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**Title:** Arterial bicarbonate as a determinant of the length of non-invasive ventilation (NIV) in COPD patients with acute hypercapnic respiratory failure (AHRF)

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**Body:** Introduction: Factors related to length of stay are complex and related to many non-medical factors, however length (duration) of NIV treatment is not. Although the associations of mortality of patients requiring NIV are well-documented (Thomas A et al. Thorax 2010; 65:4. A33.), the determinants of the length of NIV have not been clearly elucidated, which we decided to investigate. Methods: A retrospective analysis of the initial arterial blood gas bicarbonate ( $\text{HCO}_3$  mmol/L) values on 115 consecutive episodes of NIV for at a dedicated respiratory NIV unit from 01 Jan to 31 Oct 2011 was carried out. Analysis of blood gases and duration of use of NIV (in days) was documented and analyzed. Results: There were 115 patients admitted with AHRF with COPD. Plotting a graph with  $\text{HCO}_3$  and length of NIV we see that it has a linear relationship.

The p-value for  $\text{HCO}_3$  as a determinant of length of NIV is 0.00084, which suggests that it is significant.

Conclusion: This scientific survey indicates that the length of NIV therapy in patients in AHRF increases with a higher  $\text{HCO}_3$ . Though outcome and mortality is closely linked to the pH, length of NIV is more closely linked to the  $\text{HCO}_3$ . This is explained by the fact that people with higher  $\text{HCO}_3$  are likely to have had chronic respiratory failure for longer and are likely to take longer to recover from the respiratory failure.