ISSN 2786-0183
Helwan International Journal for Nursing Research and Pratctice
Vol. 2, Issue 2, Month: December 2023, Available at: https://hijnrp.journals.ekb.eg/

Factors affecting on the duration of Ventilation among Mechanically Ventilated Patients

Ekram Mahmoud Shalash *, Zeinab Hussein Ali **, Taiseer Zaiton ***

Assistant Lecturer of Critical Care and Emergency Nursing, Faculty of Nursing Tanta University*, Professor of Medical Surgical Nursing, Faculty of Nursing Helwan University**, Professor of Critical Medicine, Faculty of Medicine Alexandria University***

Abstract

Background: Mechanical ventilation is a therapeutic modality which is commonly used to support patients with life-threatening illnesses. Weaning from mechanical ventilation is an essential element in the care of mechanical ventilated patient. Repeated ventilator weaning failure can cause prolonged mechanical ventilation period which may increase morbidity and mortality of patients. **Aim of the study:** This study aimed to assess factors affecting on the duration of Ventilation among Mechanically Ventilated Patients. **Research design:** A descriptive exploratory design was used. **Setting:** Study was conducted at General intensive care units and cardiopulmonary intensive care unit of Damanhur Medical Institute**. Methods:** A purposive sample of 60 adult patients undergoing Co-ordinated Spontaneous Awakening and Breathing Trials from previously mentioned setting. **Tools**: Three tools were used included: First tool spontaneous Awakening Trial Safety Screen, Second tool spontaneous Breathing Trial Safety Screen, Third tool mechanical ventilation duration measurement record. **Results:** The main factors affecting on the duration of mechanical ventilation were SAT, and SBT co-ordinated protocol before weaning. **Conclusion:** It can be concluded that the factors affecting on the duration of ventilation for mechanical ventilated patients were Co-ordinated Spontaneous Awakening and Breathing Trials. **Recommendations:** Apply Co-ordinated Spontaneous Awakening and Breathing Trials for mechanical ventilated patients help to decrease duration of mechanical ventilation.

Keywords Key Words: Spontaneous Awakening, Spontaneous Breathing Trial, Duration of ventilation.

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Introduction

Mechanical ventilation (MV) is a therapeutic modality which is commonly used to support the respiratory function of patients with life threatening illnesses. There are numerous indications for MV, but in general MV should be considered for the patient cannot maintain an airway, adequate oxygenation or ventilation. MV should not be delayed until the patient is in extremis. Over 3 years studied, total ICU occupancy ranged from 57.4% to 82.1% and more than half of ICU patients using MV to help them breathe. [1].

Core principles of critical care to present comfort, improve tolerance of the rough intensive care unit environment, and help to decrease distress. Critically ill patients, especially those who are receiving mechanical ventilation usually have dyspnea, pain, fear, anxiety, and other forms of distress such as disruption, noise, and sleep deprivation that coupled with stress and fear of the critical illness are also culprits. [2].

Mechanical ventilation is not an intervention without complications. Mechanical ventilation can be both physiologically and psychologically stressful. Most patients report that being a ventilated is a miserable experience. Muscle weakness, ranging from mild limb paresis to severe tetraplegia, has been noted in up to 25% of all patients who spend seven or more days in an ICU. Weakness has been reported in up to 60% of patients who undergo more than one week of mechanical ventilation. And up to 70% of patients diagnosed with sepsis or systemic inflammatory response syndrome. The incidence approaches 100% if multiple organ failure is present. [3].

Weaning from mechanical ventilation is an essential and universal element in the care of critically ill intubated patients receiving mechanical ventilation. Weaning covers the entire process of liberating the patient from mechanical support and from the endotracheal tube, including relevant aspects of terminal care. There is uncertainty about the best methods for conducting this process, which will generally require the cooperation of the patient during the phase of recovery from critical illness. This makes weaning an important clinical issue for patients and clinicians. Immediate, uncomplicated postoperative extubation is excluded from the scope of the current statement. [4].

Weaning from mechanical ventilation is the procedure used to permit patients to resume spontaneous breathing without the support of mechanical ventilation. Most mechanically ventilated patients can be weaned from mechanical ventilation, usually within seven days following successful treatment of the underlying cause of respiratory failure. However, it has been reported that 20% to 30% of mechanically ventilated patients are difficult to wean, as they have repeated weaning trails [5].

