# Burn's Wean Assessment Program versus Routine Method to Predict Weaning Outcomes of Mechanically Ventilated Patients

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## Abstract
**Background**: Knowing the weaning criteria is crucial to ensuring the success of mechanically ventilated patients, as weaning from the ventilator is the most challenging task for nurses. **The study aim** to compare utilizing Burn's Wean Assessment Program Versus Routine Method to predict outcomes of mechanically ventilated patient's Quasi experimental **research design** was used. **Setting**: This study was carried out in general intensive care unit at sohag university hospital 110 adult patients who had been on the ventilator for more than 72 hours served as a **convenient sample**. Three **tools** were utilized in this study: **tool 1** patient characteristic, medical data, hemodynamic parameter, level of conscious assessment, Mechanical ventilation data and Acute Physiological and Chronic Health Evaluation **tool 2** Burn's wean assessment checklist**; tool 3** patient's outcomes. **Results:** Burn's score and weaning outcome had a statistically significant and inverse relationship, which meant that a high Burn's score was linked to a shorter ventilation time and effective weaning. **Conclusion:** According to the study, using the Burn's program was preferable than using the conventional approach of weaning. **Recommendations:** Making a burn wean evaluation program training session for new nurses working in the critical care.

***Key words;*** Mechanical Ventilation Burn's, Routine Method Weaning, and Outcomes Wean Assessment

## Introduction
When a person is unable to breathe sufficiently on their own, a mechanical ventilator steps in to do the breathing work for them. Other names for the mechanical ventilator are ventilator, respirator, and breathing apparatus. **American Thoracic Society (2020).**

The main objectives of MV are to normalise or reduce the work of breathing while stabilising the alveolar gas compartments and guaranteeing an adequate amount of pulmonary gas exchange. In fact, during the MV period, the patient's underlying cause of respiratory failure is treated. **Windisch, W et al, (2020)**

Long-term MV entails a higher risk of consequences like ventilator associated pneumonia (VAP), tracheal ischemia, lung damage, and diaphragmatic muscle dysfunction, all of which raise the mortality risk. Additionally, patients who have trouble weaning use about 40% of the resources in the ICU environment. **Schönhofer et al, (2020)**

Weaning is described as the full process of removing the patient's endotracheal tube and mechanical support, which can occupy more than 56% to 90% of the MV time. **Keykha A. et al., (2017)**

Determining the patient's readiness for the process of weaning from MV is of crucial importance. However, it is not an easy task to wean a patient with respiratory failure due to respiratory disorder. Because MV itself is associated with many complications, as well as improper weaning can lead to respiratory failure and re-intubation, the decision of weaning still represents a challenge to the respiratory physician **Jeong and Lee (2018)**

Expected Results of the Weaning Process Successful weaning is defined as the capacity to sustain spontaneous breathing for 48 hours following extubation without intrusive mechanical ventilation or the requirement for reintubation. **Zein et al, (2016)**

The Burns Wean Assessment Program's (BWAP) original checklist was created as a tool to assess a patient's readiness for weaning from the ventilator. It systematically evaluates weaning parameters and looks at all parameters related to a patient's pulmonary function, gas changes, physiological state, and psychological well-being **Baptistella et al., (2018).**

In patients who needed long-term mechanical ventilation (LTMV) for more than 21 days, this instrument was a reliable predictor of effective weaning and extubation. According to their findings, good extubation outcomes are associated with an m-BWAP score of 60 or higher **Jeong and Lee (2018).**

Therefore The Burn's Wean Assessment Programme versus Routine Method compared in this study to predict patient outcomes for mechanically ventilated patients.

## Significance of the study

Although medical knowledge has advanced, weaning too soon or too late is still a problem. One typical reason for late weaning is delays in determining readiness to wean. Patients who require prolonged ventilation may consequently suffer from airway injuries, post-extubation delirium, drug dependence, ventilator-induced infections, other types of increased morbidity, and even greater fatality rates **Chaitanya Kaul et al., (2021).**

The number of patients hospitalised to the intensive care unit at Sohag University Hospital in the year (2020) was roughly 615 patients, with 88.3% of them requiring mechanical breathing, according to the most recent records available **(Hospital records of Sohag University 2020).**

The study's objective is to assess how well Burn's Wean Assessment Programme and routine methods predict weaning results for patients.

