Impact of a Nursing Strategy for Mechanical Ventilation Liberation on Patients' Outcomes

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Abstract

Background: Successful liberation from mechanical ventilation is a critical milestone in intensive care, facilitating patient recovery and reducing the risk of ventilator-associated complications. Optimizing this process requires structured, evidence-based nursing strategies that ensure timely and safe weaning from mechanical support. **Aim of the study**: to evaluate the impact of a nursing strategy for mechanical ventilation liberation on patients' outcomes. **Design**: A quasi-experimental pre and post. **Setting**: The study was conducted in the general intensive care unit (ICU) of Sohag University Hospital. Sample: A total convenient sample of 50 adult patients with acute exacerbation of chronic obstructive pulmonary disease requiring mechanical ventilation was recruited. **Data collection tools included**: Tool (I) a mechanically ventilated patient assessment sheet, Tool (II) respiratory care for ventilator weaning, and Tool (III) a patient outcome assessment sheet. **Results**: Significant decrease number of patients (25.7%, P = 0.001) had prolonged mechanical ventilation (>21 day) post respiratory care. There was a significant decrease in Sequential Organ Failure Assessment score in the studied patients post intervention than pre intervention (3.29±2.72) versus (5.69±4.516) respectively P=0.009. **Conclusion**: Application of nursing strategy for mechanical ventilation liberation has positive effects on improving respiratory care for ventilation weaning assessment as decrease duration of mechanical ventilation and Sequential Organ Failure Assessment score. **Recommendations**: Applying respiratory care for ventilator weaning preparedness assessment on different intensive care units.

Keywords: Liberation, Mechanical ventilation, Nursing strategy & Patients` outcomes.

Introduction

In the critical care unit, mechanical ventilation (MV) is an essential tool for survival. In addition to helping manage respiratory failure, it also increases gas exchange, lessens breathing effort, and frees up time for other treatments that address the underlying cause of respiratory failure (**Girard & Burns, 2023**).

Weaning off of mechanical ventilation entails removing the endotracheal tube and releasing the patient from mechanical support. It's important to assess the patient's readiness for tapering off of MV. However, weaning a patient from MV who has respiratory failure is not an easy task. The respiratory therapist still faces challenges when making weaning decisions since premature and inappropriate weaning might result in respiratory discomfort and re-intubation **(Wunsch, et al, 2023).**

More time spent on mechanical ventilation and prolonged mechanical ventilation (PMV) results from delays in estimating patients' readiness for weaning. This can lead to increased morbidity, such as ventilator-associated infections, psychosis, drug dependence, or airway injury, as well as higher mortality rates for patients with PMV who are on mechanical ventilation (**Huang et al., 2022).** Moreover, non-clinical effects include increased costs and a greater strain on medical resources; for instance, it has been found that patients with PMV use 37% of the resources in intensive care units (**Gunther et al., 2021).**

Burns, et al., (2024) concluded that nursing strategy for mechanical ventilation liberation causes lower length of ICU stay and proportions of participants requiring prolonged ventilation for longer than seven days. **Rose, et al., (2019**) stated that based on data from 21 trials totaling 1676 participants, utilization of an automated closed loop system may result in a reduction in the duration of weaning, ventilation and ICU stay. This directly aligns with all 3 trials analyzed that stated their primary outcomes to be a reduction in weaning and ventilation time along with ICU length of stay. Parallel to this all trails within this review were found to have a negligible effect on ICU mortality or hospital length of stay.

Although prior research has reported a number of respiratory indices and predictors that predict weaning success, there is disagreement over the most pertinent predictive indicators, particularly for patients with respiratory disorders (**Abdelaleem et al., 2020**). The purpose of the Respiratory Care for assessment of mechanical ventilation weaning was to help determine weaning readiness. For patients with respiratory failure, it is an effective predictive checklist of successful ventilator liberation. It includes clinically relevant components such arterial blood gases, lung sounds, and serum electrolyte

levels **(Lee et al., 2019)**.

