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Article

# THE Effect of Suction Towards Oxygen Saturation to Patients in Intensive Care Unit: Literature Review

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**Abstract:** Introduction: Oxygen saturation is the percentage of Hb in blood related to oxygen in the arteries. An oxygen saturation value of less than 95% indicates that the patient is hypoxaemic. Suction is an intervention often performed by nurses to patients with critical illness. The objective is to identify the value of oxygen saturation and the effect of suction towards oxygen saturation value to patients in ICU. Research Method: The method used literature review with articles indexed by SINTA, SCOPUS and Google Scholar. The article used experimental design with a pretest and posttest design. Articles were from 2011 to 2020 and obtained 11 suitable articles. The variables were suction and oxygen saturation. The measuring instruments used observation sheets, pulse oximetry and questionnaires. Result: The results of 11 articles were obtained based on literature review of results of oxygen saturation values pre-test which were below normal with a minimum value of 48.1 and a maximum of 100, while the oxygen saturation post-test value with a minimum value of 42.6 and a maximum of 100 to patients in ICU and there were significant changes in the value of oxygen saturation on pre suction and post suction with a value of  $p < 0.05$ . Conclusion: there was an effect of suction towards oxygen saturation value to patients in ICU.

**Keywords:** suction; oxygen saturation; intensive care unit; literature review

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## Introduction

Oxygen saturation is the percentage level of oxygen that can be bound by hemoglobin (Mathar, 2018). It is important to know the condition of the body's health by looking at the amount of oxygen supply bound by the blood, patients who experience hypoxia are characterized by a lack of oxygen in the blood which causes the oxygen saturation value to decrease and other signs that can be seen if the patient is hypoxic are shortness of breath, tend to breathe faster and faster heart rate (Asmadi, 2012). Multi-organ disorders involving disorders of the respiratory organs are usually experienced by critically ill patients (Sundana, 2018).

Data from the *World Health Organization* (WHO) 2016, critical patients in the ICU increase every year. There are around 9.8%-24.6% of critically ill patients treated in the ICU per 100,000 population, and deaths from critical to chronic illnesses in the world have increased by 1.1-7.4 million people. According to data from the Ministry of Health of the Republic of Indonesia in 2020, 94% of patients treated in the ICU room were available from the 16 beds available at the Riau Provincial Hospital (Kemenkes, 2021).

Decreased oxygen saturation can be caused due to respiratory failure, decreased consciousness and even fall into a coma to be one of the causes of patients experiencing multi-organ failure and requiring patients to be treated in the ICU (Dewi et al, 2020). Excessive accumulation of secretions can cause respiratory failure or decreased consciousness so that it can cause a decrease in oxygen saturation levels (Dewi et al, 2020). Signs and symptoms of a decrease in oxygen saturation are oxygen saturation levels  $< 90\%$ , patients experience respiratory distress such as difficulty breathing, faster breathing rate of 35x/minute, decreased level of consciousness, cyanosis, fast and shallow pulse (Hidayati et al, 2020).

Critical patients who are treated in intensive care rooms experience airway obstruction due to excessive accumulation of secretions (Dewi et al, 2020). Things that can be done to free the airway, prevent infection in the lungs and reduce the buildup of secretions are by taking *suction* (Asmadi, 2012). Interventions that are often given to critically ill patients who experience excessive accumulation of secretions are by providing *suction* (Asmadi, 2012). Research conducted by (Kitong et al., 2014) showed that after the action *suction* there was a change in oxygen saturation levels. Research conducted by (Syahran et al., 2019) also showed changes before and after *suctioning* where the patient's oxygen saturation level changed. So it can be concluded that *suction* can affect oxygen saturation levels in patients who have problems with the patient's airway. Based on the phenomena and background of the problem above, the researcher is interested in analyzing the effect of action *suction* on oxygen saturation in patients in the ICU based on a *literature review*.