Weaning failure is the failure to pass a spontaneous-breathing trial or the need for reintubation within 48 hours following extubation. Weaning can be classified by duration as: ―Simple weaning‖ ventilator discontinued after the first weaning attempt about 69% of weaning trails. ―Difficult weaning‖ ventilator discontinued from 2–7days after the first weaning attempt from 16%-25% of weaning trails. ―Prolonged weaning‖ ventilator discontinued in >7days after first weaning attempt from 5%- 15% of weaning trails. [6].

Repeated ventilator weaning failure can cause prolonged mechanical ventilation period which may increase morbidity and mortality of patients. Mechanically ventilated patients experience negative emotions such as anxiety, anger, fear and frustration during mechanical ventilation period because of the intensive care unit (ICU) environment, invasive monitoring devices, ventilator dyssynchrony, invasive procedures, communication difficulties, and dyspnea. [7,8].

Additionally, the weaning process itself may precipitate anxiety or fear. A negative emotion such as anxiety increases muscle tension which can increase the work of breathing during weaning due to sudden shift from artificial ventilation to spontaneous breathing. This in turn increases energy demand and can lead to dyspnea, which can further decrease patient's ability to breathe spontaneously. Consequently, these negative emotional responses precipitate hypoxia, agitation, anger and dyspnea occurrence in mechanically ventilated patients and thus may cause weaning failure. [9].

Accordingly, it is not surprising that nearly 85% of MVPs require sedative therapy and analgesics medications. Sedatives, such as benzodiazepines and propofol, have been used to attenuate anxiety, pain, fear and agitation associated with MV experience and to provide stability in physiological status and comfort. Some

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of these agents may be administered in the form of intermittent boluses; however, commonly used agents, such as propofol, are typically administered in the form of continuous intravenous infusions. **[10]**.

Although sedation may provide relief of anxiety and agitation, it is also associated with risks, including alternations in respiratory drive, inability to maintain and protect the airway, prolonged duration of MV, Introduction 4 VAP, unstable cardiovascular status, delirium, psychological disturbance, longer duration of MV and ICU stay, and higher mortality rate. Furthermore, patients receiving sedative infusions can quickly become over sedated or sedated for a prolonged period even after the sedation discontinued. It is an important nursing responsibility to lessen the occurrence of these complications thorough strategies that maintain a delicate balance between minimizing risks and optimizing quality of care and comfort as well as reducing the burden of excessive sedation. **[12]**.Hence, this study is an attempt to fill a gap regarding factors affecting on the duration of Ventilation among Mechanically Ventilated Patients [13].

The nurse as a member of the health care team must be involved. As a fully compensatory system the person is unable to perform self-care actions nurse must fulfill all life supporting needs for the MVP. Through ensure patient' safety in the MV, decrease work of breathing, feeding, maintain intake and output, maintain skin integrity, protect from fall or injury, and maintain psychological wellbeing [14].

Significance of the study

Use of criteria for weaning readiness has been shown to significantly reduce the number of weaning failure among mechanically ventilated patients. However, despite the use of these criteria, over 45% failed at least one attempt. Extubation failure is reported to be as high as 15-18% of planned extubations cause difficult and prolonged weaning. [14].

In Egypt Clinical outcomes and epidemiology of mechanically ventilated patients' surveillance was conducted in critical care department of Cairo University during the 5-year surveillance study period; the result revealed that 1081 mechanically ventilated patients during their ICU stay. And 276 were successfully weaned in their first weaning attempt; while the all other mechanically ventilated patients' failed their attempt and report extubation failure. [15] . Approximately 100 mechanically ventilated patients admitted monthly to General intensive care units of Damanhour Medical Institute and Damanhour Cardiopulmonary intensive care unit. And only 35% of patients were successfully weaned in their first weaning attempt; while Introduction 6 the all other mechanically ventilated patients' failed their attempt and report extubation failure and re-intubated.

AIM OF THE STUDY:

This study aimed to assess the factors affecting on the duration of ventilation among mechanically ventilated patient

Research question:

What are the factors affecting on the duration of ventilation among mechanically ventilated patients?

Subjects and Methods

Research Design:

A descriptive exploratory research design was utilized to conduct the study.

Research Setting:

This study was conducted in the General intensive care units of Damanhur Medical Institute.