In the intensive care unit, nurses spend the majority of their time with patients. They are in charge of constant condition monitoring, determining whether a patient requires mechanical breathing support, and providing ongoing care for patients who are on mechanical ventilation. Additionally, nurses help determine whether a patient is ready to wean from MV and when that is the optimum moment to do so (**Schonhofer et al., 2021**).

Significance of the study

Annually, patients who require MV support for more than three weeks globally contribute to more than half of the overall ICU costs (**Na et al, 2022**). At intensive care unit of Sohag University Hospital, the medical record revealed that twenty-seven percent of critically ill patients received mechanical ventilation support for more than 48 hours.

Patients with respiratory failure requiring mechanical ventilation may not find a bed in the intensive care unit because other patients have been dependent on mechanical ventilation for an extended period **(Ahmed et al., 2023)**. Therefore, the study was done to evaluate the impact of a nursing strategy for mechanical ventilation liberation on patients' outcomes.

Aim of the study

The study's aim was to evaluate the impact of a nursing strategy for mechanical ventilation liberation on patients' outcomes.

Research hypotheses

1- Patients who receive the nursing strategy for mechanical ventilation liberation experience decreased duration of mechanical ventilation, length of hospital stay, Step-down Unit, and rate of weaning failure post intervention than pre intervention.
2- Patients who receive the nursing strategy experience less organ dysfunction post intervention than pre intervention.
3- Patients who receive the nursing strategy experience less mechanical ventilation related complications post intervention than pre intervention.
4- Patients who get the nursing strategy exhibit a lower incidence of ICU acquired muscular weakness post intervention than pre intervention.

Operational definition:

Mechanical ventilation liberation nursing strategy

Operationally, it is the collection of particular nursing interventions and actions intended to assist and oversee the weaning process of a patient from MV. Assessing preparedness, conducting spontaneous breathing trials, and keeping an eye out for any indications of weaning intolerance or consequences like respiratory distress, exhaustion, or hemodynamic instability are all included in this.

Step-down unit:

Reserved for those patients admitted to General Internal Medicine who require a level of care that is intermediate between the Intensive Care Unit and the ward to allow for the care of patients who do not require full intensive care but cannot be safely cared for on a normal ward. These patient requirements may include (but are not limited to) specific organ support, nursing needs, vital sign monitoring, or ventilator weaning." Nonspecific.

Patients and Method

Design: A quasi-experimental **pre and post** was utilized in the present study.

Setting:

The study was conducted in the general intensive care unit (ICU) of Sohag University Hospital.

Subjects:

A total convenient sample of 100 adult patients with acute exacerbation of chronic obstructive pulmonary disease requiring mechanical ventilation was recruited

Tools

Three tools were utilized to gather data.

Tool 1: - mechanically ventilated patient's assessment sheet**:** The researcher developed this tool after studying the literature **(Gunther, et al, 2021& Ahmed et al, 2023)** to establish baseline data for the patients. This tool consisted of two parts.

Part one: Patient demographic and clinical data assessment: It covers demographic data (age, gender) and clinical data includes (chest radiological findings as pneumonia, hyperinflation, pleural effusion, pulmonary embolism, and pneumothorax upon ICU admission, and vital signs assessment).

Part two: Respiratory parameters: Include arterial blood gases as PH, partial pressure of oxygen (pao2) and carbon dioxide (paco2), serum bicarbonate (HCO3), and mechanical ventilation modes and settings which involves mechanical ventilation respiratory rate, Tidal volume, Pressure support, peak pressure, fraction of inspired oxygen, and Positive End Expiratory Pressure.

Tool 2: Respiratory care respiratory care for ventilator **weaning assessment** sheet**.**

this tool adopted from **(Lee, et al,2019)** to assess readiness for MV liberation and composed of 3 elements, the first is physiological function assessment, including (7 items) and the second is electrolyte balance assessment which contains (7 items), and the third is respiratory function assessment contains (12 items).

