

**Research Article****VENTILATORY HABITS AND OUTCOME OF PATIENTS ADMITTED IN AN ICU OF A TERTIARY CARE TEACHING HOSPITAL- A RETROSPECTIVE ANALYSIS****James Chacko., Asish Karthik., Sruthy Unni and Aparna Satisch**

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ABSTRACT

Background: Since the advent of mechanical ventilation, there has been tremendous progression and refinement of ventilators, to the extent of Neurally adjusted ventilatory assist (NAVA), High-frequency oscillatory ventilation (HFOV) etc. However to what extent these high-end ventilators are put into use is doubtful. **Methodology:** We did a retrospective analysis of details of initial ventilatory support provided to patients admitted to Anaesthesia Intensive Care Unit (AICU) of a tertiary care teaching hospital. We also analysed the outcome of these patients. **Results:** A total of 88% (40%+48%) had good outcome. CMV, SIMV+PS, CPAP, T-Piece were the modes employed with 26.4%, 7.3%, 2.5%, 0% mortality respectively. **Conclusion:** we concluded that, whatever modes of ventilation is available with the advanced machines in use, intensivists tend to adhere to the conventional modes of ventilation with proven track record and with which they are familiar with, rather than venturing into the advanced versions especially when dealing with a difficult case. CMV, SIMV+PS, CPAP, T-Piece remains the popular choices and with decreasing order of mortality.

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INTRODUCTION

Post operative ventilator support has increased enormously in recent years¹⁻³ and it constitutes a major therapeutic modality in any intensive care unit (ICU). Various decisions with regard to ventilator support need to be made once it is determined that a patient requires mechanical ventilation. However, data regarding the frequency, optimal modes of ventilation, and its uniformity among intensivists is scanty.

With advent of microcomputer-based mechanical ventilators, several new more physiological and complex combination ventilatory modes have been introduced⁴. Although intriguing from a physiologic viewpoint, these newer modes have not been shown to have advantages in terms of improved ventilator capabilities, enhanced efficacy of weaning, morbidity. However, data regarding the clinical acceptability and usage of these new modes are not available to clinicians in pubmed, google and similar search engines as per todays date. So we intend to fill up this grey area by a retrospective analysis of the ventilator habits followed in the ICU of a tertiary care teaching hospital.

MATERIALS AND METHODS

This retrospective study was conducted in the department of Anaesthesiology and critical care of Government Medical college Hospital, Thrissur, India, a 1500 bedded tertiary care teaching hospital. The intensive care unit (AICU) receives post operative patients from general surgical, orthopedic, neurosurgical, ENT, urologic and obstetrics. Case records of

all the patients directly admitted to AICU from the operating room (OR) during a one year period from January to December 2016 were included in the study.

Demographic data regarding the age of the patient, gender, surgical specialty, type of the procedure and initial ventilatory support offered to these patients in the ICU were recorded. We also collected the prognosis of these patients in our ICU and thus their outcome in search of finding a relation with the initial modes of ventilation used to assist their respiration.

The collected data were analysed using the statistical software version 21.0. Frequency and percentage analysis was done as preliminary analysis. Significance was tested by setting the level of significance at 0.05 levels.

RESULTS**Table 1** Age wise distribution

Age group	Frequency	Percent
1-10	5	2.0
11-20	10	3.9
21-30	12	4.7
31-40	34	13.3
41-50	46	18.0
51-60	70	27.3
61-70	60	23.4
71-80	19	7.4
Total	256	100.0

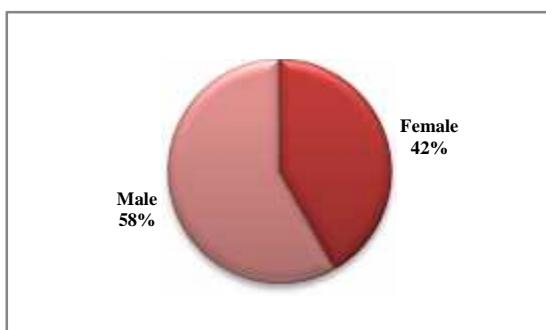


Figure 1 Gender wise distribution

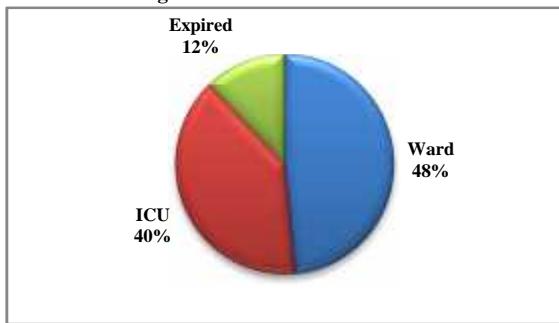


Figure 2 Outcome

Patients classified under ward and ICU indicates better outcome, where the patients are either recovered or sent to respective speciality wards and their ICU, while expired denoted a bad outcome.

Table 2 Outcome at different modes of ventilation

Outcome	Modes of ventilation					
	CMV		SIMV with PSV		CPAP	
	Count	Percent	Count	Percent	Count	Percent
Ward	22	24.2	50	61.0	24	60.0
ICU	45	49.5	26	31.7	15	37.5
Expired	24	26.4	6	7.3	1	2.5
Total	91	100	82	100	40	100
Chi square = 46.215***; P-value < 0.001						

** significant at 0.01 level

DISCUSSION

Our demographic data is representative of both genders with wide range of admissions with regard to the age of patients admitted to ICU. The majority of patients who needed ventilator supports were between 3rd to 7th decade of life with male preponderance.

