

Effectiveness of a multicomponent intervention bundle in preventing pain, agitation, and delirium among mechanically ventilated patients in intensive care units: A quasi-experimental study

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Abstract

Background: Pain, agitation, and delirium (PAD) are common complications among mechanically ventilated patients in intensive care units (ICUs) and are associated with prolonged mechanical ventilation, increased ICU stay, and poor clinical outcomes. Evidence suggests that multicomponent intervention bundles may reduce the incidence of these complications, however, evidence from Indian ICUs remains limited.

Objective: To evaluate the effectiveness of a multicomponent intervention bundle in preventing pain, agitation, and delirium among mechanically ventilated patients admitted to intensive care units.

Methods: A quantitative quasi-experimental, non-randomized pretest post-test control group design was conducted among 60 mechanically ventilated patients admitted to two tertiary care hospitals in Salem, Tamil Nadu, India. Participants were assigned to an experimental group (n = 30) receiving the multicomponent intervention bundle in addition to routine care and a control group (n = 30) receiving routine care alone. Pain, agitation, and delirium were assessed using the Critical Care Pain Observation Tool (CPOT), Richmond Agitation-Sedation Scale (RASS), and Intensive Care Delirium Screening Checklist (ICDSC). Data were analysed using descriptive and inferential statistics, with statistical significance set at $p < 0.05$.

Results: The experimental group demonstrated a significant reduction in pain, agitation, and delirium scores following implementation of the multicomponent intervention bundle compared with the control group ($p < 0.05$). Post-intervention scores were significantly lower in the experimental group, indicating the effectiveness of the intervention. No significant association was found between selected demographic variables and study outcomes.

Conclusion: The multicomponent intervention bundle was effective in reducing pain, agitation, and delirium among mechanically ventilated patients. Incorporating evidence-based multicomponent interventions into routine ICU nursing practice may improve patient outcomes and enhance the quality of critical care.

Keywords: Mechanical ventilation, intensive care unit, pain, agitation, delirium, multicomponent intervention bundle, critical care nursing

Introduction

Mechanical ventilation is a life-saving intervention widely used in intensive care units (ICUs). However, mechanically ventilated patients are at increased risk of developing pain, agitation, and delirium (PAD), which are associated with prolonged mechanical ventilation, longer ICU stays, increased healthcare costs, and higher mortality.

Pain, agitation, and delirium are interrelated complications that negatively affect patient recovery. Inadequate pain control may lead to agitation, while both poor pain management and inappropriate sedation increase the risk of delirium. These complications are associated with prolonged hospitalization, delayed recovery, and adverse clinical outcomes.

Current critical care guidelines recommend an integrated approach to PAD management through evidence-based interventions, including routine pain assessment, spontaneous awakening and breathing trials, early mobilization, sleep promotion, and family engagement. These interventions, collectively known as the ABCDEF bundle, have been shown to improve patient outcomes by reducing delirium and shortening the duration of mechanical ventilation.

Although the effectiveness of multicomponent intervention bundles has been reported internationally, evidence from Indian ICUs remains limited. Therefore, this study aimed to evaluate the effectiveness of a multicomponent intervention bundle in preventing pain, agitation, and delirium among mechanically ventilated patients admitted to intensive care units. The findings may support the implementation of evidence-based nursing interventions to improve the quality of critical care.

Materials and Methods

A quantitative quasi-experimental, non-randomized pretest post-test control group design was used to evaluate the effectiveness of a multicomponent intervention bundle in preventing pain, agitation, and delirium among mechanically ventilated patients.

The study was conducted in the intensive care units of two tertiary care hospitals in Salem, Tamil Nadu, India. Sixty mechanically ventilated patients were selected using purposive sampling and assigned to an experimental group (n = 30) and a control group (n = 30). Patients receiving mechanical ventilation for ≥ 24 hours with normal arterial blood gas values were included, while those with severe

neurological disorders, deep coma, deep vein thrombosis, or a history of substance abuse were excluded.

The experimental group received a multicomponent intervention bundle comprising pain assessment and management, spontaneous awakening and breathing trials, early mobilization, sleep promotion, and family engagement, in addition to routine ICU care. The intervention was administered twice daily for three consecutive days. The control group received routine ICU care alone.

Pain, agitation, and delirium were assessed using the Critical Care Pain Observation Tool (CPOT), Richmond Agitation-Sedation Scale (RASS), and Intensive Care Delirium Screening Checklist (ICDSC), respectively. Baseline assessment was performed on day 2 of mechanical ventilation, and post-test assessment was conducted on day 4.

Data were analysed using descriptive and inferential statistics. Paired and independent t-tests were used to compare outcome measures within and between groups, while the chi-square test was used to determine the association between selected demographic variables and study outcomes. Statistical significance was set at $p < 0.05$. Ethical approval and written informed consent were obtained before data collection.

Results

Sixty mechanically ventilated patients were included, with 30 participants each in the experimental and control groups. Baseline characteristics were comparable between the groups.

Following implementation of the multicomponent intervention bundle, the experimental group showed a significant reduction in pain, agitation, and delirium scores compared with the control group ($p < 0.05$). No significant association was observed between selected demographic variables and the study outcomes ($p > 0.05$).

Table 1: Comparison of post test outcome scores between the experimental and control group

	Pain	Agitation	Delirium
Experimental group	2.37 ± 0.96	0.96 ± 3.05	0.56 ± 1.30
Control group	3.36 ± 1.18	1.50 ± 0.5	4.13 ± 2.44

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