A Study to Predict Duration of Mechanical Ventilation based on Sapsii Score

Kshitij Balkrishna Shetty[1], Prashant Hubballi[2]

ABSTRACT

Introduction: Mechanical ventilation (MV) is an important and lifesaving modality. The use of prolonged mechanical ventilation is associated with a number of disastrous complications. The ability to systematically predict the duration of ventilation for a general ICU population would be useful. We try and predict duration of MV using SAPSII scoring system. Study aimed to find the role of severity scoring systems in predicting duration of mechanical ventilation and to find out the SAPS score which can approximately predict the duration.

Material and methods: In all the patient's requiring mechanical ventilator support clinical, laboratory and ventilator parameters were used to assess the patient's. Universal sampling technique were adopted for the purpose of this study. 250 samples collected. In all the patient's severity scoring were recorded at 0hrs and 48hrs of initiation of mechanical ventilation.

Results: Out of 250 patients, 175(75.11%) patients required mechanical ventilation (MV) for <7 days (Group I) and 58(24.89%)patients required MV for >7 days (Group II) and 17patients expired during the study. There were 143 male patients and 107 female patients. Of the total patients 233 (93.2%) survived and 17(6.8%) died. It was seen that at step two of regression analysis, only SAPS at 48 hour was significantly correlated with duration of MV.

Conclusion: According to our study and results SAPSII score at the end of 48hr proved to be more accurate in predicting mortality than the duration of ventilation.Patients with lower SAPS had lower mortality rate compared to those with higher SAPS.

Keywords: Mechanical Ventilation, Sapsii Score

INTRODUCTION

Mechanical ventilation (MV) is an important and lifesaving modality. The use of prolonged mechanical ventilation is associated with a number of disastrous complications which includes nosocomial pneumonia, cardiac-associated morbidity, and death. . It has various effects on the other organ systems. Maintaining hemodynamic stability for the patient is the ultimate goal for a patient on mechanical ventilation support".

Mechanical ventilation using a machine is the most common way of providing ventilation in the critically ill ICU patients. Most patients can be extubated or weaned from mechanical ventilation without difficulty, while approx. 20 percent represent a complex challenge for the ICU staff . It has been estimated that weaning takes about 40 percent of the mechanical ventilator trajectory. Prolonged mechanical ventilation is usually associated with life-threatening complications so weaning should be carried out as expeditiously as possible.[1]

Weaning trial undertaken too early and unnecessary delays in the discontinuation process is undesirable

Patients on mechanical ventilators should be continuously screened for the possibility of weaning.[2]

For the maximum success of weaning the nurse must consider the patient as a whole, taking into account the factors that impair the gas exchange. Initial weaning failures are usually as a result of the incomplete resolution of the illness that precipitated the requirement mechanical ventilation or, due to the development of a new problem.[3]

In the ICU patients who need mechanical ventilation have a very high mortality and are a responsible for an unequal distribution of nursing care and financial resources in the ICU.[4]

The diversity of reasons that contribute to the complexity in deciding extubation range from patient factors to physician factors and the financial affordability of the patients.[5]

Protracted stays of mechanically ventilated patients in the ICU are associated with a number of complications like poor functional status, increased mortality and morbidity which also increases the cost of care and lengthen the hospital stay[6]

The ability to systematically predict the duration of ventilation for a general ICU population would be useful for examining resource allocation, designing and evaluating clinical trials, and as a means for analysing practice patterns among ICUs.

This report presents the accuracy of the equation and examines its potential usefulness in planning and evaluating resource utilisation and in assessing ICU efficiency by assessing the role of severity scoring systems in predicting duration of mechanical ventilation.

Aim of the study were to find the role of severity scoring

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SAPS								
SAPS @0hrs			137	70	20	4	5	15
SAPS @48hrs	135	6	23	27	25	10	20	2
SAPS II score for 137patients were in the range 40-50. SAPS II score for 135 patients were in the range 20-30.								