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Research Subject:

A convenience sample composed of 60 adult mechanically ventilated patients from the above mentioned setting were included in the study under the following inclusion criteria:

-Newly admitted patients (less than 24hrs).

- Age 18 years or more of both sexes.

- Patients who will in need for mechanical ventilation for more than 24 hours on continuous sedation.

Tools for data collection:

Three adoptive tools were used in this study.

Tools of this study included:

First Tool:- [16]

Part 1: Spontaneous awakening trial safety screen: This part used to assess patient's readiness for SAT

Part 2: Spontaneous awakening trial tolerance screen This part is used to monitor patient's tolerance to sedation interruption for 6-12 hours without exhibiting two or more of these failure criteria

Second Tool :- [17]

Part I: Spontaneous breathing trial safety screen: Patient's eligibility for weaning trial readiness.

Part II: Spontaneous Breathing Trial Tolerance Screen: It includes trial failure criteria to be monitored for (30-120 minutes).

Third Tool:- [18]

Mechanical ventilation duration measurement record for coordinated spontaneous awakening and breathing trial**.**

Validity:

The content validity of the tools was done by a panel of 5 experts in nursing and medicine, who reviewed the content of the tools for comprehensiveness, accuracy, clarity, relevance and applicability. Suggestions were given and modifications were done.

Reliability:

Reliability of the tool was tested to determine the extent to which the questionnaire items are related to each other. The Cronbach's alpha model, which is a model of internal consistency, was used in the analysis. Statistical equation of Cronbach's alpha reliability coefficient normally ranges between 0 and 1. Higher values of Cronbach's alpha (more than 0.7) denote acceptable reliability

Ethical considerations:

An official permission to conduct the study was obtained from the Scientific Research Ethical Committee of Faculty of Nursing Helwan University. An official permission was obtained from the administrative authority of

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Helwan International Journal for Nursing Research and Pratctice
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the selected setting for the current study. The researcher obtained an oral and written consent from relatives of the studied patients.

The ethical considerations included explaining the purpose and nature of the study, stating the possibility to withdraw at any time, confidentiality of the information where it would not be accessed by any other part without taking permission of the participants.

Pilot study:

A Pilot study was carried out with 10% (not less than 10 patients) of the sample under study to test the applicability, clarity and efficiency of the tools , then the tools modified according to the results of the pilot study. Modifications included: rephrasing and rearrangement of some questions. After modification, the final form of the tools were developed. Patients who shared in pilot study excluded from the study sample.

Field work:

The actual field works for this study for the beginning of February 2021 to the end of March 2022.The researcher collected the data by herself.

RESULTS:

Table 1: Frequency and percentage distribution of demographic characteristics for mechanical ventilated patients (n: 60).

Studied Characteristics	No.	Percentage %
Age:		
30 - <40	3	5
40 - <50	5	8.3
50 – <60	11	18.3
60 or more	41	68.3
Mean±SD	**65.50±7.58**	
Gender:		
Male	28	46.7
Female	32	53.3
Education		
Educated	33	55
Non educated	27	45
Marital status:		
Single	33	55.0
Married	27	45.0
Occupation:		
Not working	26	46.3
Literal Work	10	20
Retired	21	35
Employee	3	5
Residence		
Rural	49	81.7
Urban	11	18.3

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Table (1) illustrated that the mean age of the studied patients Mean±SD (65.50±7.58), slightly more than half of there were females (53.3 %), and more than half (55.0 %) of studied patients were educated, as regarded the marital status more than half (55.0 %) of studied patients were single majority of them not working 43.3% , regards to residence 81.7% were from rural residence.

Figure 1 Mean score level of body weight among mechanical ventilated patients (n=60)

