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Bioimpedance spectroscopy measurements of phase angle and height for age are predictive of outcome following surgery for congenital heart disease

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Objective: Children with congenital heart disease (CHD) are often growth restricted (low weight-and/or height-for-age) and this increases mortality risk. The estimation of body composition using bioelectrical impedance spectroscopy (BIS), has been used in a variety of clinical settings, and BIS derived phase angle has been suggested as a surrogate marker of nutritional/prognostic status. We sought to describe the relationship between nutritional status, phase angle and post-operative outcomes.
Methods: 122 children with CHD following cardiac surgery (March 2015 to April 2016). Outcome variables included growth, mechanical ventilation, PICU length of stay (PICU LOS) and BIS PA at 50Hz.BIS measurements were taken before-surgery, post-operatively; day 0, day 2 and on discharge from hospital. Nutritional status was evaluated pre-operatively, and moderate malnutrition defined as height-for-age z-score (HAZ) ≤-2; 28.5% of infants and 20.6% of children met this criteria. Regression analysis was used to investigate the relationship between phase angle, HAZ and clinical outcomes.
Results: are presented as odds ratios (95% confidence interval). A phase angle of ≤2.7 was associated with increased duration of mechanical ventilation OR 4.1 (1.3–12.4, p=0.01). PA of ≤2.7 on day 2 was associated with an increased PICU LOS OR 7.8 (2.7-22.45, p<0.001). HAZ≤-2 was associated with increased mechanical ventilation OR 1.9 (1.4-2.7, p<0.001) and PICU LOS OR 1.8 (1.1–2.7, p=0.008). When the model was adjusted for age, risk factors and length of surgery, both a day 2 phased angle of ≤2.7 and HAZ≤-2 were associated with increased PICU LOS (p=0.001 and p=0.04 respectively). The model explained 81.7% of the variability in PICU LOS.
Conclusions: A pre-operative low HAZ is associated with poorer post-operative resilience, which when used with a phase angle measure of ≤2.7 on day-2 post-operatively may identify those with at increased risk of prolonged PICU-LOS.