

## Fowler and Lateral Positioning Practices and Changes in The Volume Tidal Value in Patients with CPAP Mode Ventilator in ICU General Hospital

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### ABSTRACT

**Background:** Continuous Positive Airway Pressure (CPAP) is a ventilator mode which able to improve oxygenation for a patient whose adequate breathing ability with no respiratory muscle so that weakness, so that the patient was breathing spontaneously.

**Purpose:** The research's aim is to determine the effectiveness of fowler position (sitting position) and lateral position on the change of tidal volume value of patients with CPAP mode ventilator in ICU General Hospital.

**Method:** The research used a quasi-experimental design with pre-test design post-test with the control group. The population in this study were all patients in ICU General Hospital, with CPAP mode ventilator. The sample was 36 patients consisting of 2 groups whereas 18 patients as an experimental group were given fowler positioning intervention and 18 control patients as the control group was given lateral position. Samples were taken by purposive sampling technique. The data were obtained by measuring tidal volume. Univariate and bivariate data analysis using independent T-test and dependent T-test.

**Result:** The research results were in the intervention group with Fowler positioning (sitting position) the average VT was obtained before the intervention (pretest) 433,39 ml and after intervention (posttest) 465,17 ml. There are differences of VT before and after given fowler positioning (sitting position) with an average increase of 31,778 ml ( $P$ -value = 0,000). In the control group with lateral positioning the mean of VT pretest was 435,33 ml and after posttest 455,22 ml. There are differences of VT before and after giving lateral position ( $P$ -value = 0,018) with an average increase of 19,889 ml.

**Conclusion:** The conclusion of Fowler positioning (sitting position) is more effective in increasing the tidal volume value than the lateral position for a patient in CPAP mode ventilator. Furthermore, recommendation for the hospital is to improve the nurses' skills to conduct scheduled assignments through training or seminars.

### Keywords

CPAP ventilator mode, Fowler positioning, Intensive care, Lateral positioning, Tidal volume.

### Introduction

The Hospital is one of health care facilities which provides health treatment services, emergency services, outpatient and inpatient services. Intensive Care Unit (ICU) is a special care unit which is managed to care for critically ill, critical patients, and life-threatening injuries involving trained health workers and

supported by special equipment. In the United States, the number of hospitalizations due to respiratory failure increased from 2009 - 2012 from 1,007,549 to 1,917,910, the mortality rate was 27.6% in 2001 to 20.6% in 2009 [1]. Based on data from Ministry of Health, respiratory failure ranked at the second place (20,98%) from 10 non-communicable diseases (NCD) which caused fatal deaths based on the Case Fatality Rate (CFR) in hospital hospitalization in 2010. The average number of patients admitted to the ICU was 41-42 patients/month and on average those who experienced respiratory failure were 13-14 patients/month and 10-11 patients/

month died of respiratory failure [2]. Data from the registration books of the District General Hospital ICU from January to November 2017 revealed that 1,410 patients treated in the ICU and 277 patients (19.6%) experienced respiratory failure. The average number of patients admitted to ICU was 128 patients/month and those who experienced respiratory failure were 25 patients/month.

## Method

The research method is analytic research with a quasi-experimental method, with a non-control (experimental) and control group design with pretest and posttest design. The study was conducted in March-April 2018. The sample in this study were patients in the ICU of District General Hospital, with a CPAP mode ventilator. The minimum sample size required by each group is 16 people or 32 people for 2 groups. Furthermore, to avoid drop out, added 10% of the number of samples or 4 people so that the entire sample amounted to 36 people, with the division of the experimental group is 18 people and the control group is 18 people. The sampling technique in this study is nonprobability sampling in the form of purposive sampling. The stages of implementation include firstly, measurement of tidal volume before patient positioned in Fowler or lateral position (supine) and secondly, re-measurement of tidal volume conduct right before patient being returned into a supine position. The Patient positioned in Fowler or lateral position for 15 minutes. Data analysis was carried out univariate and bivariate with T-test.

## Results

### Univariate Analysis

#### Description of Tidal Volume (VT) from Experimental Group with Fowler Position (Sitting Position)

Treatment	Mean (ml)	Median (ml)	Standard Deviation	Minimal-Maximal (ml)
Before positioned	433,39	417,50	93,776	286-608
After positioned	465,17	467,00	97,229	307-653

**Table 1:** Description of Tidal Volume (VT) from Experimental Group with CPAP Mode Ventilators in the ICU of District General Hospital Period March-April 2018.