There will be two equal groups of patients, each with 55 patients, and group "A" (the control group) will follow the routine weaning protocol while group "B" (the study group) will follow the Burn's Wean Assessment Programme.

## Aim of the study

The present study aims to compare between Burns's Wean Assessment Program and the routine Weaning method on weaning outcomes of mechanically ventilated patients at Sohag University Hospital.

## Research hypotheses

To fulfill the aim of this study, the following research hypotheses were formulated:

**1-** Mechanically ventilated patients who are weaned by using BWAP will show significant increase in success rate of weaning than that among the control group patients who are exposed to the routine weaning methods.

**2-** Duration of connection to mechanical ventilation of the study group patients who are weaned by using BWAP will be lesser than that among the control group.

**3-** The length of ICU stays among mechanically ventilated patients who are weaned by BWAP will be lesser than that among the control group subjects who are exposed to routine weaning method.

## Operational Definitions

**Weaning outcomes refers to**: success rate of weaning, duration of connection on mechanical ventilation and length of ICU stays

## Patients and Methods

## Research design

Quasi-experimental research design was used to conduct this study.

## Setting

The study was carried out in the general intensive care unit at Sohag University Hospital, which contains twelve beds in three separated rooms each room contains four beds. These units receive patients who have a variety of critical conditions that need mechanical ventilation support and who were admitted directly from the emergency room or transferred from other hospital departments**.**

## Sample

A convenience sample of 110 adult male and female mechanically ventilated patients were recruited to fulfill the purpose of this study. Their age ranged from 18 - 60 years old. Connected to mechanical ventilators for more than 72 hours, and divided randomly into two equally matched groups (study and control groups) 55 patients each. Their GCS scores are more than 9 on admission. Patients who were thermodynamically unstable were excluded from this study. Patients were matched according to age group, sex, hemodynamically stability and APACHE II score

**The study sample size was calculated by power analysis using (Epi-Info program) applying the following information:**

- Expected frequency =50%
- Acceptance error =10%
- Confidence coefficient =95%
- design effect=1
- Power=80%.

## Tools

Three main tools were used during data collection. They were developed by the researcher then they were adopted by researcher.

**Tool one: patient assessment tool**: this tool was developed by the researcher after reviewing of literatures to assess the patient condition to form base line data **Kim, S. Huh, J. (2020), Golubev, Alexandru, et al (2020, Patel, Khushbu,et al (2021)** which included

**Part 1**: assess of the socio-demographic patient's profile and clinical data which included (age, gender, marital status and educational level)**.**

**Part2**: medical data: as past medical history, date of admission and causes of ICU admission (respiratory, cardiovascular, trauma, neurology, gastrointestinal, obstetric or post-operative cause).

**Part 3: hemodynamic parameter:** It comprises (heart rate b/m, blood pressure mm/hg, mean arterial pressure mm/hg, CVP mm/dl and urine output) were assessed manually for six days, in morning and evening shift by the researcher.

**Part 4: Assessment of patient's conscious level:** Using Glasgow Coma Scale, it is a neurological scale aims to give a reliable,

objective way of recording the conscious state of a person for initial as well as subsequent assessment. **Patricia et al, (2018)**

**Part 5:** Mechanical ventilation data as: Mode, RR, Fio2, tidal volume (Vt) PEEP and PS.

**Part 6:** Acute Physiological and Chronic Health Evaluation II (APACHE II) it was adopted by the researcher and it used to measure the severity of disease for adult patients admitted to intensive care units **Jaganath (2020)**

**Tool two:** Burn's wean assessment checklist: This tool was developed by the researcher after reviewing of literature to assess readiness to wean this tool included 26 items, 12 items of them are for general measurement and 14 for patients' respiratory function **(Burn et al, 2010) Sepahyar et al, (2021)**

**Tool 3:** patient's outcomes assessment tool

This tool was developed by the researcher after reviewing of literature **Abdelaleem et al, (2020) Sepahyar et al., (2021)** to assess the following outcomes (mortality rate, length of ICU stays, duration of connection with MV and success rate of weaning).