Table-1: SAPSII at 0hrs and 48hrs

systems in predicting duration of mechanical ventilation and to find out the SAPS score which can approximately predict the duration

MATERIAL AND METHODS

The present study was conducted in the Intensive care unit of A.J Institute of Medical Sciences and Research Centre, Mangalore. All patient's admitted and on ventilator support in AJ Institute of medical sciences and research Centre were included in the study. A Total of 250 cases were analysed.

Method of collection of data

In all the patient's requiring mechanical ventilator support clinical, laboratory and ventilator parameters were used to assess the patient's.

Universal sampling technique were adopted for the purpose of this study but s minimum of 250 samples were collected,

In all patients' severity scoring methods will be used to predict the variables (GCS-Glasgow Coma scale and SAPS-Simplified Acute Physiology scoring)

The patient's clinical details were obtained from the medical records.

Examination findings and relevant investigation results were noted.

In all the patient's severity scoring were recorded at 0hrs (i.e. at the time of intubation and ventilation) and 48hrs of initiation of mechanical ventilation.

Inclusion criteria

The following patient's admitted to AJ Institute of medical sciences and Research Centre, Mangalore were included for the study.

1. All patient's above 18years of age admitted to Intensive Care unit and needing ventilator support.
2. Patient's needing ventilator support at the time of admission or within 24hours of admission.
3. Informed consent by the patient party willing to participate in the study.

Exclusion criteria

1. Patient's below 18years of age will not be included.
2. Patient's dependent on mechanical ventilator prior to admission.
3. Patient's transferred to Intensive care unit from outside setup.
4. Patient's admitted to Intensive care unit for a period less than 24hours.
5. Patient's with burn injuries, coronary care unit patient's, and post cardiac surgery patients.
6. Patient's with Neuromuscular disorders e.g. .Guillian Barre syndrome.

RESULTS

Demographic data

A) Gender distribution

In the present study Males predominated the study population with 143cases (57.2%).

B) Age distribution

In the present study the age of the cases ranged from 19yrs to 88years. 68.8% of the cases were in the age group of less than 40years.

C) Indication for ventilation

In the present study 19.6% of the patients were admitted with sepsis, 10% with meningitis. The remainder of the cases included patients with seizure disorder (8.4%), stroke (8.4%) etc. and the last being haematological malignancy, AIDS, Cirrhosis (0.4%)

D) Co morbidities

In the present study we had 107 (42.8%) patients who had type II Diabetes, 46 (9.6%) patients had Hypertension and 33(13.2%) had COPD.

E) Risk Factor

In this study only 4 patients were admitted with chronic disease out of which 2 had metastatic cancer, 1 had hematological malignancy and 1 patient had AIDS.

F) Mechanical Ventilation

Mechanical Ventilation parameters (PaO2/FiO2) for most of the patients was >200 both at 0 and 48hrs.

G) SAPS score and relation

H) Duration of ventilation

Duration of ventilation was less than 7days in 70% of the patients and 23.2% of the patients required prolonged ventilator support. 6.8% patients expired during the course of the study.

I) Days on ventilator and SAPS at 0hrs

II) Days on ventilator and SAPS at 48hrs

Out of 250 patients, 175(75.11%) patients required mechanical ventilation (MV) for <7 days (Group I) and 58(24.89%) patients required MV for >7 days (Group II) and 17patients expired during the study.

Mean age of the patients included in study was 38.856 years. The mean age of the patients was 36.97years in Group I and 43.25years in Group II, which was not statistically significant.

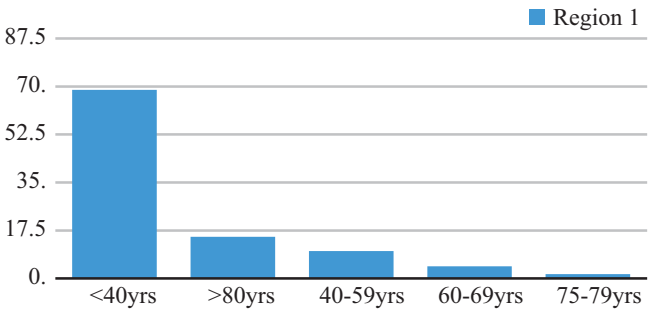
There were 143 male patients and 107 female patients, with a sex ratio of 1.33:1. There was no significant difference in sex distribution in both groups.

