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The implementation of a nonpharmacologic protocol to prevent intensive care delirium☆,☆☆

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ABSTRACT

Purpose: The purpose was to determine if the implementation of an evidence-based nonpharmacologic protocol reduced the percentage of time patients spent delirious in a medical intensive care unit (MICU) that already uses a sedation and mobility protocol.

Materials and methods: This was a prospective, pre-post quality improvement project of MICU patients conducted from September 2013 to April 2014. Evidence-based effective nonpharmacologic interventions with nursing education were bundled into the project protocol: music, opening/closing of blinds, reorientation/cognitive stimulation, and eye/ear care.

Results: Patients were evaluated between September 2013 and April 2014, with 230 and 253 patients being included in the each phase. There was a 50.6% reduction (16.1% vs 9.6%, $P < .001$) in time spent delirious in the MICU. Incidence of delirium developed was decreased (15.7% vs 9.4%, $P = .04$). The protocol reduced the odds of developing delirium by 57% (odds ratio, 0.43; $P = .005$) after controlling for age, Acute Physiology and Chronic Health Evaluation II, mechanical ventilation, and dementia.

Conclusions: The implementation of a nonpharmacologic delirium prevention protocol resulted in a significant decrease in the percentage of time spent delirious in the MICU while reducing the risk of delirium development. Additional studies with more rigorous study designs need to be completed to further the research of nonpharmacologic interventions with appropriate sedation and mobility protocols.

1. Introduction

Delirium in critically ill patients is common and is associated with many negative outcomes. The incidence of delirium is 32% according to a point-prevalence study that included 104 intensive care units (ICUs) from 11 countries. This rate increases to 80% in mechanically ventilated patients [1,2]. Delirium development in the ICU is associated with a 19% increase in 6-month mortality and up to a 15-day increase in hospitalization, and greater than 70% of patients experience residual cognitive impairment at 12 months post–ICU discharge [1,3,4]. In addition, the financial impact of delirium is estimated to be between $4 and $16 billion dollars annually, not accounting for indirect costs such as cognitive rehabilitation, lost work days, or caregiver burden [5]. In addition to the mortality and financial impact, duration of delirium is independently associated with development of long-term cognitive impairment [4]. Delirium is associated with an increase in hospital readmissions, memory dysfunction, concentration problems, and sleep disturbances in the postoperative population [6]. Because of the aforementioned negative effects, emphasis is being placed on the prevention and treatment of ICU delirium. The 2013 Pain, Agitation, and Delirium (PAD) guidelines provide guidance for both prevention and treatment of ICU delirium [2]. Although there is no strong evidence to support pharmacologic interventions to treat delirium, a greater emphasis is placed on effective prevention strategies.

There are 2 approaches to the prevention of ICU delirium: pharmacological and nonpharmacological interventions. The PAD guidelines address the role of both, providing a recommendation against pharmaceutical prophylaxis based on a low quality of evidence (−2C) [2]. Conversely, the same guidelines provide a strong recommendation based on a moderate quality of evidence (+1B) to support the use of a nonpharmacological protocol, specifically early mobilization, to reduce the incidence and duration of ICU delirium [2]. There are many additional nonpharmacologic strategies reported in the literature that show benefit in reducing the burden of delirium [7–21]. Early mobilization or physical therapy/occupational therapy, one of the most significant

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approaches for prevention, is often used as part of multi-interventional protocols, thus making it difficult to ascertain the exclusive benefit of nonmobilization strategies to reduce the effects of delirium [8,10,17–20]. The goal of the evaluation was to determine the impact of an evidence-based nonpharmacologic intervention bundle after delirium education in a medical intensive care unit (MICU) that already uses early mobilization.

2. Materials and methods

2.1. Patient population

This was a prospective, observational quality improvement (QI) project conducted at the University of Pittsburgh Medical Center, Presbyterian Hospital, a tertiary academic medical center consisting of more than 600 beds including 120 ICU beds. This evaluation was conducted in a 24-bed MICU with a nursing staff to patient ratio of 2:1 and a respiratory therapist to patient ratio of 8:1. Daily bedside multidisciplinary rounds comprised critical care physicians, clinical pharmacists, and critical care nurses. Additional standards of care include a sedation algorithm, mobilization protocol, and every 4-hour delirium screening using the Intensive Care Delirium Screening Checklist (ICDSC) which became standard practice greater than 2 years ago [22]. Nursing staff education regarding the use of the ICDSC and the screening of delirium was provided at this time.