## Material and Methods

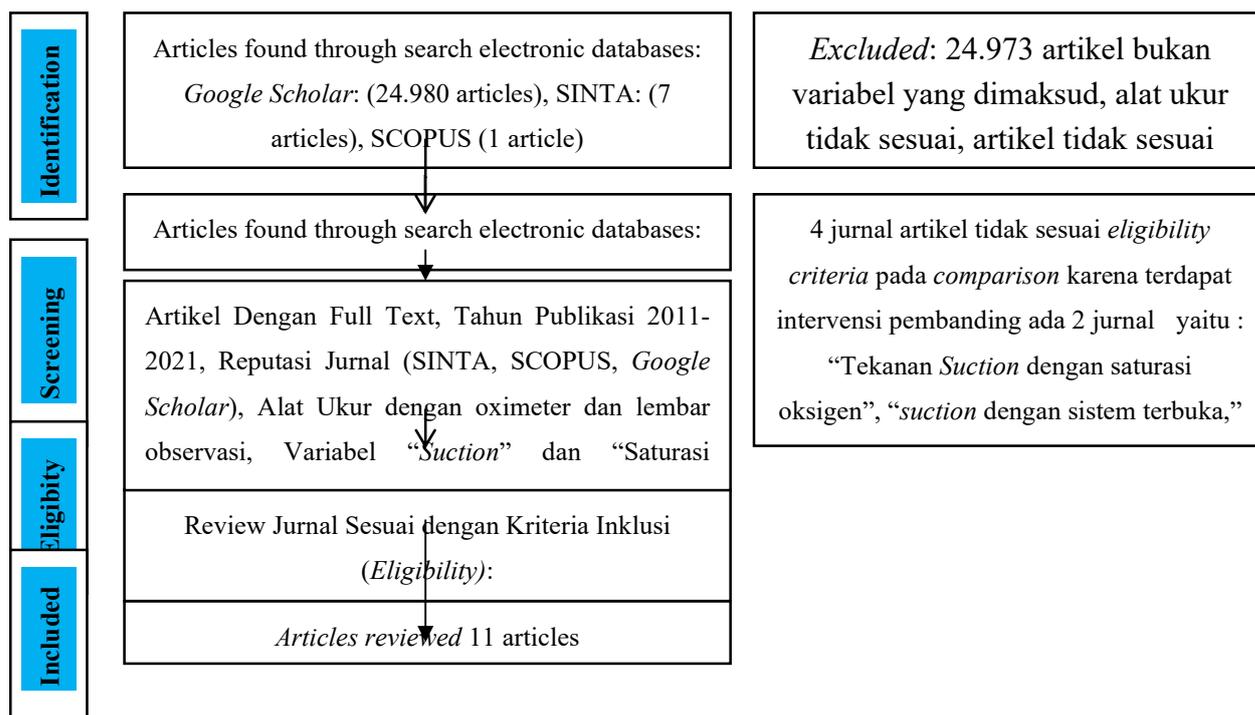
The design used in this study is a *literature review* using a *search string* with the keywords: "oxygen saturation, suctioning mucus" "oxygen saturation, suction". Researchers identified data through the PICO approach (*Population, Intervention, compare, and outcome*) which had been adjusted for the purpose of identifying oxygen saturation in patients in the ICU based on a *literature review* and analyzing the effect of *suction* on oxygen saturation in patients in the ICU based on a *literature review*.. The research journals used are published in the last 10 years from 2011 to 2021. The online database source comes from Indonesian or English. The number of journal references in this *literature review* is 11 journals consisting of abstracts and full text indexed by SCOPUS, SINTA, Google Scholar, with articles in Indonesian and English. Researchers conducted a *review* research in journals using the characteristics of respondents aged 12 years and over, male and female, and all patients in the ICU, research *quasi-experimental design, experiment, with a pre-post test design* with a sampling technique that is *total sampling, purposive sampling, consecutive sampling, accidental sampling, and quota sampling* and using analytical *t test, paired t test, Wilcoxon, paired sample t test, and independent t test*. The measuring instruments used were observation sheets, *pulse oximeters* and questionnaires. *The outcome* measured was a change in the oxygen saturation value.

In research using this literature, researchers will only focus on discussing the effect of action *suction* and oxygen saturation. It does not discuss other influences that cause changes in oxygen saturation that occur in patients and researchers determine the purpose of the study before conducting the research analysis in identifying oxygen saturation values and analyzing the effect of action *suction* on oxygen saturation in patients in the ICU in each of the 11 literature reviews that are expected will produce the same results according to the research methodology carried out.