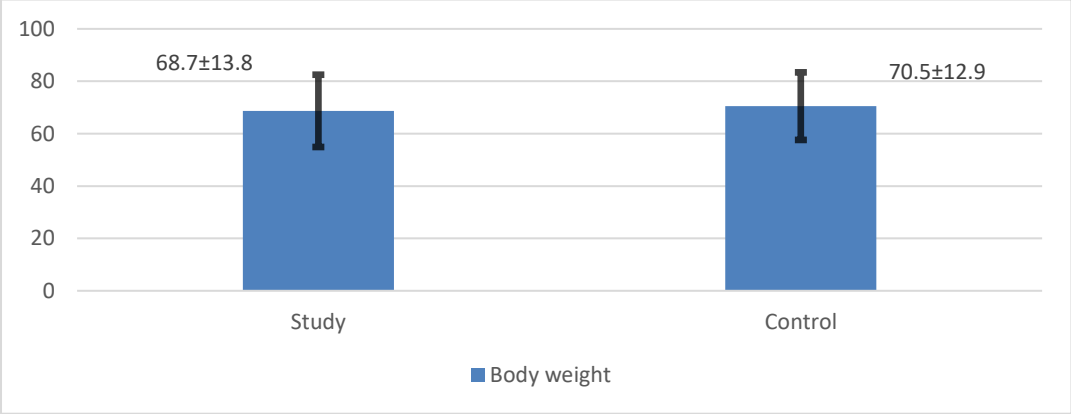

Figure (1) shows that the mean body weight of patients in the study group was 68.7±13.8, while in the control group was 70.5±12.9, with no significant difference between the both groups at a p-value > 0.05.

Table 2: Distribution of patients according to past& current medical data (n=60)

Medical data	Studied patients n(60)	
	N	%
Length of ICU stay:		
4 – 8	35	58.3
9 – 14	15	52
>14 days	10	16.7
APACHE II score on admission:		
7 – 12	22	36.7
13 – 18	24	40
19 - 24	14	23.3

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SOFA score:		
4 – 9	21	35
10 – 15	26	43.3
16 - 21	13	21.7
CAM-ICU score:		
1 – 3	26	43.3
4 – 6	24	40
7 – 9	10	16.7
Duration of continuous sedation in days:		
1 – 5	22	36.7
6 – 12	26	43.3
13 – 19	12	20

Table (2) shows that length of stay of mechanical ventilated patient's (4-8 days) was (58.3%) more than half of the patients. Furthermore, concerning the APACHE II score on admission, the score among mechanical ventilated patients (40%) was 13-18. Regarding the SOFA score, the score in the studied patients (43.3%) was 10-15, for the CAM-ICU score in the most of the studied patients (43.3%) was1-3 and Duration of continuous sedation in the studied patients (43.3%) were sedated for 6-12 days.

Table (3): Continue table (2) Distribution of patients according to their past& current medical data (n=60)

Patient medical data	Studied patients n(60)	
	N	%
Method of feeding:		
Ryle	24	40
Parenteral	36	60
SAT tolerance time: 1st 24 hours		
Yes	50	83.3
No	10	16.7
Presence of copious secretions before		

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SBT:		
Present	10	16.7
Absent	50	83.3

Table (3) illustrated that of patients in the studied patients were fed through the parenteral method. Additionally, most of the studied patients showed SAT tolerance within the first 24 hours. Regarding the presence of copious secretions before SBT, most of the studied patients did not have copious secretions before SBT.

Table (4): Frequency and percentage distribution of health related data (n:60).

Patient characteristics	Studied patients	
	N	%
Current diagnosis:		
Cardiovascular disorder	15	25
Neurological disorder	4	6.7
Endocrine disorder	1	1.7
Renal disorder	9	15
Respiratory disorder	21	35
Metabolic disorder	5	8.3
Gastrointestinal disorder	2	3.3
Musculoskeletal disorder	0	0
Hepatic disorder	3	5
Co-morbidities:		
Cardiovascular disorder	5	8.3
Neurological disorder	0	0
Endocrine disorder	1	1.7
Renal disorder	3	5
Respiratory disorder	21	35

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Metabolic disorder	12	20
Gastrointestinal disorder	6	10
Musculoskeletal disorder	2	3.3
Hepatic disorder	10	16.7

Table (4) shows that 35% of the studied patients were diagnosed with respiratory disorders. Regarding co-morbidities, 0% of the studied patients suffered from Neurological disorder, while 35% of the studied had respiratory disorders co-morbidities.

Table (5): Frequency and percentage distribution of Patient's intolerance criteria for SAT (n:60).