## Methods

This study where carried out through three main phases as following: -

**The preparatory phase**

After describing the purpose and scope of the study to the hospital's responsible officials, permission was officially obtained to carry it out in the general ICU. The study was conducted in accordance with generally accepted ethical standards for clinical research after receiving approval from the local ethical committee. The researcher created the tool utilized in this investigation after examining the pertinent literature.

## Validity

Five experts in the field of critical care nursing and anesthesiologists from Sohag University Hospital evaluated the tool's content-related validity, and the necessary revisions were made. Before data collection began, a pilot study was conducted to evaluate the viability and applicability of the study tools on 10% of the sample.

## Work field

As we were filling out the checklist for the study group, we evaluated the patients' weaning readiness. During the doctor's rounds in the morning and afternoon shifts, observe the nursing interventions of the intervention group and record any changes in the patient's condition. The intensive care specialist who lived in the unit was notified if the patient received the desired score (>17). The weaning procedure was then initiated in accordance with the prescribed instructions. Nursing interventions were carried out throughout the day with a greater focus on the primary issue highlighted in the BWAP in the event that the patient did not achieve the desired score.

## Evaluation phase

Burn's wean assessment program was used to evaluate both the control and study groups daily throughout the morning and evening shifts in order to forecast how well patients on mechanical ventilation would wean.

## Statistical analysis

Every patient's data was recorded in a unique chart. The gathered information was coded, examined, and tabulated. Statistical software SPSS 17.0 was used for data entry and analysis. For qualitative and quantitative variables, respectively, means and standard deviations were used to present the data using descriptive statistics. When comparing two independent groups, analysis of variance was used to analyze quantitative continuous data. Using the chi-square test to identify significant differences in non-parametric data.

Statistically significant differences were considered when P-value used as follows:

P >0.05 non-significant

*P<0.05 significant

**P<0.01 moderate significant

***P<0.001 highly significant

## Results

**Table (1):** shows that there was no statistically significant difference in studied patients in both study and control group in relation to gender and age groups P value was (0.340 &0.136 respectively).also, Regarding cause of ICU admission, the table illustrate that respiratory cause was the common cause in both study and control group with no statistically significant difference between them in this respect. Also, Revealed that GCS scores differed significantly in the evening shift during the 1st day of admission with p values of (0.226&0.027* respectively), as well as in the 6th day with p values of (0.105&0.001** respectively). However, in relation to **APACHEII scores** on admission, no statistical difference was found between both groups.

**Table (2):** Displays that only **PEEP** mode differs significantly between both study and control groups on admission in in evening shift with p- value of (0.0267*).

**Table (3):** revealed successful weaning in about (90.9%) of the study group subjects as compared to (30.9%) of the control group subjects with highly significant statistical difference between the two groups with p-value of (<0.001**). Thus, hypothesis one can be supported.

**Table (4):** show that in relation to duration of mechanical ventilation, a highly statistically significant difference was put into evidence between study and control group with p- value of (<0.001**). Thus, hypothesis two can be supported. Also, length of ICU stay differed significantly between the two groups with p-value of (<0.001**). Thus, hypothesis three can also be supported.