**Table 1.** Analisis PICO (Population, Intervention, compare, dan outcome).

Author	Method		Result
	Sample size	Measuring tools	
Wanidi et al (2014)	37 people	Pulse oximetry and observation sheet	1. Before:- 2. After: - 3. Statistical test results p value = 0,0001
Sari & Ikbal(2019)	30people	Observation sheet	1. Before: average 99.48 2. After: average 94.02 3. Statistical test results p value = 0,000
Zukhri et al (2018)	20 people	Pulse oximetry and observation sheet	1. Before: average 97,4 2. After: average 95,7 3. Statistical test results p value = 0,004

Nizar & Haryati (2017)	40 people	Observation sheet	1. Before: average 89,86 2. After: average 91,65
Syahrani et al (2019)	13 people	Pulse oximetry	1. Before: average 97,77 2. After: average 96,50 3. Statistical test results p value = 0,002
Septimar (2018)	40 people	Observation sheet	1. Before: average 95,78 2. After: average 97,25 3. Statistical test results p value = 0,000
Karokaro & Hasrawati (2019)	22 people	Observation sheet	1. Before: average 86,90 2. After: average 95,85 3. Statistical test results p value 0.000
Kitu et al (2019)	15 people	Pulse oximetry and observation sheet	1. Before: average 94,40 2. After: average 97,87 3. Statistical test results p value 0.000
Kristiani et al (2020)	35 people	Pulse oximetry and observation sheet	1. Before: - 2. After: - 3. Statistical test results p value p 0,001
Giakoumidakis et al (2011)	103 people	Kuisoner	1. Before: - 2. after: - 3. Statistical test results p value $p < 0,05$
Muhaji et al (2017)	30 people	Pulse oxymetry	1. Before: average 95,60 at a pressure of 140 mmHg and an average of 94.73 at a pressure of 130 mmHg 2. after: averaged 98.07 at a pressure of 140 mmHg and averaged 95.87 at a pressure of 130 mmHg 3. Statistical test results p value 0.000



## Result

### *Results of Oxygen Saturation in Patients in the Room Based on Literature Review*

Results from 11 journals obtained about oxygen saturation obtained There are 6 journals with the authors Wanidi et al (2014), Sari & Iqbal (2019), Nizar & Haryati (2017), Karokaro & Hasrawi (2019), Kitu et al (2019) and Muhaji et al (2017) revealed that the oxygen saturation value of patients in the ICU was poor or below normal, namely the saturation value *pre-test* ranged from 86.90 to 94.73. Furthermore, 6 journals with the authors Sari & Iqbal (2019), Zuhri et al (2018), Syahrani et al (2019), Septimar (2018), Giakoumidakis et al (2011) and Muhaji et al (2017) revealed in their journals that the oxygen saturation of patients was *pre-test* good, namely the oxygen saturation value *pre-test* ranged from 95.60 to 99.48. Then 1 journal with the author Kristen et al (2020) in his journal did not disclose in the journal the oxygen saturation value *pretest* and patients using a ventilator in the ICU room were good or bad, only explaining that there was a change in the oxygen saturation value. There are 4 journals with the authors Zuhri et al (2018), Syahrani et al (2019), Karokaro & Hasrawi (2019), and Kitu et al (2019) in the journals of respondents using ventilators and oxygen saturation values of *pre-test* at least 79 and the highest being 100.

### *The Results of the Effect of the Action of Suction on Oxygen Saturation in a Patient in the ICU is Based on Literature Review*

Based on the synthesis of value measurement of oxygen saturation in patients di ruang ICU of 11 journals all imply any change subsequent to the action of *suction* written by Wanidi et al (2014), Syahrani et al (2019), Kristen et al (2020), Sari & Iqbal (2019), Muhaji et al (2017), Zuhri et al (2018), Giakoumidakis et al (2011), Nizar & Haryati (2017), Karokaro & Hasrawi (2019), Septimar (2018) and (Kitu et al., 2019) in the journal using the p statistical test obtained a p value of 0.000 ( $p < 0.05$ ).