Tool 3: Patient outcomes assessment sheet:

This tool was developed by the researcher after reviewing literature **(**Girard & Burns **, 2023**, Wunsch**, et al, 2023**, Schonhofer **et al., 2021)** to assess patient outcomes. This tool consisted of five parts.

Part1: Muscle strength: It was initially described by The MRC total score 1943, also utilized by **Mohamed et al., 2019,** it rated on a six-point Medical Research

Council (MRC) scale. Six pairs of muscles were assessed bilaterally (shoulder abduction, flexion of the elbow, wrist extension, flexion of the hips, extension of the knee, and ankle dorsiflexion).

Scoring system: The standard six-point grading method uses a scale of 0 (no muscular contraction) to 5 (full power against maximum resistance). A score less than 48 indicates ICU acquired muscle weakness.

Part 2: Weaning outcomes: weaning success or failure rate (failing to breath spontaneously and reconnection to MV due to early weaning), length of hospital stay, transferee to normal ward, and duration spent on mechanical ventilation.

Part 4: Mechanical ventilation-related complications such as pressure ulcer, upper gastrointestinal bleeding, hypotension, pulmonary embolism, and ICU acquired weakness.

Part 5: SOFA score (Sequential Organ Failure Assessment)

This tool adopted from **(Vincent et al., 1996)** and applied by **(Ling et al., 2023) to** assess the degree of failure in 6 various organ systems (the respiratory, cardiovascular, hepatic, coagulation, renal, and nervous systems). It was evaluated upon discharge.

Scoring system: Each organ system is scored from 1 to 4, total scores ranging from 0 to 24.

- **Content validity:** The tool's content validity was determined by a panel of 5 experts (two professors of critical care medicine and one professor of Chest Diseases medicine and two critical care nursing staff) who evaluated the tools for clarity, relevance, comprehensiveness, understanding, and applicability and no modifications were done.
- **The reliability of the study's tools**: Cronbach's alpha was used to assess the reliability, and the results were 0.886 (tool I) , 0.875 (tool II) and 0.943 (tool III), which were acceptable.
- **A pilot study** was conducted with five patients (10% of the patients and included in the study sample) to assess the tools' clarity, validity, and applicability.

Method

The study was conducted throughout three main steps:

Preparation:

The phase involved:

- Official permission to conduct the study was obtained from the responsible authorities of general intensive care unit at Sohag University following clarifying the study's purpose.
- The researcher constructed the study tools after reviewing the national and international literature.

Ethical consideration:

Written approval was taken from the Ethics Research Committee, Faculty of Nursing, Sohag University. There was not any danger to patients during the research implementation. Voluntary participation and the right to withdraw from the study at any time without penalty. Respect for privacy and confidentiality. Patient family provided informed oral consent after clarifying the nature and goal of the study. Confidentiality was guaranteed (adherence to the Helsinki Declaration).

2) Implementation:

The researcher checked patients to assess demographic data, radiological finding and clinical data when patient being admitted to ICU, as well as vital signs, and arterial blood gases (PH, Pao2 and Paco2, HCO3) assessed daily.

The studied patients received nursing strategy for mechanical ventilation liberation.

Patients were screened for eligibility for MV weaning daily and scored using respiratory care assessment sheet for ventilation weaning assessment by the researcher. The score involved physiological function assessment, electrolyte balance assessment, and respiratory function assessment. The physiological functions (7 items) included heart rate, blood pressure, temperature, fluid balance, bowel movement, chest X-ray, and pain).