## Results

**Table (1): - Comparison between Study and control group related to patients' profile (N=110)**

| Variables | Study (N=55) | | Control (N=55) | | P. value |
|---|---|---|---|---|---|
| | No | % | No | % | |
| **Gender** | | | | | |
| **Male** | 21 | 38.2 | 18 | **32.7** | 0.690 |
| **Female** | 34 | 61.8 | 37 | **67.3** | |
| **Age** | | | | | |
| **18-35** | 14 | 25.5 | 17 | 30.9 | 0.136 |
| **36- 45** | 26 | 47.3 | 16 | 29.1 | |
| **46-65** | 15 | 27.3 | 22 | 40.0 | |
| **Mean±SD(range)** | 39.96±10.88(18-61) | | 43.69±14.17(18-65) | | 0.125 |
| **Comorbidity** | 30 | 54.5 | 31 | 56.3 | 0.998 |
| **Diagnosis** | | | | | |
| **Respiratory causes** | 19 | 34.5 | 18 | 32.7 | 0.998 |
| **Cardiovascular causes** | 5 | 9.1 | 8 | 14.5 | 0.560 |
| **Renal causes** | 1 | 1.8 | 3 | 5.5 | 0.598 |
| **Neuromuscular causes** | 5 | 9.1 | 2 | 3.6 | 0.428 |
| **Gastrointestinal causes** | 2 | 3.6 | 4 | 7.3 | 0.663 |
| **Obstetric causes** | 6 | 10.9 | 9 | 16.4 | 0.767 |
| **Trauma** | 9 | 16.4 | 8 | 14.5 | 0.798 |
| **Post-operative** | 8 | 14.5 | 3 | 5.5 | 0.209 |
| **Glasgow Coma Score** | **Mean±SD** | | **Mean±SD** | | |
| **6th day** | 13.51±1.63 | | 12.29±2.23 | | 0.001** |
| **APACHEII on admission** | 9.76±3.47 | | 9.82±3.38 | | 0.934 |

**Table (2): - Comparison between Study and control group related to mechanical ventilation mode and parameters (N=110)**

| Mode | Morning shift | | | | | Evening shift | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Study | | Control | | P. value | Study | | Control | | P. value |
| | No | % | No | % | | No | % | No | | |
| **On admission** | | | | | | | | | | |
| AC | 35 | 63.6 | 32 | 58.2 | 0.469 | 8 | 14.5 | 17 | 0.9 | 0.067 |
| SIMV | 19 | 34.5 | 23 | 41.8 | | 28 | 50.9 | 27 | 9.1 | |
| CPAP | 1 | 1.8 | 0 | 0.0 | | 19 | 34.5 | 11 | 0.0 | |

| MV parameters | Morning shift | | | Evening shift | | |
|---|---|---|---|---|---|---|
| | Study | Control | P.value | Study | Control | P.value |
| | Mean±SD | Mean±SD | | Mean±SD | Mean±SD | |
| **On admission** | | | | | | |
| **Fio2** | 48.18±10.2 | 44.91±9.98 | 0.092 | 42.73±6.51 | 42.09±5.42 | 0.579 |
| **Spontaneous respiratory rate** | 13.76±2.33 | 12.11±0.46 | <0.001** | 13.8±2.28 | 12.11±0.46 | <0.001** |
| **Tidal volume** | 482.44± 76.43 | 497.45± 94.85 | 0.363 | 483.35±76.33 | 497.45±94.85 | 0.392 |
| **PEEP** | 6.69±1.3 | 6.80±1.86 | 0.055 | 6.09±1.3 | 6.42±1.89 | 0.0267* |
| **PS** | 7.45±1.21 | 7.75±1.06 | 0.183 | 7.51±1.16 | 7.75±1.05 | 0.269 |

**Table (3): - Comparison between Study and control group related to success (N=110)**

| | Study (N=55) | | Control (N=55) | | P. value |
|---|---|---|---|---|---|
| | No | % | No | % | |
| **Success or failure of weaning** | | | | | |
| **Succeed** | 50 | 90.9 | 17 | 30.9 | <0.001** |
| **Failed** | 5 | 9.1 | 38 | 69.1 | |

**Table (4): - Comparison between Study and control group related to outcomes (N=110)**

| | Study (N=55) | | Control (N=55) | | P. value |
|---|---|---|---|---|---|
| | No | % | No | % | |
| **Duration on mechanical ventilation** | | | | | |
| Less than 10 days | 35 | 63,6 | 10 | 18,2 | <0.001** |
| From 10-20 days | 20 | 36,4 | 28 | 50,9 | |
| More than 10 days | 0 | 0,0 | 17 | 30,9 | |
| **Length of stay in ICU** | | | | | |
| Less than 10 days | 31 | 56.3 | 7 | 12.7 | <0.001** |
| From 10-20 days | 14 | 25.4 | 21 | 38.2 | |
| More than 10 days | 10 | 18.1 | 27 | 49.1 | |