Based on the table above, in the experimental group which given fowler position (sitting position), the average VT before positioned (pretest) was 433.39 ml with median score 417.50 and a standard deviation of 93,776. The lowest VT was 286 ml and the highest was 608 ml. Whereas in the control group the lateral position was given an average of VT before positioned (pretest) was 435.33 ml with a median 413.50 ml and a standard deviation of 110,389. The lowest VT was 248 ml and the highest was 673 ml. The results of further analysis with Independent T-test on VT before positioned (pretest) between the experimental group (fowler positioned) and the control group (lateral positioned) obtained P-value = 0.955 > (0.05) then Ho was accepted, which means there was no difference in VT before positioned (pretest) in the experimental group (fowler positioned) with the control group (lateral positioned). This means

that the two groups before given a specific position (pretest) are in the same or homogeneous condition so that it cannot be compared or compared.

#### Description of Tidal Volume (VT) from Control Group with Lateral Position

Condition	Mean (ml)	Median (ml)	Standard Deviation	Minimal-Maximal (ml)
Before positioned	435,33	413,50	110,389	248-673
After positioned	455,22	429,50	108,533	320-680

**Table 2:** Description of Tidal Volume (VT) from Control Group CPAP Mode Ventilators in the ICU of District General Hospital Period March-April 2018.

After positioned (posttest) with Fowler position (sitting position), the average VT was 465.17 ml with a median score of 467.00 and standard deviation of 97,229. The lowest VT value was 307 ml and the highest was 653 ml. While the control group after given the lateral position (posttest) obtained an average VT after 455.22 ml with a median of 429.50 ml and a standard deviation of 108.533. The lowest VT value was 320 ml and the highest was 680 ml.

With tidal volume calculation of 8-10 ml/kg BB, and the respondent's body weight ranging from 55-70 kg. The experimental group with fowler position (sitting position) with the average value of VT was 465.17 ml already meets the minimum value of tidal volume. On the lateral position, the average tidal volume was 455.22 ml, then it has fulfilled the minimum value of tidal volume that should be achieved in patients who fail to breathe with a mechanical ventilator. The results of the further analysis with Independent T-test on VT after positioned between the intervention group of the experimental group (fowler position) and control group (lateral position) obtained P-value = 0.744 > (0.05). Therefore, Ho was accepted meaning and there was no difference in VT after given intervention (posttest) in the experimental group with fowler position and the control group with lateral position. So that there is no difference between these two positions because each given position to the two groups both increasing the tidal volume.

### Bivariate Analysis

Tidal Volume	Shapiro Wilk Test			Conclusion
	Statistic	df	P value	
Fowler position (Before positioned)	0,965	18	0.692	Data normally distributed
Fowler position (After positioned)	0,964	18	0.688	Data normally distributed
Lateral position (Before positioned)	0,973	18	0.848	Data normally distributed
Lateral positioned (After positioned)	0,912	18	0.092	Data normally distributed

**Table 3:** Results for Normality Test of Patients' Tidal Volume Data (VT) Before and After Positioned in Fowler and Lateral in ICU District Hospital Period March-April 2018.

Analysis of Differences in Tidal Volume before (pretest) and after

Positioned (posttest) (VT) in Experimental Group

Position	Tidal Volume	
	Before Positioned (Pretest)	After Positioned (Posttest)
Fowler position	433,39	465,17
Lateral position	435,33	455,22
T Independent test	P value = 0,955 T value = 0,057	P value = 0,744 T value = 0,290

**Table 4:** Differences in Tidal volume (VT) before (pretest) and after given fowler position (posttest) in Experimental Group in the District General Hospital ICU Period March-April 2018.