The electrolyte balance assessment of (7 items) Na, K, Ca, Mg, phosphorous levels, hematocrit > 25%, and albumin > 2.5 g/dl. The respiratory function (12 items) involved Maximal inspiratory pressure ≤ -20 to -25 cmh2o, tidal volume > 5 ml/kg, rapid shallow breathing index < 105 min/L, minute ventilation < 10 L/min; Ph., paco2, pao2, respiratory rate, lung sounds, sputum character, coughing ability; and presence of tracheostomy. Every item was graded on a two-point scale (1 = yes that means normal and 0 = No that means abnormal). The score is determined by dividing the total number of yes answers by 26 and multiplying by 100. If the score exceeded or equaled 67%, the patients had a greater possibility for successful liberation. Patients with a score below 67% had a higher possibility for failed weaning .

When the score was less than 67%, nursing strategies and care implemented concentrating more on the noted element that decreases the respiratory care score.

Nursing strategies used to improve respiratory care **score: Respiratory function:** Respiratory rate, ABGS, lung sounds, sputum (amount, colour, character), and coughing ability were assessed. Postural drainage position was maintained for 5 minutes; percussion and vibration were applied followed by suction. The patient was pre-oxygenated with 100% before suction; oral care was done every 6 hrs. Respiratory circuit was humidified using humidifier which replaced every 5 days. Elevating the head of the bed between 30-45 %, and early mobilization within 24- 48 hours of ICU admission included turning patient every two hours, active/passive range of motion every 2 hrs, and sitting up in a chair while awake.

Hemodynamic status: Heart rate, blood pressure, intake and output, and skin turgor assessed daily. ensure good hydration: intake/output should be more than 1500 ml for the past 3 days before weaning , fluids were given for hypotensive patient guided by central venous pressure measurement. Gastrointestinal bleeding was detected through ng- tube lavage and presence of melena and

controlled by infusion of antacid, giving fluid, and decreasing peep and inspiratory pressure according to oxygenation improvement**.**

Pain: Pain was assessed by using behavioral pain scale. Non-pharmacological pain-relieving measures such as imaging, deep breathing and coughing exercise. Lidocaine inhalation before suctioning, sedation, and analgesia was received as prescribed by the physician **.**

Temperature: Monitoring body temperature hourly WBC count, in case of fever cold application, and antipyretics was given. Strict aseptic technique during invasive procedures to reduce the risk of infection. Hand hygiene before and after dealing with patients. Intravenous catheters, urinary catheters, nasogastric tube changed regularly **.**

Nutrition and bowel problems: Enteral nutrition within 24 hours of ICU admission. Patient's requirement: 25-35 kcal/kg/day, prepared formula (30–35% of total calories lipid, carbohydrates 45–50, and a protein of 1.2 – 1.5 g/kg/body weight) was given. Patients were monitored for signs of feeding intolerance, vomiting and abdominal distention. In patients with gastric feeding intolerance IV metoclopramide was used as a prokinetic therapy. Feeding was given slowly, and patients placed on a semi-fowlers position during feeding**.**

When patients obtained scores of 67%, the physician was informed, and patients were weaned gradually and endotracheal tube removed if the patients were stable and hadn`t any signs and symptoms of respiratory distress as respiration rate > 35, shortness of breathing, systolic blood pressure more than 180 mmHg or less than 90 mmHg, rapid pulse > 140 b/min, agitation, decreased conscious level, and increased sweat.

Evaluation:

Evaluation was conducted post one week by using the same tools used in the pre-test to evaluate the impact of a nursing strategy for mechanical ventilation liberation on patients' outcomes.

Statistical analysis:

SPSS was used to evaluate the data once it was electronically recorded (version 22). Two groups' quantitative data were compared using the independent samples t-test. To compare and determine the importance of qualitative variables, the Chi-square test was used. A p-value below 0.05 was regarded as statistically significant**.**

Results:

Table (1): Show most of the studied patients (78%) were between 51 and 65 years old. The study sample was predominantly males, which constituted 68%. The finding revealed that pneumonia is the most common cause of COPD exacerbation and ICU admission (56%)

Table (2): Shows that there was no statistically significant difference in mechanical ventilator sitting mean scores pre and post nursing strategy intervention (p. Value >0.05).