## Discussion

Critical care nurse can play an important role in managing successful weaning and reach to the best weaning outcome for the benefit of the patient so our study showed that:

In terms of gender, the current study discovered that the majority of the sample was made up of females. The results of the current study are explained by the researcher's perspective that women are more at risk than men are because they are exposed to more stress and smoke from smoked food, and more women than men enter ICUs.

More than half of the patients in the study were female, according to the study's findings, which

were in line with those of **Alkotamie et al., (2019).**

In contrast to the findings of the current study, **Ghiani et al.'s (2020)** investigation revealed that males make up more than two-thirds of both weaning success and failure group instances..

Comparing the study and control groups' reasons for ICU admission revealed that respiratory disease was the primary factor in two thirds of both groups. The results of the current study are explained by the researcher who believes that respiratory issues are the major factors undermining the pulmonary circulation and regular ventilation processes, making them the most prevalent diagnosis among patients on mechanical ventilation.

his outcome was consistent with the research of **Karagozlu et al. (2018),** who discovered that internal medical conditions were the primary cause of ICU admission in the majority of the managed and uncontrolled groups. The current study's findings, however, were in contradiction with those of **Lee et al., (2016),** who indicated that fewer than half of the first and second.

The findings on first ventilated mode indicated that synchronized intermittent mandatory ventilation was used by the majority of the research and control groups. The results of the current study support the researcher's hypothesis that synchronized intermittent mandatory ventilation (SIMV) mode patients are somewhat dependent on mechanical ventilation, making ventilator breath synchronization with patient inspiratory effort the most effective and efficient way of ventilation. This will ease trials of spontaneous breathing and encourage patients to engage their respiratory muscles, making it useful for early weaning.

The results of the present investigation were in agreement with those of **Abd-Elbaky (2020),** who discovered that all of the patients under study stayed connected to the mechanical ventilator in SIMV mode throughout the MV hookup. On the other hand, the results of the current study

Approximately two thirds of the study group spent less than 10 days attached to the ventilator, compared to one third of the control group who did the same. The study also demonstrated that the burn wean evaluation programme for the study group and routine weaning assessment for the control group resulted in a shorter mean length of stay in the ICU for the intervention group than for the control group.

This is in line with **Jeong and Lee (2018),** who found that patients who were effectively weaned had higher modified burn wean assessment program (m-BWAP) scores than those who weren't. Additionally, they demonstrated the strong clinical value of the m-BWAP score at the time of the first SBT in predicting the likelihood of liberation from MV, regardless of the length of the condition.

Our study revealed that 90.9% of the study sample successfully weaned, while 9.1% of the study sample failed to do so. This finding is explained by the researcher's contention that using the BWAP increased the likelihood of successfully weaning.

According to this study's findings, patients with a BWAP score of 50 or higher had a considerably higher chance of successfully weaning than those with lower levels. According to the findings, the length of MV was greatly reduced by nurses' comprehensive evaluation of the patient using BWAP **Sepahyar et al., (2021).** Additionally, according to **Jeong & Lee (2018),** modified burn wean assessment program (m-BWAP) scores were higher in patients who were effectively weaned and lower in those who weren't**.**

## Conclusion

Based on the results of the current study, it can be said that BWAP is more effective than the conventional weaning strategy in improving outcomes for mechanically ventilated patients.

## Recommendations

Following suggestions are made in light of the current study's findings:

**For researches**

1. Explicitly analyzing the clinical BWAP variables and updating them in subsequent investigations.
2. Using BWAP as a useful tool in another study to assess patients' readiness for weaning and to provide the best weaning outcomes.

## Limitation of the study

There were some limitations facing the researcher during the period of data collection, it includes following points:

- Small sample size.
- Medical team was not cooperate enough .

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