



Risk factors for the development of early-onset delirium and the subsequent clinical outcome in mechanically ventilated patients[☆]

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Abstract

Objectives: The aim of the study was to investigate the risk factors of developing early-onset delirium in mechanically ventilated patients and determine the subsequent clinical outcomes.

Methods: Confusion assessment method for the intensive care unit (ICU) was used to assess the enrolled mechanically ventilated patients for delirium. The risk factors of developing delirium and clinical outcomes were determined in these subjects.

Results: Delirium was present in 31 (21.7%) of 143 patients in the first 5 days. In multivariable analysis, hypoalbuminemia (odds ratio, 5.94; 95% confidence interval, 1.23–28.77) and sepsis (odds ratio, 3.65; 95% confidence interval, 1.03–12.9) increased the risk of developing delirium in mechanically ventilated patients. The patients with delirium had a higher in-hospital mortality (67.7% vs 33.9%, respectively; $P = .001$) and longer duration of mechanical ventilation (19.5 ± 15.8 vs 9.3 ± 8.8 days, respectively; $P = .003$) than patients without delirium. The incidence of nosocomial pneumonia was increased in delirious patients (64.5% vs 38.4%, $P = .01$) compared with nondelirious patients, whereas the lengths of ICU or hospital stay were similar between both groups.

Conclusions: Mechanically ventilated patients with sepsis or hypoalbuminemia were more vulnerable to develop delirium in their early stay in the ICU. Early-onset delirium is associated with prolonged duration of mechanical ventilation and higher incidence of nosocomial pneumonia, leading to a higher mortality.

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1. Introduction

Delirium is an acute change in mental status with a fluctuating course of impaired attention and disorganized thinking. Delirium is especially common in certain groups of patients including elderly patients, patients with alcohol

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abuse, and patients in the intensive care unit (ICU) [1-3]. Several risk factors for the development of delirium [4] have been identified, including advanced age, preexisting brain disease or cognitive impairment, multiple medications, and multiple systemic illnesses [5]. Evidence indicates that development of delirium is associated with longer ICU stay [3], higher medical cost [6], and increased mortality rate [7-9].

Delirium, especially the hypoactive type, is usually overlooked by many clinicians. Detection of delirium in patients with mechanical ventilation is even more difficult because of a lack of verbal communication. The introduction of nonverbal assessment, confusion assessment method for the ICU (CAM-ICU), has improved the detection rate of delirium in those patients [10]. Development of delirium in mechanically ventilated patients has been shown to be associated with as much as a 3-fold increase in risk for mortality even after controlling for preexisting comorbidities, illness severity, and use of sedative medication [9]. Our recent study also demonstrates that development of delirium in the early course of ICU stay (early-onset delirium) is as important as the Acute Physical and Chronic Health Evaluation III (APACHE III) score in predicting patients' outcome and is associated with a higher mortality rate [11]. Thus, the early onset of delirium in patients with mechanical ventilation may be regarded as a warning sign for illness deterioration, and interventions should be implemented for modifiable factors.

This study is designed to identify the risk factors for the development of early-onset delirium in mechanically ventilated patients and to determine the impacts on subsequent clinical outcomes, including the length of ICU stay, duration of mechanical ventilation, and occurrence of complications.

2. Materials and methods

2.1. Patients

The institutional review board approved this study, and informed consent was obtained from the patients or surrogates. The study recruited mechanically ventilated adult ICU patients admitted to a university-affiliated medical center medical ICU. From October 2002 to May 2003, there were 206 patients admitted to the ICU, and 175 patients required mechanical ventilation support. Among the 175 patients, 151 were enrolled and 24 were excluded; some of these subjects were included in a previously published investigation of the association between delirium and survival [11]. The exclusion criteria of this study were a history of chronic dementia, psychosis, mental retardation, or other neurologic disease; patients receiving antipsychotics, high dose of morphine (>50 mg/d), or midazolam (>0.09 mg/kg per hour); general anesthesia, recovering from surgery, or heavily sedated combined with

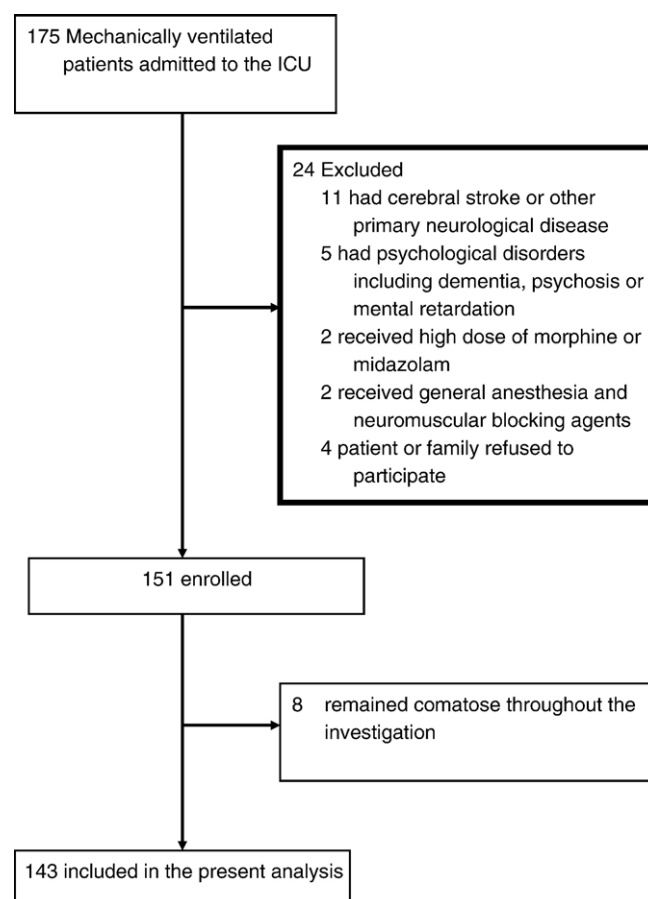


Fig. 1 Flow diagram of patients in the study cohort.

neuromuscular blocking agents that would confound the diagnosis of delirium ($n = 20$); and patient or family refusal to participate ($n = 4$). The presence of dementia was defined as in a previous report [9]. Briefly, in addition to a history of severe dementia, the Blessed Dementia Rating Scale [12] was used at enrollment to screen for previously unrecognized dementia via surrogate interviews. Patients were defined as having "suspected dementia" if they met any of the following 2 criteria: a Blessed Dementia Rating Scale score of 3 or higher, or a rating by the surrogate of 3 or higher out of 5 as "possibly having dementia." The definition of heavily sedation was determined by the Richmond Agitation Sedation Scale [13] scoring ranging from -3 to -5 . In addition, 8 of the 151 enrolled patients remained comatose throughout the investigation and were excluded from analysis. Therefore, a total of 143 patients were included in the final analysis. Exclusion criteria are outlined in the patient flow diagram (Fig. 1).

2.2. Baseline assessment

Before the beginning of the study, the questionnaires were pilot tested and research assistants were well trained and standardized in the interview procedure [11]. Each patient and their family members were interviewed, and the

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