Table (3): Shows that there was no significant difference (p .value > 0.05) among the studied groups in relation to muscle strength, Regarding the SOFA score at discharge there was a significant decrease in SOFA score at discharge in pre and post nursing strategy intervention (6.77±4.46) versus (3.18±2.65) respectively. In terms of weaning outcomes, the weaning failure rate was significantly higher in pre nursing strategy intervention than that of the post nursing strategy intervention (46%, versus12%) respectively. A significant number of patients pre nursing strategy intervention have prolonged mechanical ventilation.

Table (4): regarding patients' outcomes, table (4), showed that the Length of hospital stay was significantly longer in pre nursing strategy intervention than that of the post nursing strategy intervention. A significant number of patients post nursing strategy intervention have transferred to normal wards.

Figure (1): Shows differences in complications among the studied patients pre and post nursing strategy intervention. Post nursing strategy intervention had significantly lower rates of pressure ulcers, ICU acquired weakness , occurrence of pulmonary embolism , upper gastrointestinal bleeding, and hypotension than post nursing strategy intervention.

Table (1): Demographic characteristics and clinical data among the studied patients

acteristics and clinical data		N0	%
Sex			
Male		34	68
Female		16	32
Age	18- <36	5	10
	36-<51	6	12
	51-65	39	78
Diagnosis	Pneumonia	28	56
	Hyperinflation	12	24
	Pleural effusion	7	14
	Pulmonary embolism	1	2
	Pneumothorax	1	2
	Free	1	2

Table (2): Differences in mechanical ventilator sitting mean scores among the studied patients pre and post nursing strategy intervention (n=50)

MV sitting	Pre nursing strategy intervention	Post nursing strategy intervention	P- value
Respiratory rate	12.33 ± 2.07	12.25±1.63	.875
Tidal volume	465 ± 32.01	472.33± 27.44	.188
Fio2	41. 44± 10.22	42.22± 8.22	.434
Pressure support	12.22± 4.21	11.66 ± 2.31	.654
PEEP	5.88 ± 1.89	6.45±1.66	.547
Ppeak	23.78 ± 5.77	21.88± 6.55	.355

NS there is no significant difference p .value > 0.05. - t-test
Fio2: fraction of inspired oxygen, PEEP : positive end expiratory pressure, Ppeak: Peak pressure

Table (3): Patients' outcomes differences pre and post nursing strategy intervention (n=50)

Patients' outcomes	Pre nursing strategy intervention	Post nursing strategy intervention	P-value
Weaning failure	23(46%)	6(12%)	0.007*
Prolonged mechanical ventilation (> 21 day)	14(28%)	0(0%)	.001*
Muscle strength	43.99±13.78	51.22±8.88	.178
SOFA score	6.77±4.46	3.18±2.65	.008*
Pain	8.33 ±1.66	2.52±1.33	<0.001**
Temperature	37.39 ± 0.77	37.02 ± 0.12	

NS there is no significant difference p .value > 0.05.
** Significant difference p .value < 0.05- t-test.-Chi-square test for qualitative variables.*

Table (4): Patients' length of hospital stay and transferred to Step-down Unit differences pre and post nursing strategy intervention (n=50)

Items	Pre nursing strategy intervention	Post nursing strategy intervention	P-value
Length of hospital stay	18.78 ±1.93	9.33±1.22	<0.001**
Transferred to Step-down Unit	27.44 ± 0.56	13.02 ± 0.12	<0.001**

