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Acid Base Disturbance in Critically Ill Patients

Essay

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Intensive Care

By

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Mohamed Abdel Aziz Abu Mostafa

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List of Abbreviations

AE-1	:	Anion exchanger 1
AE-2	:	Anion exchanger 2
AG	:	Anion gap
Alb	:	Albumin
A_{TOT}	:	Total Acids
BD	:	Base Deficit
BE	:	Base excess
CA	:	Carbonic anhydrase
C_{alb}	:	Albumin concentration
$Citrate_{TOT}$	:	Total citrate
C_{phos}	:	Phosphate concentration
CSF	:	Cerebrospinal fluid
ECF	:	Extracellular fluid
ENaC	:	Electrogenic epithelial sodium channel
ERC	:	European Resuscitation Council
ET-1	:	Endothelin-1
GFR	:	Glomerular filtration rate
HA	:	Metabolic acid
Hb	:	Hemoglobin
HCO_3^-	:	Bicarbonate
ICF	:	Intracellular fluid
ICU	:	Intensive care unit
IM	:	Intra muscular
$\sum$	:	The sum
NBCn1	:	Electroneutral Na^+-HCO_3^- symporter
NEAP	:	Net endogenous acid production
NH_4^+	:	Ammonium
NHE3	:	Na^+/H^+ exchanger 3
NKCC2	:	Apical membrane Na^+-K^+-$2Cl^-$ symporter
$PaCO_2$	:	Partial CO_2 Tension
PI_{TOT}	:	Total phosphate
PTH	:	Parathyroid hormone.
QTc	:	Corrected QT Interval.

List of Abbreviations (Cont.)

RBCs	:	Red Blood Cells
RNAE	:	Renal net acid excretion
SID	:	Strong Ion Difference
SIDa	:	Apparent Strong Ion Difference
SIDe	:	Effective Strong Ion Difference
SIG	:	Strong Ion Gap
TA	:	Titratable acid
THAM	:	Tri-hydroxymethyle aminomethane
UA	:	Unmeasured anions
UC	:	Unmeasured cations
XA-	:	Unidentified strong anions

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Introduction

Acid base disorders are common challenges seen in the intensive care unit (ICU) resulting in difficulty in weaning patients off the ventilator, prolonged admission periods, cardiac arrhythmias and cardiac arrest **(Adekola et al.,2012).**

The chemical composition of the extracellular and intracellular spaces is tightly controlled; it includes, but not limited to, hydrogen and hydroxyl moieties. Alteration in the relative concentrations of these ions, widely described as disorders of acid base chemistry. Consequently, the detection, interpretation, and treatment of acid base abnormalities become a core element of clinical care **(Neilgan et al., 2009).**

The initial therapeutic goal for patients with severe acidemia is to raise the systemic pH above 7.1-7.2, a level at which dysrhythmias become less likely and cardiac contractility and responsiveness to catecholamines will be restored. Metabolic acidosis can be reversed by treating the underlying condition or by replacing the bicarbonate. The decision should be based upon the pathophysiology of the specific acidosis, the clinical state of the patient, and the degree of acidosis **(Wilson et al., 2013).**

For the past 5 decades, a bicarbonate-based approach has been the dominant method used for the diagnosis and treatment of acid-base disorders. Stewart, using principals of electroneutrality and conservation of mass, developed a new approach to the diagnosis and management of these disorders **(Rastegar A 2009).**

Aim of the Work

- Understanding acid base physiology.
- Understanding different approaches of acid base disturbance and its mathematical equations.
- Highlight on causes and management of acid base disturbance in the intensive care unit