



Blood Urea Nitrogen as a Predictor of Mortality in Acute Pancreatitis: A Meta-Analysis

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Abstract

Acute Pancreatitis (AP) causes hundreds of thousands of hospitalizations around the world each year. Common rating scales used to assess AP patients are the RANSON criteria and BISAP score. Both of these criteria utilize a number of risk factors and lab values to predict the mortality of patients admitted to the hospital with a diagnosis of AP.

Among the commonly trended lab values, when considered individually, Blood Urea Nitrogen (BUN) is often referred to by clinical physicians as the best predictor of mortality in these patients. The efficacy of using BUN alone as a predictor of mortality in AP patients has not yet been quantified.

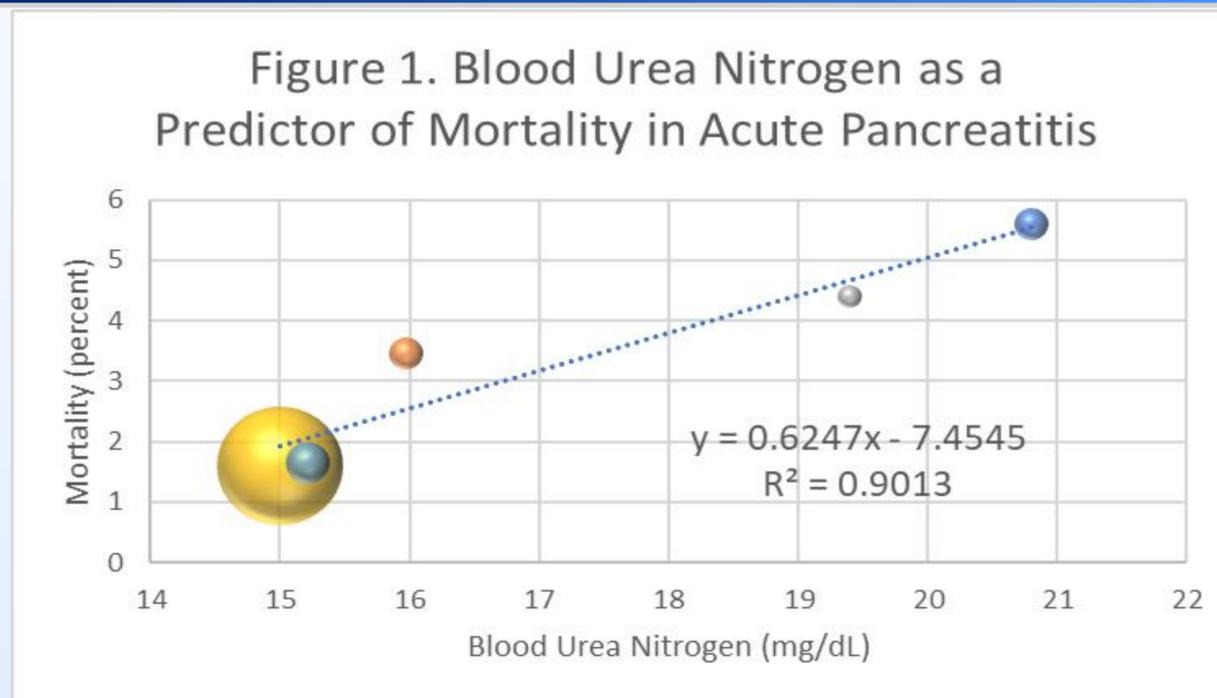
Data was collected from 5 primary studies which followed AP patients and included measurements for BUN within <24 hours of admission as well as percent mortality. Results of this meta-analysis show that a line of best fit could potentially be used to estimate a mortality rate for AP patients 18 years or older based on their BUN if measured within 24 hours of admission.

Introduction

Patients admitted to the hospital with Acute Pancreatitis (AP) typically have certain laboratory values trended. These values can be entered into tools such as the Ranson Criteria and the BISAP Score to help clinicians to predict the likelihood of mortality in their patient. One commonality between these two criteria, is that they utilize Blood Urea Nitrogen (BUN) as part of their scoring criteria. While accurate, these tools are also somewhat restrictive. The Ranson's Criteria requires certain labs be trended for 48 hours to produce an accurate score, thus making it less useful in the acute setting. The BISAP score does not consider BUN <25 mg/dL, potentially ignoring valuable data.

BUN is often considered the most prognostic single lab value for determining mortality in AP patients. This study aims to determine the potential for BUN by itself can predict mortality in AP.

Results



Results show the data comparing BUN to percent mortality. A line of best fit was found to be linear. The equation for this line has an R2 value of 0.9013 indicating that it represents the given data points well. BUN values can be input as the x-value in the equation resulting in the predicted percent mortality (y-value). Each study is represented as a different color and the size of each sphere is directly proportional to the number of patient in each study.

Methods & Materials

Research Methods

Original article search included a compilation of 8 different studies with 5 of them being used for the meta-analysis. Only studies that listed both a mean BUN value and a percent mortality were included in our analysis. The studies all combined included 7658 patients all of which were hospitalized with a primary diagnosis of acute pancreatitis. Both men and women were included in the study with ages ranging from 37 to 84.

Below is inclusion and exclusion criteria from the primary studies.

• Inclusion criteria

- All patients were admitted with a primary diagnosis of AP
- Patients must be presenting with AP for the first time
- Patients must meet 2 of the 3 Atlanta Criteria for diagnosis of AP

• Exclusion criteria

- Patients with underlying malignancy or tumors
- Patients having unclear symptoms or another comorbidity that better explains the symptoms
- Patients with chronic pancreatitis

Statistical Methods

The figure above includes a scatterplot utilizing the values for BUN and percent mortality collected from the primary studies. The line of best fit was plotted and resulted in a linear equation which reveals the relationship between all of the data collected.

Discussion

It is unclear if our model can be used to accurately predict mortality in AP patients. However, our data does indicate that higher levels of BUN, even if within normal physiological limits (6mg/dL - 24mg/dL), correlate with higher mortality in AP patients. This information is valuable, in that not only is there potential for BUN levels to closely correlate with percent mortality in AP patients, but there appears to be room for improvement of the Ranson's Criteria and BISAP score. If those two commonly used tools were to incorporate BUN values on a sliding scale, there is a possibility they could predict mortality in AP patients with a higher degree of accuracy.

There is still much potential for continued research into this topic as well as room for improvement of the study. Of note, due to all the studies in this meta analysis having statistically significant P values, they were not weighted based on their n value.

Future directions of study include: (1) A larger meta analysis with more primary research studies (2) A comparison of our model to other tools commonly used to predict mortality in AP patients.

Conclusion

Several tools exist to predict a percent mortality for patients being hospitalized with AP, yet each of these tools has certain shortcomings. A benefit of using our line of best fit model is that there is potential for mortality in AP patients to be predicted quickly based only on their BUN, provided the lab is drawn within 24 hours of admission. Additionally, the findings of this meta analysis indicate that there is room for improvement of tools such as the Ranson Criteria and BISAP score. Future study into this subject will aim to create a model which could reliably predict mortality in AP patients early in their admission, using only BUN.

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