** Significant difference p .value < 0.05- t-test.*

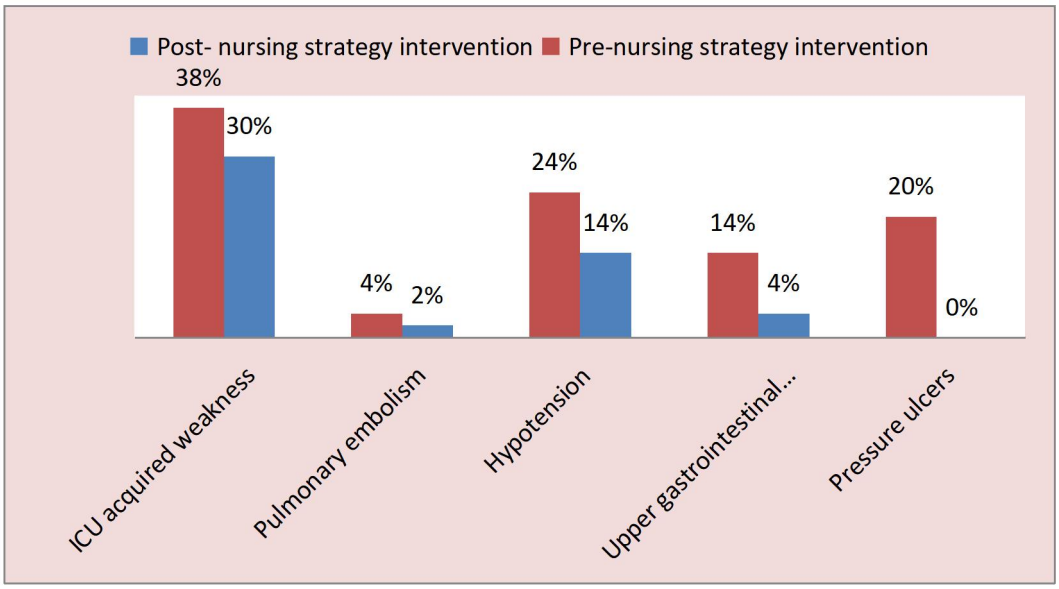

Figure (1): Differences in complications among the studied patients pre and post nursing strategy intervention (n=50)

Discussion

Mechanical ventilation is currently the most used kind of life support for critically sick patients, despite the fact that it comes with a number of financial and clinical risks. Hospital-acquired infections rank second in terms of the most common sickness affecting ventilated patients. These infections have higher rates of morbidity, mortality, and length of stay (ranging from 4 to 13 days). As soon as it is practicable, patients should be weaned off of ventilators to avoid problems associated with mechanical ventilation (**Haribhai & Mahboobi, 2022**)

In reference to the clinical and demographic data of the patients, the findings showed that over three-quarters of the patients in the study were in the age range of 51 to 65. Males made up more than three-fifths of the investigation sample. The results showed that for over half of the patients in the study, pneumonia is the most frequent reason for COPD exacerbation and ICU admission. **Hill et al., (2020**) provided support for this finding. The study by **Todorov et al., (2021**) revealed that a large number of males are at high risk of being admitted to an intensive care unit with differential diagnoses such as shock, ARDS, trauma, and others. According to their findings, approximately two-thirds of patients hospitalized to the critical care unit are men, and that this difference can be explained by the potential immunological effects of sex hormones and health state.

According to medical findings, **Hasenstab et al., (2021)** found that patients with chronic obstructive lung disease can be categorized based on the severity of their computed tomography scans, which can predict the course of their illness and their risk of dying. The most frequent cause of respiratory failure in patients with COPD and ICU admission was pneumonia, as radiological studies demonstrated that over half of the patients in the study had the illness. This finding is consistent with a study by **Niu et al., (2021**) that found that roughly one-third of patients with COPD were diagnosed with pneumonia based on the appearance of consolidation on chest X-ray.

According to the study's findings, patients in the intensive care unit had better ventilation practices after being released from the hospital than they had before. From the researchers' point of view, it reflected the positive effects of nursing strategy. According to the study, participants in the ICU liberation group used a T-piece, a basic face mask, and room air to improve from admission to six days compared to those in the non-ICU liberation bundle group. This beneficial outcome was brought about by the use of the ICU liberation bundle, specifically SAT & SBT. A study by **Na et al., (2022**) found that patients who completed the requirements for weaning were comparatively better off in the intensive care unit after the weaning process was carried out with a T-piece. According to earlier research, ashorter mechanical ventilation duration was linked to the T-piece (**Thille et al., 2022**).