Comparison between duration of mechanical ventilation support and Sex was not significant with a p-value (0.678345) which was not significant.

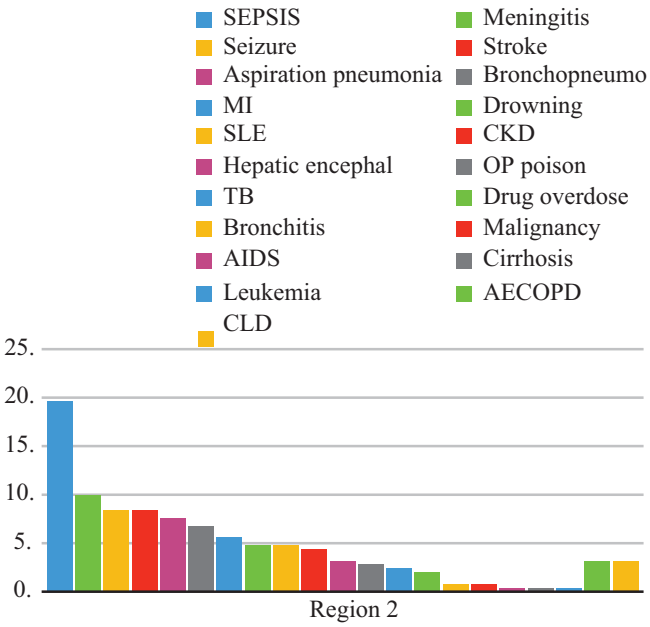
The distribution of basic disease groups and presence of past illness varied between two groups. Of the total 250 patients included in this study, 233 (93.2%) survived and 17(6.8%) died, survival in group I and group II was 100% and 77.34%(58patients) respectively.

15 (6%) patients underwent tracheotomy. Majority of the patients underwent tracheotomy were in group II.

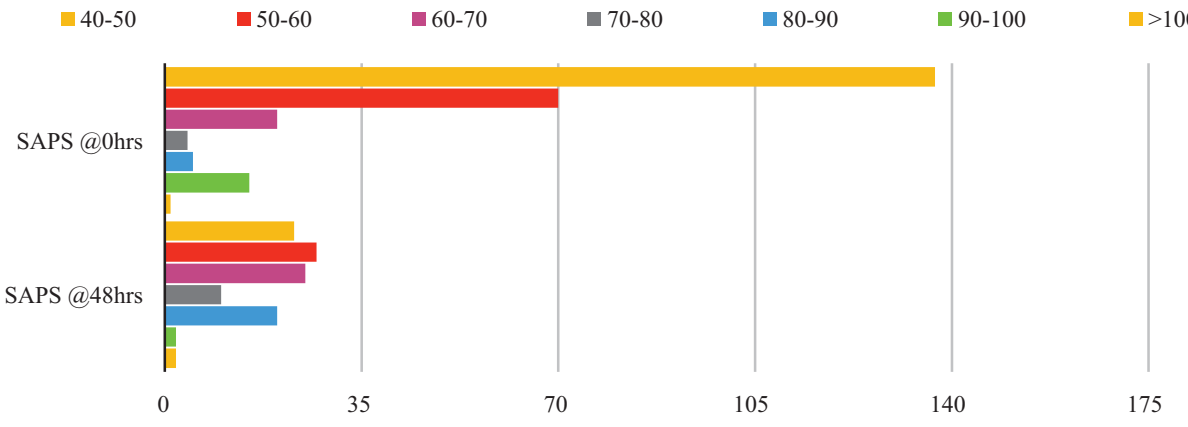
Most of the clinical, laboratory and ventilatory parameters at initiation and 48 hour showed significant difference. It was