Patient position management is one of the important components in performing ICU care. This intervention is believed to affect morbidity and mortality rate in critical patients [3]. From the results of the analysis it was found that the average tidal volume (VT) in the experimental group before given fowler position (pretest) was 433.39 ml and after fowler positioned (posttest) was 465.17 ml with an average increase was 31,778 ml. The results of the Dependent T test obtained P value (0,000) < (0,05) and count (5,760) > table (2,109) then Ho was rejected, meaning that there was a difference between VT before and after given the Fowler position. In line with other research conducted in Philadelphia, it was obtained data that the Fowler position (sitting position) contributes better than supine and fowler position specifically on the respiratory loss chamber and pulmonary residual functional capacity. Another research also showed the results that the average increase in the tidal volume of a patient with fowler position was higher 211.818 ml than in a patient with a semi-fowler position of 90.909 ml and with the p-value in the independent T-test is <0.00001 [4]. So that it can be concluded that the Fowler position is more effective than a semi-fowler position in increasing tidal volume in patients with respiratory failure who are attached to a ventilator.

**Analysis of Pretest and Posttest Tidal Volume (VT) in Experimental and Control Groups**

Group	Tidal Volume	Mean	Average Increase	T count	P Value
Experiment group (Fowler Positioned)	Before	433,39	31,778	5,760	0,000
	After	465,17			
Control group (Lateral Positioned)	Before	435,33	19,889	2,631	0,018
	After	455,22			

**Table 5:** Differences in Tidal Volume (VT) Before (Pretest) and After (Posttest) Given Lateral Position in Control Group and Given Fowler Position in Experimental Group in the District General Hospital ICU Period March-April 2018.

**Difference Tidal Volume (VT) before (Pretest) and after (Posttest) Given Lateral Position in Control Group**

The result of given lateral position in the control group showed that the average tidal volume (VT) before lateral positioned (pretest) was 435.33 ml and after positioned (posttest) was 455.22 ml with the average increase of 19,889 ml. The results of the Dependent T test obtained P value (0.018) < (0.05) and count (2.631) > table

(2.109). Therefore, Ho was rejected, which means that there was a difference between VT before and after given the lateral position. An increase in tidal volume in the lateral position compared to the supine position indicates that the lateral position is better than the supine position.

**Comparison of the Effectiveness between Fowler Positioning and Lateral Positioning on Tidal Volume Increase in Patients with Respiratory Failure a CPAP Ventilator Mode**

The independent T-test showed that there were significant differences between the tidal volume of the experimental group (given fowler position) and control group (given lateral position). That condition is supported by the results of the P value < 0.05 so that it can be concluded that statistically there is the significant increase in the tidal volume after given intervention between fowler positioned and lateral positioned. This study has attempted to determine the effectiveness of increasing the tidal volume (VT) between the Fowler position and lateral position. Researchers had evaluated it by looking at the average increase in paired T-test results of each group, wherein the control group (fowler positioned) the increase was 31.7778 ml (7, 33%) and in the experimental group (lateral positioned), the average increase was 19,889 ml (4.57%). The average increase in the group which given fowler position is higher than the group which given lateral position. So, can be concluded that the Fowler position is more effective in increasing tidal volume than the lateral position in patients with respiratory failure who are attached to the CPAP mode ventilator.

**Discussion**

The results of statistical tests using the independent T-test showed that there were significant differences between the fowler and lateral groups. Shown by the results of the P-value <0.05, it can be concluded that there is a statistically significant difference in the increase in tidal volume after treatment of the Fowler position and lateral position.

This study aims to determine the effectiveness of increasing tidal volume between fowler position and lateral position control, the researchers evaluated it by looking at the average increase in paired T-test results of each treatment group, where the average fowler position increased by 31,778 ml (7,33%) and lateral position averaged an increase of 19.889 ml (4.57%). The increase in the average position of the fowler which is greater than the lateral position, it was concluded that the position of the fowler was more effective in increasing tidal volume than the lateral position in the patient who failed to breathe with the CPAP mode ventilator installed.

Regular patient positioning in the ICU aims to prioritize comfort, prevent ulcer formation due to pressure and reduce the incidence of deep vein thrombosis, pulmonary embolism, atelectasis, and pneumonia. Positioning is usually by moving the patient between the lateral right and left followed by the position of other bodies such as supine or semi-recumbent position. Somebody positions can affect lung development and the thoracic wall. Lung volume and gas exchange can be affected by changes in position [5].

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## Conclusion

The conclusion of Fowler positioning (sitting position) is more effective in increasing the tidal volume value than the lateral position for a patient in CPAP mode ventilator. Furthermore, recommendation for the hospital is to improve the nurses' skills to conduct scheduled assignments through training or seminars.

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