Atrophy and muscle weakness are common problems for severely ill patients who are admitted to the intensive care unit (ICU). Extreme muscle weakness can lead to physical disability, tetraplegia, decreased or absent tendon reflexes, a delayed transition off of mechanical breathing, and an increased risk of mortality. Exercise, massage therapy, and early mobility improved muscle strength in the critically ill patients admitted to intensive care units. The study group with an ICU liberation bundle had a mean muscle strength level that was significantly/highly higher than that of the control group without an ICU liberation bundle, as shown by the p-values of 0.001. From the researchers' point of view, it reflected the success of nursing strategy.

The present study's results are in line with those of Anekwe et al. (2020), who shown through a thorough review and meta-analysis that early rehabilitation was associated with a decreased risk of ICU-AW.These results align with the findings of **Rahiminezhad et al., (2022**). The results of your study suggested that range-of-motion exercises and massage could have a major effect on the muscle strength of patients admitted to intensive care units. Because of the type of intervention and the study environment, the conclusions derived from the analysis of the data of **Sarfati et al., (2018**) did not match the findings of the current inquiry.

According to the study's findings regarding patients' outcomes, it was observed that the length of hospital stay was significantly longer in pre nursing strategy intervention than that of the post nursing strategy intervention. A significant number of patients post nursing strategy intervention have transferred to Step-down Unit. From the researchers' point of view, it confirmed the success of nursing strategy liberation intervention.

Result of this study was similar to a study conducted by and found that a protocol for liberation from MV driven by ICU nurses decreased the duration of MV and ICU length of hospital stay and Step-down Unit in mechanically ventilated patients for more than 24 hours without adverse effects and was well accepted by ICU physicians.

This conclusion was corroborated by **Mohammed et al., (2023**), who found that the study group's mean ICU stay and MV duration were reduced. This may have to do with the increase in oxygenation that was attained after the ventilator care bundle was put in place, which led to a quick recovery and release. Furthermore, this result is consistent with the study by **Pun et al., (2019**), which looked at the ABCDEF bundle's use in the treatment of critically ill patients. This result, however, conflicted with a research by **Khalil et al., (2018**) in Africa that evaluated the use of complete versus incomplete ventilator care bundles and looked at patients' weaning off of mechanical breathing.

The study's findings regarding weaning outcomes revealed that the pre-nursing strategy intervention had a significantly higher weaning failure rate than the post-nursing strategy intervention. This was because the checklists group used an RCC ventilator weaning assessment as a weaning strategy, which was successful in predicting the best time to wean. This finding was consistent with **Yekefallahet al., (2019**), who examined the effects of the Persian weaning tool (PWT) on the outcomes of patients connected to mechanical ventilation and claimed that the PWT increases rates of weaning success. On the other hand, **Oliveira et al., (2019**) examined the effects of a ventilatory weaning protocol in an adult intensive care unit and found no statistically significant difference observed between the studied groups regarding number of weaning attempts and success rate.

The study's findings indicated that many patients had long-term mechanical ventilation prior to nursing strategy intervention. This conclusion is consistent with the Ahmed et al., 2023 study, which indicated that almost half of the routine care group lasted more than 20 days hooked up to the ventilator. This is because the weaning decision was delayed. The Persian Weaning tool, however, had no discernible impact on the length of mechanical ventilation, according to **Yekefallah et al.'s (2019)** study.

This finding aligns with **Wang et al.'s (2021**) research, which shown that one of the major systemic symptoms of COPD is skeletal muscle failure. The loss of muscle mass and strength, which is exacerbated by a decrease in physical activity due to dyspnea and exercise restriction, was related to COPD.