Signs of intolerance spontaneous awakening trial	**2** hrs after SAT		**4** hrs after SAT		**6** hrs after SAT		**8** hrs after SAT		**10** hrs after SAT		**12** hrs after SAT	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Decreased level of consciousness	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**6**
Restlessness	**30**	**50**	**10**	**16.6**	**6**	**10**	**0**	**0**	**0**	**0**	**0**	**0**
Agitation/ anxiety	**2**	**3.3**	**2**	**3.3**	**2**	**3.3**	**0**	**0**	**2**	**3.3**	**2**	**3.3**
Pain	**29**	**48.3**	**12**	**20**	**8**	**13.3**	**2**	**3.3**	**2**	**3.3**	**5**	**8.3**
Diaphoresis	**1**	**1.7**	**1**	**1.7**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1.7**
Use of accessory muscles	**15**	**25**	**5**	**8.3**	**2**	**3.3**	**0**	**0**	**0**	**0**	**0**	**0**
SpO_2 < 88 %	**2**	**3.3**	**3**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table (5) illustrated that only 16.7 % of the studied patients' were intolerated to spontaneous awakening trial tolerance criteria.While 83.3 of the studied patients were tolerated to spontaneous awakening trial tolerance criteria.

Table (6): Frequency and percentage distribution of Patient's intolerance criteria for SBT for study and control groups (n:60)

Patient's intolerance criteria for SBT	30 min. after SBT		60 min. after SBT		90 min. after SBT		120 min. after SBT	
	N	%	N	%	N	%	N	%
Abrupt change in mental status	3	5	3	5	4	6.7	3	5
Restlessness	26	43.3	11	18.3	14	23.3	4	6.7
Agitation	1	1.7	3	5	4	6.7	1	1.7
Diaphoresis	2	3.3	5	8.3	6	10	0	0
Use of accessory muscles	11	18.3	12	20	12	20	1	1.7

Abdominal paradox	6		2		6		0	0
SpO_2 < 88 %	8		7		5		1	

Table (6) illustrated that SBT intolerance criteria as only 16,7% of the studied patients showed SBT intolerance 120 minutes after SBT. While 83.3% of the studied patients showed SBT tolerance 120 minutes after SBT.

Table (7): Correlation between duration of mechanical ventilation and the implementation of (SAT, and SBT co-ordinated protocol) among studied patients (n=60).

Item	implementation of (SAT, and SBT co-ordinated protocol)	
	R	**P-value**
Duration of mechanical ventilation	0.481	<0.001**

Table (7): illustrates that, there was a highly statistically significant positive correlation between the duration of mechanical ventilation and the implementation of (SAT, and SBT co-ordinated protocol) among studied patients with p-value <0.001.

DISCUSSION

Mechanical ventilation is the most used short-term life support technique worldwide and is applied daily for a diverse spectrum of indications, from scheduled surgical procedures to acute organ failure. More than half of the patients in the ICU are ventilated the first 24 hours after ICU admission; comprised of individuals who have acute respiratory failure, compromised lung function, difficulty in breathing, or failure to protect their airway. The lungs primary function is to add oxygen and to remove CO2 from the blood passing through the lung's capillary bed. There are multiple modes of mechanical ventilation support that provide air to the patient based on pressure, flow and volume. Although lifesaving, mechanical ventilation can be associated with life threatening complications, including air leaks and pneumonia**.[19].**

The present study findings revealed that, the mean age of the studied patients was 65.50±7.58., The increased incidence of weaning failure and re-intubation could be explained as normal physiological changes of aging, and the morphological changes occur inside respiratory system as the patients in this age group are more prone to infections, use of invasive procedures, and problems associated with aging process including malnutrition, loss of bone and muscle mass, and therefore decreased pulmonary ventilation which may in turn lead to breathing difficulty and greater distress during weaning attempts contributing to weaning failure. This explanation was supported by **Corbellini, et al (2019)** who reported in the study about "Weaning from mechanical ventilation: a cross-sectional study of reference values and the discriminative

validity of aging" revealed that ageing affects distal air space leading to close the small airways more readily, decrease expiratory flow and gas trapping .

As regards gender, the current study reveals that about more than half of the studied patients were females. In this regard the current study reveals also that a positive correlation between MVPs' gender and weaning failure. This finding may be due to more stress and anxiety during weaning process in females than males. This could be attributed to the fact that in Egyptian culture men are not expected to show or express negative emotions like fear and anxiety. These results were congruent with **Kikusui& Nakamura, (2019),** who found that females experienced greater level of anxiety and fear during the weaning process in comparison to males.

Females are generally at greater risk of weaning failure. The finding is congruent with **Trowbridge K& Horstman H(2017)** who reported in the study about "The effect of music listening on anxiety and agitation in adult mechanically ventilated patients: A systematic review" reported that more than half of the studied patients were females due to nature of females and stress, and sex hormones.