## Discussion

### *Identifying Oxygen Saturation in Patients in the ICU Based on Literature Review*

Based on facts from 11 journals, normal and poor oxygen saturation values were used. There are 6 journals with normal saturation values with values from 95.60 to 99.48 and poor saturation values ranging from 86.90 to 94.73. Oxygen saturation is the percentage of Hb in the blood related to oxygen in the arteries (Mathar, 2018). Normal oxygen saturation levels are 95%-100%, oxygen saturation values less than 95% indicate the patient is hypoxic (Wahid and Suprpto, 2013). Blood oxygen levels that are very low and require immediate treatment are characterized by oxygen saturation values <90%. The occurrence of other symptoms of respiratory distress can indicate low oxygen saturation (Idris et al., 2020). Factors that affect changes in oxygen saturation, namely hemoglobin, activity and suction (Zakiyah, 2015). Signs and symptoms of a decrease in oxygen saturation are oxygen saturation levels <90%, patients experience respiratory distress such as difficulty breathing, respiratory rate becomes faster 35 x/minute, decreased consciousness, cyanosis and fast and shallow pulse (Hidayati et al, 2020) . The measuring instrument used to measure oxygen saturation levels is an oximeter (*pulse oximeter*). *Pulse oximeter* or oximetry is a non-invasive method of continuous monitoring of hemoglobin oxygen saturation (SaO<sub>2</sub>). This examination is used to monitor patients for sudden changes or small changes in oxygen saturation (Wahid & Suprpto, 2013). The results of 11 journals obtained oxygen saturation values from 86.90 to 94.73 indicating poor or below normal oxygen saturation values, where the oxygen saturation value decreased which could be due to blockage in the respiratory tract due to excessive mucus buildup but the patient was unable to do so. releasing secretions that occur in patients treated in the ICU, so that the value of oxygen saturation in patients in the ICU decreases.

### *Analyzing the Effect of Action on Suction Oxygen Saturation in Patients in the ICU Based on the Literature Review*

Results from 11 journals obtained, the administration of intervention *suction* proved effective on oxygen saturation in 11 journals (100%) as evidenced by changes after performed *suctioning* was on the results and statistical test of each research design used.action *Suction* needs to be carried out on patients who are unable to excrete their own secretions so that patients do not experience hypoxia, butaction *suction* has a relationship with changes in oxygen saturation values that occur in patients treated in the ICU so it is necessary to make observations made by nurses in the ICU. The value of oxygen saturation after action *suction* in patients in the ICU obtained a value of 91.65 to 98.50. *Suction* is an action to help patients who are unable to excrete excessive secretions which aims to maintain the airway so as to allow for an adequate gas exchange process (Timby, 2009 in Wagiran 2015). The Action is *suction* carried out by rotating the suction catheter for no more than 15 seconds (Gultom, 2020). The purpose of the action is *suction* to clean and maintain a clean airway to help meet the oxygen supply so that it remains fulfilled with an adequate airway, maintain a patent airway by maintaining a smooth airway and freeing the airway from accumulated secretions or mucus (Rakhman, 2014). . Changes in oxygen saturation, cardiac dysrhythmias, hypotension and increased intracranial pressure are the effects caused by *suction* in critical patients if it is not carried out with incorrect procedures (Gultom, 2020).

Based on the exposure of 11 journals were selected using a *literature review* their influence the action of *suction* on the value of the oxygen saturation in patients di ruang ICU, it is evidenced by the change in the value of oxygen saturation can be seen in the comparison of *pre-test* and *post-test* of the intervention group or the control group apart significant changes in oxygen saturation values and can be seen from the results of the observation sheet.management is *Suction* often performed on patients treated in the intensive care unit who have decreased consciousness and patients who are on an ETT ventilator. Based on the results of a recommended review of 11 journals used in critically ill patients with circulatory disorders to prevent hypoxia. The function of providing *suction* in patients with critical situations is to maintain the patient's airway due to the accumulation of excess secretions and the benefit is not only to help maintain the supply of incoming oxygen but also to help

patients who experience decreased consciousness so as not to experience aspiration so that patients can help patients breathe easily. normal, although *suction* can make the oxygen saturation value decrease temporarily before giving hyperoxygenation but it is still done to improve the patient's critical condition. Then related to the duration of management *suction* according to the theory, which is <15 seconds, but in practice the 11 journals have different durations for each journal, this is due to adjusting the characteristics of respondents with varying conditions but this is not an obstacle for researchers in journals to see the effect of the action *suction* given, because the researchers in the 11 journals provided action *suction* gradually and regularly.

## Conclusion

From the results of a *literature review* of 11 journals, it can be concluded that:

1. The results of the oxygen saturation value before and after the action *suction* changed with the average oxygen saturation value before the action *suction* 86.90-99.48 and the average oxygen saturation value after the action *suction* 91.65-98.30.
2. Based on the results of the *literature review*, it was found that there was an overall effect of action *suction* on the oxygen saturation value which changed in *pre suction* and *post suction* with a p value of 0.000 ( $p < 0.05$ ).

## Suggestion

1. Nurses in the ICU are  
Expected to carry out strict supervision in carrying out actions *suction* and the procedure *suction* must be carried out in accordance with the SOPs that are correctly applied in the hospital.
2. For Further Researchers Future  
Researchers are expected to develop research by looking at the effect of action *suction* on oxygen saturation values that occur in patients treated in the ICU.

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