The sedation algorithm stressed analgosedation favoring non–benzodiazepine-based sedation while targeting light sedation (Riker Sedation-Agitation Scale of 3 to 4). Patients were evaluated daily for the use of spontaneous breathing trials and daily awakenings. The implementation of this protocol resulted in a 77% decrease in benzodiazepine, a 31% reduction in fentanyl, a 26% reduction in propofol, and a 278% increase in dexmedetomidine use compared with prior practices (unpublished data). To further elaborate on the mobilization protocol, patients were evaluated for daily for inclusion during multidisciplinary rounds. If inclusion was met, patients were mobilized daily through the work of MICU dedicated physical therapist. Multidisciplinary team (MICU physician, Physical Medicine & Rehabilitation physician, physical therapy, and nursing) evaluations were conducted once weekly as a quality assurance measure. The protocol resulted in a significant increase in the number of patients getting out of bed during a 3-month assessment period (unpublished data).

Patients were included in this evaluation if they were admitted to the MICU during the specified period. Patients were excluded if any amount of time was spent in an ICU (internal or external) before MICU admission, had history cognitive impairment (ie, cerebral palsy, mental retardation, or stroke) documented, were admitted to the MICU before the first day of evaluation period, had MICU stay less than or equal to 24 hours, presented to the MICU delirious, or did not have a recorded ICDSC. Patients were not evaluated for the presence of metabolic encephalopathy. The primary outcome was a comparison of percentage of MICU length of stay spent in a delirious state between phases 1 and 2. Percentage of MICU length of stay spent delirious was calculated by the total hours of delirium experienced divided by total hours of MICU length of stay in delirious patients.

2.2. Data collection

This project was approved by the University of Pittsburgh Medical Center QI committee. Data were obtained through a review of the electronic health record. Patients were assessed on the day of admission and then followed until the time of transfer, discharge, or death, whichever came first. All data were collected in the same manner for the project's entirety.

2.3. Study design

2.3.1. Phase 1: baseline data collection before protocol implementation

Phase 1 consisted of a 3-month baseline assessment period, where all patients admitted to the MICU were assessed for the presence of predisposing risk factors for delirium [23,24]. Upon a patient's first positive delirium screening (ICDSC ≥4), each subsequent ICDSC was collected until transfer, discharge, or death. If the patient did not screen positive for delirium, no additional information was collected.

2.3.2. Development and implementation of nonpharmacologic protocol

A systematic literature search of EMBASE and MEDLINE was completed; the methods are described in detail elsewhere [25]. Twenty-seven unique nonpharmacological interventions were identified that displayed positive impact on delirium (Fig. 1). Of these, it was determined that 5 were within the unit's current standard of care, 4 were not feasible, and 9 were not appropriate for inclusion into the protocol but should be incorporated into the standards of care. This assessment was conducted by a multidisciplinary team consisting of physicians, pharmacists, and nurses. The remaining 9 interventions were combined into the protocol entitled "Give your patient M.O.R.E." The acronym can be defined as music, opening of blinds, reorientation and cognitive stimulation, and eye/ear protocols (Fig. 1).

A multifaceted nursing education approach using proven techniques was completed [26,27]. This included didactic lectures and visual handouts with a focus on case-based learning, bedside hands-on nursing education, a large poster prominently displayed within the MICU, and provision of an electronic copy of pertinent literature before the presentation. The educational focus was geared toward the screening, development, and consequences of delirium, as well as education about each unique intervention that was incorporated. One-on-one nursing education was conducted for 2 weeks; however, the handouts and posters remained available to nursing staff for the duration of the project (Appendix 1).A 2-week washout period followed the implementation of the protocol. This time period allowed for nurses to become familiar with the protocol and to include it in their daily practice.

2.3.3. Phase 2: post–protocol implementation evaluation

All patients admitted over the 3-month postimplementation phase were included if they met the previously outlined inclusion criteria. There was no additional education provided. At no point during the evaluation were nurses made aware of the data collection.

2.4. Statistical analysis

Data were managed through an online database, RedCap [28]. Descriptive statistics, Mann-Whitney U, and χ^2 tests were used to describe and compare the patient demographics between phase 1 and phase 2; a P value $< .05$ was considered significant. Statistical analysis was completed with SPSS [29]. A sample of 60 delirious patients was needed to detect 20% reduction significant at $\alpha = .05$ and power $= 0.8$. A Student t test was used to evaluate the primary outcome. These data were log transformed to meet the assumptions of a parametric test. Secondary end points included time to development of delirium, days coma and delirium free, and ICU length of stay. These end points were evaluated with the Mann-Whitney U test. Normally distributed data are reported as mean $\pm$ SD, and nonnormally distributed data are reported as median (interquartile range). Predictors of delirium were assessed through logistic regression Predictive risk factors with a P value $\leq .1$ in univariate analysis were included in a multivariate logistic regression model with a P value $< .05$ being considered statistically significant.

3. Results

A total of 729 patients were evaluated with 230 and 253 meeting inclusion criteria in phase 1 and phase 2, respectively (Fig. 2). The median