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ORIGINAL ARTICLE

Characteristics, outcome of patients on invasive mechanical ventilation: A single center experience from central India

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KEYWORDS

Mechanical ventilation;
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Outcome;
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Abstract *Introduction:* The information on patient characteristics and outcome in patients requiring invasive mechanical ventilation (IMV) is critical for better use of resources and clinical decision making in a rural ICU.

Objective: To understand characteristics and outcome of patients on IMV.

Design: This is a retrospective study in patients admitted in medical intensive care unit of a rural hospital who were on IMV during August 2013 to February 2015. Adult patients with failing respiratory drive and/or those who failed oxygen therapy or NIV (non invasive ventilation) were considered eligible for invasive ventilation. Patients exclusively on NIV were excluded (reason for exclusion was to study the outcome in an expensive intervention like IMV). Patients who were weaned and extubated and subsequently shifted to medicine ward were considered "good" outcome and "adverse" (not-extubated) if they died or sought discharge against medical advice.

Outcome measure: All-cause mortality during ICU stay.

Results: A total of 505 patients, of which 74.7% were male with mean age of 52 years (IQ range 38–65 years). Comorbidities were seen in 76.4% patients; significantly higher in not-extubated (94.85% vs 5.15%) ($p = 0.008$). The ICU stay, days on ventilation and total hospital stay were 5 (3–9) days, 2 (1–5) days and 5(3–9) days respectively. Primary cause for IMV was sepsis, neurological, cardiac, renal and respiratory and others like envenomation, drug overdose, organophosphate poisoning, etc. Hypertension and diabetes were the commonest co-morbidities.

Abbreviations: IMV, invasive mechanical ventilation; CKD, chronic kidney disease; ABG, arterial blood gas; CAD, coronary artery disease; AKI, acute kidney injury; KFT, kidney function test; WBC, white blood cell.

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Conclusion: The mortality in patients requiring invasive ventilation support from low-resource setting is high.

1. Introduction

The need for invasive mechanical ventilation (IMV) is very common in intensive care unit (ICU) and its use is increasing in the developing world. It is an important organ support therapy given to the critically ill. The goal of ventilation therapy is to lessen the work of respiration and pulmonary gas exchange and thereby maintain or restore an adequate oxygen supply to the body tissues. Mechanical ventilation can cause substantial and often lifelong cognitive, physical and behavioral impairments that require long-term access to healthcare services. However, predicting the healthcare service utilization and mortality rate associated with IMV is difficult because of its widely varying rate and extent of recovery. Although IMV patients consume substantial medical resources, their outcomes tend to be poor, especially in the elderly population [1]. Wide variety of ventilation strategies are available offering a complex, well organized and technically sophisticated level of care. Invasive MV is used in wide range of background pathogenesis ranging from sepsis, trauma to Acute Respiratory Distress Syndrome (ARDS) [2].

Providing effective medical care for IMV patients is challenging and requires good planning and effective clinical decision making policies. Its use varies in different clinical settings such as urban and rural areas or hospitals of varying sizes [3]. Quality of care depends on physician staffing, hospital volume, resources and access to healthcare [4,5]. Limited resources and lack of trained personnel often limits comprehensive health services in rural ICU. Further, specialized services in rural hospitals depend on the trained paramedics, sustainability of standards in low patient numbers, resources and financial stability. Higher mortality rates are reported in rural patients who require complicated ventilation. The conditions such as ARDS, multiple organ dysfunction and sepsis accounts for a higher mortality rate than overall rural mortality rate: suggesting that there are certain high-risk patients who may benefit after referral to a tertiary care center with better resources and technology [6]. Thus IMV remains associated with significant mortality and impairment in patients' quality of life post-MV due to various reasons [7]. Hence information on incidence, patient characteristics, and outcomes of patients requiring IMV is critical in understanding the reasons for high mortality in these patients. It will also help for better use of resources and making critical clinical decisions [8].

There are limited studies focused on epidemiology and outcome in invasive ventilation in rural Indian population.

2. Material and methods

This is a retrospective observational study from rural tertiary care hospital from central India having a 20 bedded medical open ICU with an average of 100 admissions a month. The nurse to patient ratio is 1:3; there are three resident doctors in the day and two in the night with shift duty and a senior physician available on call. The study was approved by the institution ethics committee.

Adult patients with acute respiratory insufficiency as suggested by clinical evaluation, arterial blood gas (ABG) and falling saturation and/or failed oxygen therapy or non-invasive ventilation (NIV), were considered for invasive MV. Consent form was duly filled and signed by patients and/or near relatives. Clinical assessment and management was done by a senior physician and resident doctors and was documented by handwritten notes. Cases admitted through the emergency medicine and/or other departments during August 2013 to February 2015 were included in the study. Adult patients who exclusively received NIV were excluded. Data were collected from medical records available in the medical records department. Average length of ICU stay (ALOS) was calculated from the time of admission in ICU to discharge from ICU or death. Time duration between admission to ward and shift to ICU and from admission to ICU and putting patient on IMV was calculated. Duration of IMV was taken as time from intubation to putting on invasive ventilation, till the time of either weaning followed by extubation/extubation failure/death. Baseline clinical data included age, blood pressure, WBC, KFT and chest X-ray. Among serial ABG done, the one prior to invasive ventilation was recorded in the data form. All patients received oxygen therapy, volume control mode of ventilation, inotrope support, fluid management and anti-microbials based on culture and sensitivity profile. None of these patients had been scored to predict outcome. Patients were regularly and timely assessed and handwritten records were maintained by resident and senior physicians on call. Outcomes were defined as 'good' if patients were weaned and extubated and subsequently shifted to medicine ward and as 'adverse' if not-extubated or those who died.

3. Statistical analysis

Demographic data were analyzed and expressed as median and interquartile range. Quantitative data were analyzed using Student's t-test and qualitative data, expressed as number (n) and percentage (%), and were analyzed using chi-square test. Logistic regression analysis was done with clinical outcome as dependent variable and other measured variables, which were noted to have significant ($p < 0.05$) association in univariate analysis. The p values <0.05 were considered as statistically significant. Statistical analysis was performed using the IBM SPSS statistics version 17.0.

4. Results

4.1. Demographics

A total of 505 patients were evaluated. The median age of the patients studied was 52 years (IQ range 38–65 years); out of which 377 (74.7%) were men and 128 (25.3%) were female. Comorbidities were present in 386 (76.4%) patients. 344