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PREDICTIVE ROLE OF ADMISSION LACTATE LEVEL IN CRITICALLY ILL PATIENTS WITH ACUTE UPPER GASTROINTESTINAL BLEEDING

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☐ **Abstract—Background: The predictive role of lactate in critically ill patients with acute upper gastrointestinal bleeding (UGIB) remains to be elucidated. Objective: The primary objective of this study was to assess the value of lactate level on admission to predict in-hospital death in patients with UGIB admitted to the intensive care unit (ICU). The secondary objective was to assess whether lactate level adds predictive value to the clinical Rockall score in these patients. Methods: This was a retrospective cohort study that included 133 patients with acute UGIB admitted to the ICU. Inclusion criteria were age > 18 years and presence of UGIB on admission to the ICU. Results: Mean age was 55.4 years old and 64.7% were male. The most common cause of gastrointestinal bleeding was peptic ulcer disease, followed by erosive esophagitis/gastritis. The in-hospital mortality was 22.6%. Median lactate level in survivors and nonsurvivors was 2.0 (interquartile range [IQR] 1.2–4.2 mmol/L) and 8.8 (IQR 3.4–13.3 mmol/L; $p < 0.01$), respectively. The receiver operating characteristic (ROC) area to predict in-hospital death for clinical Rockall score and lactate level (0.82) was significantly higher than the ROC area for the clinical Rockall score alone (0.69) ($p < 0.01$). Conclusions: In patients admitted to the ICU with acute UGIB, lactate level on admission has a high sensitivity but low specificity for predicting in-hospital death. Lactate level adds to the predictive value of the clinical Rockall score. Given its high sensitivity, lactate level can be used in addition to other prediction tools to predict outcomes in patients with UGIB.** © 2015 Elsevier Inc.

☐ **Keywords—lactate; gastrointestinal bleeding; Rockall score; mortality in ICU**

INTRODUCTION

Acute upper gastrointestinal bleeding (UGIB) accounts for >400,000 hospitalizations per year in the United States, with an estimated mortality rate ranging between 6% and 10% (1–4). In the intensive care unit (ICU), the mortality rate can be even higher (5). Risk stratification in UGIB is important in order to select low-risk patients for early discharge and high-risk patients for ICU management. Several scoring systems have been developed to predict outcomes after UGIB, but none of these scoring

The results of this study were partly presented in the American Thoracic Society 2014 international conference held in San Diego, CA on May 21, 2014 (Chaddha US, Sinha RS, El-Kersh K, Woodford M, Cavallazzi R. Lactate level in critically ill patients with acute gastrointestinal bleeding. Am J Respir Crit Care Med 2014;189:A5492).

This study has been approved by the appropriate ethics committee and has therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. This study was approved by the University of Louisville Institutional Review Board (protocol #13.0231). Informed consent was waived.

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systems used serum lactate level as a predictor of outcomes (6–8). Although it is well known that in severe sepsis a high serum lactate level is associated with mortality independent of organ dysfunction and shock, the knowledge about the role of serum lactate level upon admission in predicting outcomes in patients with UGIB is still evolving (5,9–11). We hypothesized that the use of serum lactate level upon admission can be a valuable tool for the prediction of outcomes in patients with upper gastrointestinal hemorrhage. The primary aim of this study was to evaluate the value of the admission lactate level to predict in-hospital death in patients with UGIB admitted to the ICU. The secondary aim was to evaluate whether lactate level adds predictive value to the clinical Rockall score in these patients.

METHODS

This was a retrospective cohort study that included consecutive patients with acute UGIB admitted to our university hospital ICU from 2010 to 2013. We performed a secondary analysis of a database created by our group of patients with gastrointestinal hemorrhage admitted to the ICU. The study was approved by the university Institutional Review Board (protocol #13.0231). Informed consent was waived.

Patients

Patients admitted to the ICU from the emergency department (ED) with a primary diagnosis of acute UGIB were identified through a computerized search using International Classification of Diseases, Ninth Revision, and Clinical Modification (ICD-9-CM) codes. Medical records were subsequently reviewed. Inclusion criteria for the study were age > 18 years, presence of UGIB (evidenced by hematemesis or an endoscopic evidence of UGIB in patients presenting with either hematemesis or melena) on admission to the ICU, and a lactate level that was obtained on the same day of ICU admission. We excluded patients with lower gastrointestinal bleeding and those who did not have a lactate level upon admission to ICU. All the patients included in the study were admitted to the same ICU, which had a single team managing all of the patients with UGIB included in the study with the same standard protocols for volume resuscitation, blood transfusions, pressor usage, and interventional procedures, among others.

Measurements

We abstracted information from the charts of patients using a structured data-collection form. Information collected included demographics, cause of gastrointestinal hemorrhage, comorbidities, vital signs, and lactate level on admission to the ICU, the clinical Rockall score, and outcomes.

The medical record review and data abstraction were performed by two internal medicine residents who had at least 1 year of internal medicine training. They underwent data-collection training that included defining eligibility criteria and other variables that were included in the study via initial supervised data collection of randomly selected charts. After completion of data collection, random chart reviews were performed to ensure data accuracy.

The clinical Rockall score (before endoscopy) was calculated from three clinical variables that included patient's age (score 0 to 2), presence of shock (systolic blood pressure and heart rate) (score 0 to 2), and presence of comorbid conditions (score 0 to 3), with a maximum additive score of 7 (Table 1).

The venous lactate level was measured by VITROS-5600 analyzer (Ortho Clinical Diagnostics, Rochester, NY). The outcome for this study was in-hospital death.

Statistical Analysis

We present normally distributed continuous variables as mean and standard deviation (SD). When they are not normally distributed, we present them as median and interquartile range (IQR). We employed the Wilcoxon rank-sum (Mann-Whitney) test to compare continuous variables. For categorical variables, we employed Fisher's exact test. We provided the accuracy of both lactate level and the clinical Rockall score to predict in-hospital death. For lactate level, we used a cutoff of >2.1 mmol/L, as

Table 1. Clinical Rockall Score

	Score			
Variable	0	1	2	3
Age, y	<60	60–79	≥80	
Shock				
SBP, mm Hg	≥100	≥100	<100	
HR, beats/min	<100	≥100		
Comorbidity	No major comorbidity		IHD, CHF, any major comorbidity	Renal or liver failure, disseminated malignancy

CHF = congestive heart failure; HR = heart rate; IHD = ischemic heart disease; SBP = systolic blood pressure.