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New Strategy for Management of Morbid Obese Patients in Intensive Care Unit

Essay

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List of Abbreviations

ABW	Adjusted Body Weight
ACS	Abdominal Compartment Syndrome
AF	Atrial Fibrillation
AFOI	Awake Fibre Optic Intubation
AKI	Acute Kidney Injury
APACHE	Acute Physiology And Chronic Health Evaluation
ARDS	Acute Respiratory Distress Syndrome
ATN	Acute Tubular Necrosis
BMI	Body Mass Index
BSA	Body Surface Area
CAD	Coronary Artery Disease
CHG	Chlor Hexidine Gluconate
Cm	Centimeter
CNS	Central Nervous System
CO₂	Carbon Dioxide
CPAP	Continuous Positive Airway Pressure
CT	Computed Tomography

List of Abbreviations (Cont.)

CVVH	Continuous Veno Venous Hemofiltration
DVT	Deep Venous Thrombosis
ECG	Electro Cardio Graph
ERV	Expiratory Reserve Volume
FEV₁	Forced Expiratory Volume in the first second
F_iO₂	Oxygen Fraction in the Inspired air
FRC	Functional Residual Capacity
FVC	Forced Vital Capacity
G	Gram
GERD	Gastro Esophageal Reflux Disease
Hr	Hour
HbA1c	Hemoglobin A1c
HIV	Human Immunodeficiency Virus
IAH	Intra Abdominal Hypertension
IAP	Intra Abdominal Pressure
IBW	Ideal Body Weight

List of Abbreviations (Cont.)

ICU	Intensive Care Unit
IGF	Insulin like Growth Factor
IL	Interleukine
Kg	Kilogram
KHz	Kilo Hertz
L	Liter
LMWH	Low Molecular Weight Heparin
LV	Left Ventricle
M	Meter
MHz	Mega Hertz
Min	Minute
ml	Milliliter
NASH	Non Alcoholic Steato Hepatitis
NF	Necrosis Factor
OSA	Obstructive Sleep Apnea
PAI	Plasminogen Activator Inhibitor
PAP	Pulmonary Artery Pressure
PCA	Patient Controlled Analgesia

List of Abbreviations (Cont.)

PEEP	Positive End Expiratory Pressure
PEG	Percutaneous Endoscopic Gastrostomy
PO₂	Oxygen Tension
PVCs	Premature Ventricular Contractions
QTc	Corrected QT interval
R	Radius
RV	Right Ventricle
TLC	Total Lung Capacity
TNF	Tumour Necrosis Factor
TREC	T-Cell Receptor Excision Circle
TV	Tidal Volume
UBP	Urinary Bladder Pressure
UOP	Urine Output
US	Ultra Sonography
VDRF	Ventilator-Dependent Respiratory Failure
WHO	World Health Organization

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INTRODUCTION

The prevalence of obesity is increasing at an alarming rate worldwide (**Salome et al., 2008**). It is considered epidemic in the world in general, and it is an increasingly major health hazard in many developing nations (**Pelosi et al., 1999**).

Obesity can be classified according to body mass index (BMI) to overweight, class I, class II, and class III or morbid obesity in which BMI is equal or exceeding 40 kg/m² (**Krai and Heymsfield, 1997**).

Morbid obesity results in significant physiologic and pathologic changes in different body systems like coronary artery disease, diabetes mellitus (DM), hypertension, cerebrovascular stroke, abnormal lung function, cancers etc. Morbid obesity increases the incidence of complications, length of hospital stay, and poorer outcome (**Vaughan and Conaham, 2000**).

Management of morbid obese patients admitted to intensive care unit (ICU) constitutes a challenge to the ICU medical staff regarding intubation, tracheostomy, radiologic

procedures, vascular access, hemodynamic monitoring, nutritional, nursing, and drug dosing (***Varon and Marik, 2001***).

Safe and successful management of the obese patients necessitates an established level of organizational commitment, including staff education, clinical expertise, and specific care protocols (***Hogue et al., 2009***).

AIM OF THE WORK

The aim of this essay is to know the pathophysiological characteristics of critically ill obese patients and to know the new recommendations for their management in the critical care setting.

OBESITY AND BODY MASS INDEX

1. Defining Obesity:

Body mass index (BMI) is a method used to estimate human body fat burden in an individual. It describes relative weight for height and is significantly correlated with total body fat content (*Adams et al., 2006*).

Body mass index (BMI) is calculated as weight (kg)/height squared (m^2). To estimate BMI using pounds and inches, use: $[\text{weight (pounds)}/\text{height (inches)}^2] \times 703$

Examples for metric and non-metric conversion formula for calculation of BMI:

(a) *Metric conversion formula = weight (kg) / height (m^2):*

Example of BMI calculation: A person who weighs 78.93 kilograms and is 177 centimeters height has a BMI of 25:

$$\text{Weight (78.93) kg} / \text{height (1.77m)}^2 = 25$$

(b) *Non-metric conversion formula = weight (pounds) / height (inches)²:*

Example of BMI calculation: A person who weighs 164 pounds and is 68 inches height has a BMI of 25:

$\text{weight (164 pounds)}/\text{height (68 inches)}^2 \times 703 = 25$ (*Adams et al., 2006*).

Overweight persons are those with body mass index (BMI) ranges from 25 to 29.9 kg /m². Obesity can be subdivided to class I with BMI ranges from 30 to 34.9 kg/ m² and class II with BMI ranges from 35 to 39.9 kg/m² (**Leary et al., 2000**).

Any person whose body mass index (BMI) exceeds 40 kg/m² is diagnosed as severely or morbidly obese. This equates to be about 100 pounds (45.5 kg) overweight or more than two times the ideal body weight (**Leary et al., 2000**)(table 1).

Table 1: WHO Classification of Obesity according to BMI

WHO Classification	BMI (kg/m ²)
Underweight	<18.5
Normal weight	18.5-24.9
Overweight	25.0-29.9
Class I obesity	30.0-34.9
Class II obesity	35.0-39.9
Class III obesity Commonly called morbid or severe obesity	BMI: 40-49.9 kg/m ² morbidly obese BMI: >50 kg/m ² super obese

(**Yusuf et al., 2005**).

The BMI should be used to assess overweight and obesity and to monitor changes in body weight. In addition, measurements of body weight alone can be used to determine efficacy of weight loss therapy (**Adams et al., 2006**).

Clinical obesity is a syndrome involving both weight and metabolic changes, and is influenced by both genetic and environmental factors. Both aspects can participate in the pathology associated with obesity. The specific factors can be categorized into weight-related, physiologic, and pro-inflammatory. All may participate in the response to stress factors (**Karason et al., 1997**).

Obesity was not included as a co-morbid variable in the development of the APACHE (acute physiology and chronic health evaluation) prognostic indices. However, morbidly obese patients have an eight fold higher mortality following blunt trauma than non obese patients (**Parameswaran et al., 2006**). This is probably because height and weight are not routinely recorded in ICU. Thus, the usual prognostic scores that are designed to predict the mortality of ICU patients may neglect an important parameter that may lead to an under-estimation of mortality in the specific population of obese patients, as reflected by an observed mortality that is higher than the predicted mortality (**Estenssoro et al., 2002**).