Regarding to body weight, more than half of the studied sample with high percentage of overweight grade I was noticed. Which can be associated with increasing cardiovascular and respiratory diseases. Obesity has an important role in atherosclerosis and coronary artery disease. Obesity leads to structural and functional changes of the heart, which causes heart failure, and respiratory failure.

On the same line **Obi & Mazer M, et al (2018)** who conducted "Obesity and weaning from mechanical ventilation- An exploratory study" reported that obesity measured by using BMI and was strongly associated with an increased risk of respiratory failure. Obesity increases the risk of a number of diseases and is often comorbid with other cardiovascular risk factors such as diabetes, hypertension, elevated plasma lipids, left ventricular hypotrophy, subclinical atherosclerosis, and obstructive sleep apnea.

The result of the current study reveals that the most common encountered diagnosis was respiratory disorders, they constitutes one third of the studied MVPs. This could be related to the old age of MVPs.

The current study revealed that a positive correlation between MVPs' diagnosis and weaning failure. This could be due to patients with chronic airflow obstruction increase risk for ventilator intubation. This finding was in line with **Ghoneim A& El-Komy H (2017)** who conducted "Assessment of weaning failure in chronic obstructive pulmory disease patients under mechanical ventilation in zagazig university hospitals " reported that nearly fifty percent of all initial weaning trials in mechanically ventilated chronic obstructive pulmonary disease patients failed .

Regarding to Level of educational, the present study showed that majority of the studied patients can read and write. From the researcher’s point of view, this may be because higher percentage of the current study were old age, and in the past, parents did not care about high level of education so that majority of the studied sample could only read and write.

The finding of the present study was supported by **Khater& Noaman et al., (2019)** who conducted a study about "Health related quality of life among ICU patients at Cairo University hospitals". The study mentioned that nearly half of the studied patients were educated (basic education). This findings disagree with **Abd Allah, et al., (2021)** who conducted a

study about "Quality of life before and after intensive care among 100 older ICU patients in Egypt" who reported that two third of the studied patients had high education.

Concerning to place of residence, the finding of the present study showed that majority of studied patients lived in rural area. The study finding was supported with **Ghoneim A& El-Komy H (2017)** who conducted a study about "The relationship between socio-demographic characteristics and quality of life among ICU patients" carried out in Egypt, reported that, nearly three-quarters of the selected sample lived in rural areas. This findings also supported by **Obi & Mazer M, et al (2018)** who studied " Quality of life among elderly MVPs " revealed that, 62% of studied patients lived in rural areas.

As regards patient's readiness for SAT: no signs of myocardial instability in the previous 24 hours of SAT as indicated by ECG which displays no signs of ischemia, HR is not more than 120 b/m with no change in SBP by 20% from baseline, this study shows that more than three quarters of MVPs met these criteria. Whereas patient's no need for continuous sedative infusion, in addition to RASS with target level less than 2, about more than two third of the MVPs met these criteria.

Regarding assessment of patient's readiness and tolerance for SAT for study and control groups, weaning should be considered as early as possible, but early extubation can lead to weaning failure. Therefore, the concept of SAT was conceived as the best way to assess whether MVPs can be successfully shut off the patient's continuous sedative infusions. Passing the SAT is interpreted as readiness for discontinuation of sedative infusion, whereas failing the SAT indicates non-readiness. This is the rationale make weaning trial safety screening is an important step to ensure the MVPs' safety. Early identification of MVPs who are able to wake up from sedation infusion spontaneously results in a short duration of mechanical ventilation and lower complication rates.

The finding of the present study reveals that more than two thirds of the studied MVPs met the safety screening criteria to SAT from the first attempt. These findings were similar to the findings reported by **Lee & Sims (2017)** who studied "The Combination of SAT and SBT Protocols May Help Reduce the Incidence of Ventilator-Associated Pneumonia in the Burn Intensive Care Unit" and found that about more than half of MVPs met the safety screen criteria to SAT from the first attempt. The finding of present study reveals that more than half of study group met the safety screen criteria to SBT from the first attempt. This may related to less accumulation of sedative drugs metabolites resulting in faster recovery of mental status essential for weaning and the immediate shift to SBT which reduce the dependence level on mechanical ventilator. The finding of current study shows also that more than three quarters of MVPs proceeded to SBT using CPAP method.

