

**Factors Affecting Arterial Blood Gases  
Analysis among Critically Ill Patients: A  
Suggested Nurses Performance Protocol**

**Thesis**

**Submitted for Partial Fulfillment of the Requirement  
Master Degree Nursing Science (Critical Care Nursing)**

**By**

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**Under Supervisions of  
Prof. Kamelia Fouad Abd-Allah**

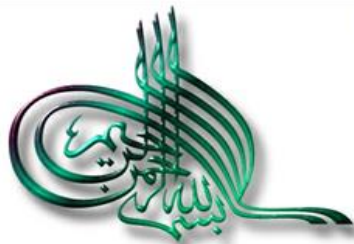
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**2018**



وَقُلْ اَعْمَلُوا فَسَيَرَى اللّٰهُ  
عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ

صَلَّى  
الْعِظَمِ



In the name of **Allah**, the most kind and the most merciful.

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## List of Abbreviations

| Abbreviation                       | Meaning of abbreviation               |
|------------------------------------|---------------------------------------|
| <b>ABGs</b>                        | Arterial Blood Gases                  |
| <b>BE</b>                          | Base Excess                           |
| <b>BF</b>                          | Breathing Frequency                   |
| <b>Ca<sub>2</sub><sup>+</sup></b>  | Calcium                               |
| <b>Cl<sup>-</sup></b>              | Chloride                              |
| <b>CNS</b>                         | Central Nervous System                |
| <b>CO<sub>2</sub></b>              | Carbon Dioxide                        |
| <b>CCU</b>                         | Critical Care Unit                    |
| <b>O<sub>2</sub></b>               | Oxygen                                |
| <b>COPD</b>                        | Chronic Obstructive Pulmonary Disease |
| <b>CPAP</b>                        | Continuous Positive Airway Pressure   |
| <b>DKA</b>                         | Diabetic Ketoacidosis                 |
| <b>ECF</b>                         | Extracellular Fluid                   |
| <b>FiO<sub>2</sub></b>             | Fraction of Inspired Oxygen           |
| <b>H<sup>+</sup></b>               | Hydrogen Ion                          |
| <b>H<sub>2</sub>CO<sub>3</sub></b> | Carbonic Acid                         |
| <b>H<sub>2</sub>O</b>              | Hydrogen Ions Dissolved in Water      |
| <b>HCl</b>                         | Hydro Chloric Acid                    |
| <b>HCO<sub>3</sub><sup>-</sup></b> | Bicarbonate                           |
| <b>ICU</b>                         | Intensive Care Unit                   |
| <b>K<sup>+</sup></b>               | Potassium                             |
| <b>mEq/L</b>                       | Milliequivalents Per Liter.           |
| <b>Mg<sup>2+</sup></b>             | Magnesium                             |
| <b>mmHg</b>                        | Millimeters Mercury                   |

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*List of Abbreviations*

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|                                    |                                             |
|------------------------------------|---------------------------------------------|
| <b>Na<sup>+</sup></b>              | Sodium                                      |
| <b>P</b>                           | phosphorus                                  |
| <b>PaCO<sub>2</sub></b>            | Partial Pressure of Arterial Carbon Dioxide |
| <b>PaO<sub>2</sub></b>             | Partial Pressure of Arterial Oxygen         |
| <b>PAD</b>                         | Peripheral Arterial Disease                 |
| <b>pH</b>                          | Power of Hydrogen                           |
| <b>PO<sub>4</sub><sup>3-</sup></b> | Phosphate                                   |
| <b>POC</b>                         | Point of Care                               |
| <b>SaO<sub>2</sub></b>             | Saturation Arterial Oxygen                  |
| <b>T.V</b>                         | Tidal Volume                                |

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## Abstract

Arterial blood gases (ABGs) analysis provides important information with regard to adequacy of ventilation, oxygen delivery to the tissues and acid-base balance. Interpretation of ABGs level can be difficult, especially if the nurse is under pressure to do it quickly and accurately.

**Aim:** the study aimed to assess factors affecting arterial blood gases analysis among critically ill patients. **Study design:** a descriptive exploratory design was utilized to conduct this study. **Setting:** The study was conducted at Ain Shams Specialized Hospital in four intensive care units (Intensive Care Unit A, B & C and Coronary Care Unit). **Subject:** A convenient sample of all available nurses with total number 50 was recruited in the previously mentioned units. **Data collection tools:** 1) Self-administered questionnaire, 2) Nurses practices observational checklists.

**Results:** the present study revealed that the most of the nurses had unsatisfactory level of knowledge, interpretations and level of practice (64%, 64% & 80%) respectively. Many factors affecting negatively on ABGs analysis as reported by majority of the nurses namely job regulation related factors, nurses related factors, resource and sampling analysis related factors and patients related factors (100%, 98%, 86% & 76%) respectively. **Conclusion:** Based on the finding of the current study, it can be concluded that less than two third of the nurses had got unsatisfactory level of knowledge regarding ABGs sampling techniques and interpretation of its result. And most of them had got unsatisfactory level of practice regarding ABGs sampling techniques. In addition, many factors affecting negatively on ABGs analysis as reported by majority of the nurses under study namely; job regulation related factors, nurses related factors, resource and sampling analysis related factors and patients related factors. **Recommendations:** the suggested nurses' performance protocol for improving their knowledge & practice regarding ABGs analysis, taking into consideration the many factors affecting ABGs analysis as reported by the nurses under study should be available in all Critical Care Units in different hospitals.

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### Key words:

ABGs: Arterial blood gases.

## **Introduction**

Arterial blood gases (ABGs) are a valuable tool in the assessment of a multiple of illnesses and injuries and it represents the criterion standard for determining a ventilated and non-ventilated patient's acid-base status. Critical care nurse caring for critically ill patients should be skillful in the continuous bedside assessment and management. The nurse needs to understand the issues related to the ABGs interpretation and skillfully perform the ABGs sampling technique (*Salem, 2014*).

The ABGs are a test that measures partial pressure of arterial oxygen ( $\text{PaO}_2$ ), partial pressure of carbon dioxide ( $\text{PaCO}_2$ ), acidity of the arterial blood (pH), saturation arterial oxygen ( $\text{SaO}_2$ ), and bicarbonate ( $\text{HCO}_3$ ) concentration in arterial blood. Some blood gas analyzers also measure the methemoglobin, carboxyhemoglobin, and hemoglobin levels. Such information is vital when caring for patients with critical illness, respiratory, or metabolic diseases (*Theodore, Manaker & Finlay, 2017*).

The ABGs results are routinely used by critical care nurses to assess the respiratory and acid-base status of critically ill patients in Intensive Care Unit (ICU) setting. Accurate and timely interpretation of ABGs data can be