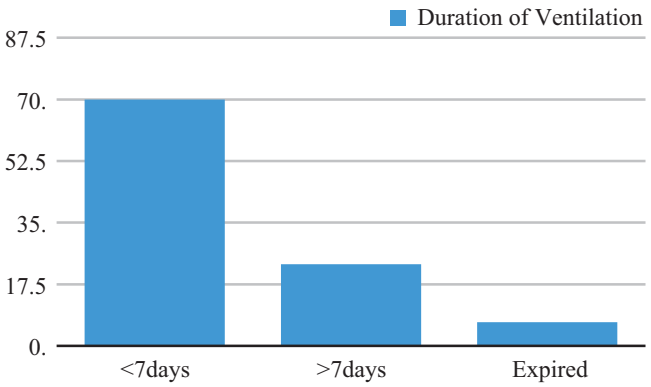
Graph-1: Age Distribution:



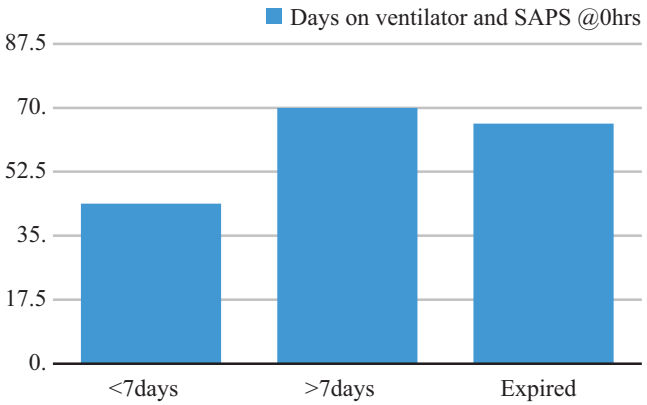
Graph-2: indication for ventilation



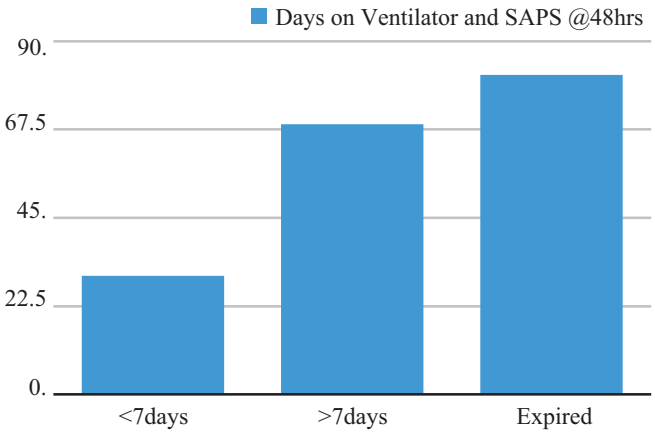
Graph-3: SAPSII at 0hrs and 48hrs



Graph-4: Summary of Days on Ventilator



Graph-5: Days on Ventilator at 0hrs



Graph-6: Days on Ventilator at 48hrs

seen that at step two of regression analysis, only SAPS at 48 hour was significantly correlated with duration of MV .

1) Sex of the patient wasn't found to be of statistical significance in predicting duration of mechanical ventilation (p-value-0.6).
2) Age was found to be statistically significant indicator in weaning out a patient off ventilator (p-value: 0.000001), in our study with the mean age of 36.97years in Group I (<7days on ventilator) and 43.25years in Group II (>7days on ventilator).
3) Chronic diseases were associated with a higher degree of mortality and longer duration of mechanical ventilation and so early Tracheostomy was indicated in these set of patients, according to this study.
4) Percentage of (PaO2/FiO2) improved at the end 48hrs. (PaO2/FiO2) >200mmhg/% was associated with a lower SAPSII score and hence lesser mortality and lesser duration of Mechanical ventilation.
5) The predicted MICU mortality rates were in the range of 24.47% for SAPS score of 40 and 46.1% for SAPS score of 50
6) This study showed that there was a significant reduction in saps score calculated at 48hrs compared to saps calculated at 0hrs in patients who survived and were weaned off ventilator support.Mortality percentage based on sapsII score also predicted lesser mortality.
7) The prediction for duration of ventilation based on SAPS AT 0hrs showed that patients with SAPS below 45 required VENTILATOR support for less than 7days, and those with SCORE ABOVE 60 required ventilator support for more than 7days.
8) The prediction for duration of ventilation_based on SAPS AT 48hrs showed that patients with SAPS around 30 required VENTILATOR support for less than 7days, and those with SCORE ABOVE 65 required ventilator support for more than 7days. Those with a SAPS score more than 80 expired.