The observed outcome disparities between baseline and performance periods are probably less than they would have been as a result of this finding, which is corroborated by **Kou et al., (2019**). A mobility score of two or higher (sitting on the edge of the bed without assistance, standing, or walking) was only attained by roughly one-third of MV patients after bundle implementation. This score is a reliable indicator of core muscle strength and the patients' capacity to successfully wean themselves off of MV.

These outcomes are in line with earlier research on bundle implementation, which shown that better bundle performance is linked to more improvements in ICU patient outcomes (bundle dose-response effect). Our study, however, outlines the cumulative effects of bundle implementation on reductions in the duration of MV, ICU LOS, and the percentage of patients with ICU LOS greater than or equal to 7 days, in contrast to earlier research that assessed the effects of bundle implementation on the next-day likelihood of an individual outcome (**Hsieh et al., 2019**). From the researchers' point of view, it confirmed the effectiveness of nursing strategy which met the aim of the study.

According to **Damanik et al., (2019**), there was a positive link between the length of time spent on a ventilator and the SOFA score at discharge. The SOFA score at discharge decreased significantly before and after the nursing strategy intervention. Prolonged mechanical ventilation is linked to an increased morbidity rate because positive pressure ventilation raises intrathoracic pressure, and intraabdominal pressure lowers cardiac output, causes GIT injury, and impairs renal function. These factors are also linked to an increased SOFA score. Patients in the checklists group received nursing interventions, such as hemodynamic, respiratory, and nutritional management, which improved their RCC score and allowed them to wean earlier, which reduced the

length of mechanical ventilation and its associated complications, which in turn decreased the SOFA score.

The patients under study experienced different issues before and after the nursing approach intervention. Following nursing plan intervention, there were significantly fewer cases of pressure ulcers, ICU acquired weakness, pulmonary embolism, upper gastrointestinal hemorrhage, and hypotension. link between the ICU-acquired frailty and the patients under study. This conclusion is consistent with the findings of the study by **de Souza et al., (2022**).Who investigated how well a quality-improvement strategy that used a specific visual assistance to promote early ICU mobilization worked? The "E" bundle component, early progressive mobilization, is a safe method of reducing ICU-acquired weakness (ICU-AW), which can have a direct effect on functional status, according to this study.

Because the study group's pre-intervention patients were on prolonged mechanical ventilation, which increased their risk of developing a pressure ulcer, the study group experienced significantly fewer complications, including a lower rate of pressure ulcers. This was because the study group's early ambulation and the use of nursing strategies reduced the length of time they were on mechanical ventilation. This was consistent with **Herer's, (2020**) findings that longer MV and increased pressure ulcer incidence were observed in the respiratory critical care unit.

This finding is corroborated by the findings of the **El-Soussi et al., (2023**) study, which showed no discernible difference in the pulmonary embolism rates between the two study groups. Significantly fewer incidences of hypotension were observed in the checklists group. This discovery corroborated the findings of a study by **Thomas et al., (2021**), which showed that positive pressure ventilation reduces venous return because it raises intrathoracic pressure, which lowers cardiac output.

According to **El Nagar et al., (2022**), a significant proportion of critically ill patients undergoing artificial ventilation experienced upper gastrointestinal hemorrhage. The most likely cause of the upper gastrointestinal hemorrhage was MV, which resulted in reduced tissue perfusion and cardiac output, which in turn caused stomach mucosal ischemia.

Conclusion:

Based on the study results, it was concluded that the current study concluded that Application of nursing strategy for mechanical ventilation liberation has positive effects on improving respiratory care for ventilation weaning assessment as decrease duration of mechanical ventilation and Sequential Organ Failure Assessment score.

Recommendations:

In light of the current study's findings, the researchers recommended the following actions.

- Using respiratory care in various intensive care units to measure ventilator weaning readiness.
- Offering a workshop to nurses on the use of respiratory care for the assessment of ventilator weaning.
- Future research: A bigger probability sample should be used in a multicenter replication of the study in order to generalize the findings.

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