Using such method to conduct SBT in the present study may be attributed to two reasons; first that it contributes to reduce the work of breathing and second, it is easier to back the MVPs to the original mode in case of intolerance. In accordance to this finding, **Lin & Zhang (2021)** who compared ATC and CPAP during SBT found that two thirds of patients meet the pre-determined screening criteria at the first time using CPAP method. They added that CPAP method is safe and do not hasten liberation from mechanical ventilation, when compared to ATC.

The present study indicates that studied patients who Combinated the SAT and SBT Protocols exhibited better weaning outcomes in the form of short period of mechanical ventilation, tracheal intubation and oxygen therapy as well. Additionally, the findings of this study show that a statistical significant difference regarding re-need for mechanical

ventilation in which control group had a high percent more than study group with a more incidence of re-intubation. While more than one third of those patients were not weaned from the mechanical ventilation.

Additionally, the current study reveals that study group was safer than control group as only one sixth of study group acquired VAP and less one quarter of them experienced PAD during their mechanical ventilation course. This may be due to control group spent more time on mechanical ventilator, with more agitation, fear, and stress responses that may contribute to PAD. All of these events may increase the risk for respiratory muscles weakness, consequently delay in the return of spontaneous breathing and increase VAP incidence.

Similar to the present study, **Burns, et al (2019)** Added that patients in the study group are extubated more faster, and they safely passed SBT compared with patients in the control group.

Regareding the relation of co-ordinated spontaneous awakening and patient's clinical data among study groups. The current study suggests the potential benefits from the "act" of awakening. The awakening strategy ensures a period of maximum wakefulness that may mitigate harm through reducing the rises of prolonged deep sedation, or allowing patients to engage in physical and cognitive activity. It is equally plausible that observed improvements were due to daily screening of eligible criteria and coordinating the both; SAT and SBT.

The low incidence of SAT and SBT failure for study group indicates that the safety screen criteria were effective in identifying MVPs who are candidates for conducting the trials. This study highlights that study group in comparison with control group, exhibited better awakening, weaning outcomes, less ventilator complications and less ventilator duration. Hence, the hypotheses of the present study have been accepted. Moreover, study group who liberated early from sedation and ventilation therapies exhibit better outcomes than those who delayed.

Regarding the Correlation between applying co-ordinated spontaneous awakening and breathing trials Protocol and the duration of ventilation among mechanically ventilated patients on the study groups. Sedation interruption has been demonstrated as a beneficial ICU intervention as initiated at **(2020) by Kress, et al**. has been also been paired with a ventilator weaning protocol to improve MVPs outcomes through a study of **Aitken, et al, (2019). Tanios, et al, (2019)** confirmed the benefits of daily SAT and extended by pairing SAT with SBT in a protocol that improved multiple outcomes, fewer hospital days with lesser duration of sedation infusion, and mechanical ventilation period, VAP incidence, ICU days as well as mortality rate.

Because deep level of sedation is among the most important potential barriers to successful implementation of early rehabilitation programs for MVPs, early and safe shift to SBT do reinforce the concept of liberation of both sedation and ventilation therapies which considered an integral part of cognitive, pulmonary and physical rehabilitation programs in ICUs.

The current study indicates that the premature decision of liberation either from sedation or mechanical ventilation could contribute to re-intubation of these therapies and poor outcomes. The present study findings indicated that, there was a statistical significant positive correlation between Pairing both SAT and SBT is an integral component of ABCDEF bundle that improve the MVPs outcomes and decrease the duration of mechanical ventilation. The finding was supported by **Aitken, et al, (2019). Tanios, et al, (2019)** who stated that, pairing SAT with SBT in a protocol was positively and significantly correlated with outcomes, fewer hospital days with lesser duration of sedation infusion, and mechanical ventilation period, VAP incidence, ICU days as well as mortality rate. Therefore, critical care nurses have a major role in tailoring as well as implementing the ABC protocol.

Conclusion:

Based on the current findings, it can be concluded that: Pairing both SAT and SBT is an integral component of ABCDEF bundle was one of the most effective factors on the duration of mechanical ventilation among mechanically ventilated patients.

Recommendation:

- Assess MVPs routinely for SAT and SBT during the ventilation period to determine MVPs at risk for weaning failure.
- Applying the co-ordinated spontaneous awakening and breathing trials protocol, before weaning to facilitate safely weaning process.

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