The ventilators used in our ICU were of the state of art and the specialists operating them were of high expertise, with postgraduate and postdoctoral training, enabling the patient to receive any advanced mode of ventilation and possible combinations. However, we observed that, there were only few modes of ventilations used by all of them as the first line to support a new patient admitted to ICU. The modes employed were Controlled Mandatory Ventilation (CMV), synchronized intermittent mandatory ventilation (SIMV with PS), Continuous positive airway pressure (CPAP), T-piece.

CMV mode needs either deep sedation or paralysis. Paralysing patients, even for short term has its intrinsic defects, terror of awake paralysis is unthinkable^{5,6}. Recognizing incomplete sedation is a challenging task, even for trained physicians, with change in hemodynamics, lacrimation and diaphoresis being the commonest indicators.

Difficulty in communicating, bed sores, decubitus ulcers, nerve compression, corneal erosions, higher incidence of deep vein thrombosis, muscle atrophy all can be associated with CMV, if due care is not executed^{7,8}. Even with all these side effects and complications CMV remains to be the favourite mode of ventilation chosen by the intensivists in the post anaesthesia care unit. It was observed that patients ventilated with CMV had the worst outcome (26.4% expired) in comparison with the other modes employed. The possible explanation could be that these patients were the victims of a larger trauma/surgical insult with borderline health tempting the treating physician to employ a mode, which needed least patient effort. It was also observed that even with wider spectrum of ventilatory choices available for such patients most physicians resorted to a familiar choice.

SIMV was also widely used as an initial ventilator in our ICU. In accordance with the US based survey results published by Venus and colleagues in 1987⁹, where 72% of physicians in the United States listed SIMV as their preferred ventilator mode. In North America, the use of a combination of SIMV and PS tied with Assist control as the most commonly used mode; in Uruguay, this combination was used twice as often as any other modality. The popularity of the SIMV and PS combination is surprising, in that this modality has undergone little scrutiny¹⁰. The clinical use of ventilator modes recently introduced, such as pressure-control, inverse-ratio ventilation, or airway pressure release ventilation, seems very limited¹¹. The SIMV plus PS combination was the second most frequently used method in the United States despite its being the only technique of weaning. Brochard and colleagues¹² reported difference in the rate of successful weaning between patients weaned with PS and patients weaned with either SIMV or with a T-Piece pooled together. We tent to follow the same trend in SIMV with PS, which remains the second common option for initial ventilator setting and had better outcome (7.3%) than CMV (26.4%). The SIMV mode permits lighter sedation, better patient compliance and can sometimes be used as a weaning mode as well.

CPAP can be applied via an endotracheal tube or by a non invasive mask. The effectiveness of non-invasive positive pressure ventilation (NPPV) in decreasing mortality and endotracheal intubation rates in patients with hypoxaemic respiratory failure has been demonstrated in meta-analyses¹³, while the data to support the use of NPPV in these patients with hypoxaemic respiratory failure is inconclusive at present. Several prospective randomised trials have demonstrated that non-invasive ventilation reduces both the need for ETI and the complication rate, and also shortens the length of ICU stay, and improves survival in patients with chronic obstructive pulmonary disease^{14,15}. A recent study evaluated whether facemask CPAP is physiologically beneficial, and reduces the need for endotracheal intubation and mechanical ventilation (ETMV) in patients with acute lung injury¹⁶. However, in a retrospective study, Tanaka *et al* reported that CPAP with pressure support during spontaneous breathing reduced both complications and the duration of mechanical ventilation¹⁷.

T-Piece trials are the most common method used for weaning from ventilator. Few randomized studies^{18,19} have evaluated it as the best technique for performing spontaneous breathing trials before extubation. The first study that dealt with this issue¹⁹ compared continuous positive airway pressure of 5 cmH₂O and T-piece in a group of 106 mechanically ventilated

patients who underwent a 1 h trial of spontaneous breathing, and no difference in the percentage of patients failing extubation was found. We also had similar results where the mortality is nil and patients were having the best prognosis. With this in mind, the study performed by the Spanish Lung Failure Collaborative Group¹⁸ compared weaning outcome after trials of spontaneous breathing with either T-Piece or pressure support of 7 cmH₂O, but no difference was observed in the percentage of patients who remained extubated for 48 h (63% in the group assigned to T-Piece and 70% in the group assigned to pressure support; $P = 0.14$).

The selection is generally based on clinician familiarity and institutional preference since there is paucity of evidence indicating that the mode affects clinical outcome. Internationally three most common modes used for mechanical ventilation in adults are volume assist/control, pressure assist/control, and pressure support. Volume assist/control is one of the oldest and still the widely used mode.²⁰ Our ICU also followed the same preferences when offering ventilatory support to patients admitted by the modes like CMV, SIMV with PS and CPAP.

We only looked into the initial ventilatory support of the patients admitted to anaesthesia ICU and has not accounted for the subsequent ventilatory setting changes that would have happened in the subsequent disease process of these patient, which may swing in to better or worse side as per the patient status, considering the ever-changing dynamic nature of patient status in an ICU. These were some of the possible limitations of our study.

CONCLUSION

Our study concludes that even though variety of newer modes of ventilation are available, ICU's always goes for basic modes of ventilation strategies which are available easily and cost effective. So from the ergonomic point of view, ICU's seem to perform better and cost effectively with more ventilators with basic modes rather than a fewer high end costly ones that can be afforded with the same purchase power. We suggest that in order to familiarize the advanced modes to treating physicians, the best place to train them is at the medical school rather than expecting to use the advanced mode for the first time in a complicated patient scenario.

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