DISCUSSION

In our study patients with SAPS score above 60 at 0hrs were at greater risk of prolonged ventilation and those with a SAPS score above 65 at 48hrs proved to be requiring prolonged ventilation and also had higher mortality rate.

There was no uniform consensus regarding the point beyond which ventilation should be considered as prolonged. A conventional approach was to continue ETT when predicted duration of MV is likely to be 10 days or less and to perform tracheotomy when predicted duration of MV was to be more than 10 days. Some studies advocated that when anticipation was not feasible, daily assessment was required and ETT should be converted to tracheotomy if requirement of MV was prolonged beyond 10-14 days.[7-13]

Most of the studies on prediction of duration of mechanical ventilation tried to assess the expected duration of mechanical ventilation on basis of various severity score calculated on day 1 of mechanical ventilation [7-13]

Further with the introduction of MV in the patient's management there was some early improvement in physiological, laboratory and ABG parameters of the patients and the changes in these parameters were studied at 48 hour of initiation. Even small improvement in these parameters altered the severity score significantly, when scores of 48 hour were compared with those at initiation. This improvement in severity scores at 48 hour might help to predict the approximate duration of MV. So a repeat evaluation of all the clinical, laboratory and ventilator parameters at 48 hour of initiation of MV was undertaken, and a calculation of severity scores at 48 hour was of advantages in the prediction of expected duration of MV. However in present study, at 48 hour of initiation of mechanical ventilation GCS and SAPS were significantly different between two groups. Thus the severity score at 48 hour correlate much more with the duration of MV as compared to the severity scores at zero hour. In the present study, sex could not predict the duration of MV.A significant correlation between duration of MV and its indication was observed.

Most of the clinical, laboratory and ventilator parameters did show difference between two groups both at the beginning and 48 hour of initiation of mechanical ventilation. There was much improvement observed in these parameters at 48 hour as compared to those of zero hour. It was more so in group I as compared to group II.

In our study patients on mechanical ventilator were assessed using SAPS II score on day 0 and 48 hours. It showed patients having low SAPS score had lower mortality rates and patients with high SAPS score had a higher mortality rate.

This study included 250 patients, out of which the mortality rate was 6.8%. Patients with SAPS score of >65.64 on day 0 and 81.41 at 48 hrs were found to have higher mortality rates.

The mortality with SAPS score of 40-59 at day 0 was 52.94%, 60-80 was 29.41% and >80 was 17.64% and at 48 hours SAPS score of 60-80 had a mortality of 47.05% and >80 was 52.94%.

It was concluded that the SAPS II at 48 hour of initiation of mechanical ventilation was a better predictor of duration of mechanical ventilation compared to the SAPS II at initiation of MV.SAPS at 48 hour was the best predictor of duration of MV. For patients requiring prolonged MV, early tracheotomy can be planned, and it may provide an idea about the success of weaning in a particular patient.

CONCLUSION

In this study we had the following conclusions:

1) According to our study and results SAPSII score at the end of 48hr proved to be more accurate, Patients with lower SAPS had lower mortality rate
2) SAPSII scoring at 0hrs also proved to be of lesser predictive.
3) Age was found to be statistically significant indicator in weaning out.
4) Chronic disease were associated with a higher degree of mortality and longer duration of ventilation and so early

Tracheostomy was indicated

5) This study showed that there was a significant reduction in saps score calculated at 48hrs compared to saps calculated at 0hrs in patients who survived and were weaned off ventilator support. The predicted MICU mortality rates were in the range of 3.7% for SAPS score of 20 and 10.6% for SAPS score of 30.

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