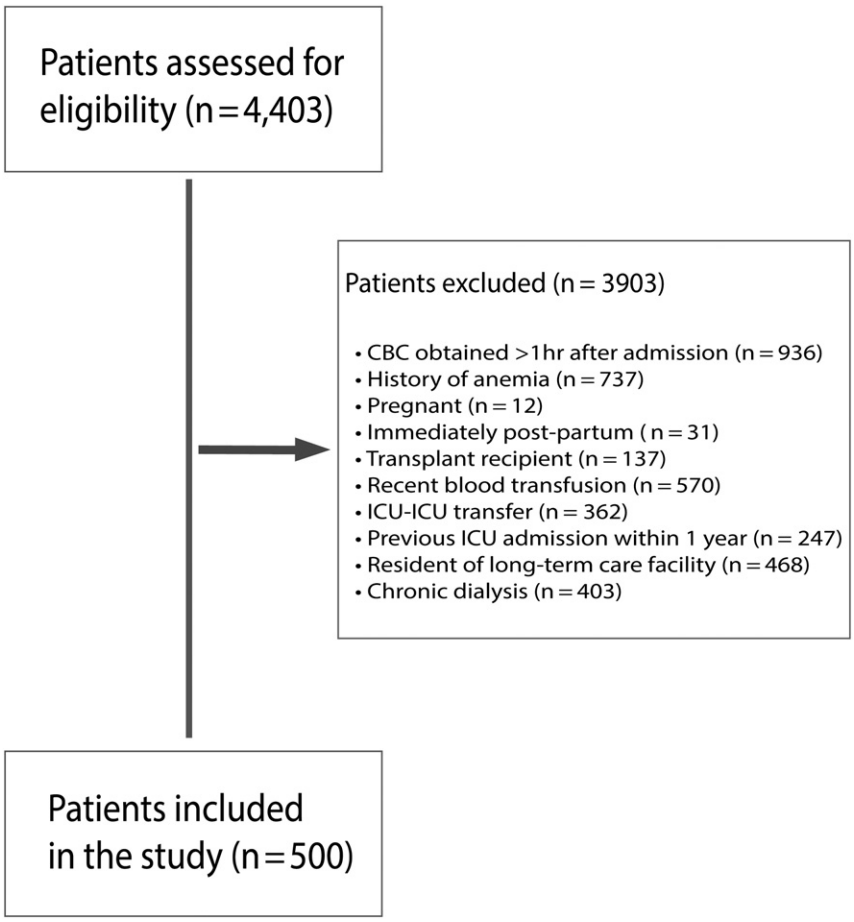

Fig. 1. Patient exclusion flow diagram. CBC = complete blood count, RDW = red cell distribution width, ICU = intensive care unit.