



Contents lists available at ScienceDirect

Australian Critical Care

journal homepage: www.elsevier.com/locate/aucc

Review Paper

Effect of organisational factors on the variation in incidence of delirium in intensive care unit patients: A systematic review and meta-regression analysis

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ARTICLE INFORMATION

Article history:

Received 21 June 2017

Received in revised form

5 January 2018

Accepted 1 February 2018

Keywords:

Delirium
 Critical care
 Incidence
 Organisational factors
 Systematic review
 Meta-analysis

ABSTRACT

Background: Delirium occurs frequently in intensive care unit (ICU) patients and is associated with numerous deleterious outcomes. There is a large variation in reported delirium occurrence rates, ranging from 4% to 89%. Apart from patient and treatment-related factors, organisational factors could influence delirium incidence, but this is currently unknown.

Objective: To systematically review delirium incidence and determine whether or not organisational factors may contribute to the observed delirium incidence in adult ICU patients.

Methods: Systematic review of prospective cohort studies reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement. Included articles were independently assessed by two researchers. Quality of the articles was determined using the Strengthening of Reporting of Observational Studies in Epidemiology checklist. Subsequently, apart from patient characteristics, a meta-regression analysis was performed on available organisational factors, including hospital type, screening method and screening frequency.

Data Sources: PubMed, Embase, CINAHL, and Cochrane Library databases were searched from inception to 27 January 2017, without language limitation.

Results: A total of 9357 articles were found, of which 19 articles met the inclusion criteria and were considered as true delirium incidence studies. The articles were of good methodological quality (median [interquartile range] 32/38 [30–35] points), published between 2005 and 2016, originated from 17 countries. A total of 9867 ICU patients were included. The incidence rate of delirium varied between 4% and 55%, with a mean \pm standard deviation of $29 \pm 14\%$. Data relating to three organisational factors were included in the studies, but they were not significantly associated with the reported delirium incidence: hospital type (p 0.48), assessment methods (p 0.41), and screening frequency (p 0.28).

Conclusions: The mean incidence of delirium in the ICU was 29%. The organisational factors found including methods of delirium assessment, screening frequency, and hospital type were not related to the reported ICU delirium incidence.

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<https://doi.org/10.1016/j.aucc.2018.02.002>

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1. Introduction

Delirium is a serious problem in the intensive care unit (ICU), as it is associated with numerous short-term adverse events such as

increased duration of mechanical ventilation¹ and length of stay.^{2–4} Also, delirium is associated with long-term adverse effects such as persistent cognitive decline^{5,6} and increased 6-month mortality.⁷ Delirium occurs frequently in the ICU; a recent meta-analysis found that delirium occurs in approximately one-third of ICU patients,⁸ but a large variation is reported. Depending whether incidence, defined as a new onset of delirium after ICU admission, or prevalence, which also includes patients who were already delirious before ICU admission, is estimated,⁹ occurrence rates vary between 4% and 89%.^{10,11} The reason for this large variability is currently not fully understood.

From a research perspective, the collection of implementation data is essential for program evaluations,¹² and multilevel causal factors are described to impact implementation outcomes, such as patient, provider, and organisational factors.¹³ First, several patient-related risk factors are clearly associated with the development of delirium, such as respiratory failure, a history of cognitive impairments, and urgent ICU admission.^{14–17} Although patient-related risk factors account for a considerable part of the variability, they do not explain all of it.^{8,18–24} Second, delirium incidence is also influenced by the provider through the ICU treatment. The current international delirium guideline emphasises that timely management of the cause is essential to reduce the delirium incidence, severity, and duration. Also aspects of care such as sedation management and early mobilisation are considered to influence the development of delirium. Third, organisational factors may contribute to delirium. These include the selection of the screening method (currently either the Confusion Assessment Method for the Intensive Care Unit [CAM-ICU] or the Intensive Care Delirium Screening Checklist [ICDSC] are recommended, of which the performance is limited,^{25,26} even when performed by experts²⁷), daily screening frequency (as delirium may not be detected if screening frequency is too low because of its fluctuating course during the day), and hospital type (as variations in different types of hospitals may account for differences). Also, strategies used for education of staff and screening compliance as the measured delirium incidence may differ because of to fluctuating course of delirium and the adequate recognition of delirium symptoms.

Recent reviews have provided insight into patient- and provider-related risk factors,^{8,15,28,29} but did not address organisational factors. As there is empirical support that the level of implementation may affect the outcome in prevention programs,¹² we feel that these should be clarified so they can be incorporated when collecting and analysing data. As the incidence of delirium can be influenced by ICU treatment, it is important to discern incidence from prevalence figures. Subsequently, the association of organisational factors with ICU delirium incidence needs to be clarified.

Therefore, the aim of our study was to systematically review delirium incidence and determine whether or not organisational factors may contribute to the observed delirium incidence in adult ICU patients.

2. Material and methods

A systematic review and meta-regression analysis was performed, according to the Cochrane Handbook for systematic reviews³⁰ and reported according to the steps of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement.³¹ The selection of articles, data extraction, and methodological quality assessment were performed independently by two reviewers (PR and MvdB). Included articles were assessed for methodological quality using the “Strengthening of Reporting of Observational Studies in Epidemiology” (STROBE) statement.³²

2.1. Eligibility criteria

Prospective cohort studies were included in which the ICU delirium incidence was determined in adult medical, surgical, or mixed ICU patients (18 years or older). Delirium incidence was defined as a new onset of delirium during ICU admission without delirium before ICU admission, diagnosed by a positive delirium screening using a validated screening tool or as a reported medical diagnosis. Articles were excluded when only delirium prevalence (i.e. delirium before ICU admission was not an exclusion criterion) was reported, when the focus was on other ICU subpopulations, or if no full-text article was available. To ensure the quality of reported delirium incidence rates, only prospective cohort studies designed to study delirium incidence were included.

2.2. Search

A systematic literature search was conducted in PubMed, Embase, CINAHL and Cochrane Library databases. References of included articles were searched for additional relevant articles. Databases were searched through combining “Delirium,” “Intensive Care Unit,” and “Incidence”, as well as relevant synonyms. The complete strategy is provided in an online supplemental. Languages were not limited during the search. Articles published from database inception until January 27th, 2017, were included. Data management was performed using Endnote X8 (Thomson Reuters).

2.3. Study selection

Eligibility of articles was independently assessed by screening title and abstract by two researchers (PR and MB) using the inclusion criteria. Eligible articles were obtained in full-text by the first author; if not possible, we planned to contact the authors of the article. Articles that were irretrievable would have been excluded from further analysis. Both turned out not to be necessary, as all articles could be obtained. After independent full-text assessment of the eligible articles, discrepancies were discussed. In case of disagreement, a third researcher (HV) was asked to make a final judgement.

2.4. Methodological quality

The selected articles were screened for methodological quality using the “STROBE statement”.³² Because an index test was not found in most of the reviewed articles, this tool was deemed most suitable for critical quality appraisal of the included articles. It allowed for structured and transparent assessment of bias and applicability of primary diagnostic accuracy articles. Each domain was assessed in terms of risk of bias, and a rating per item was given (2 = present, 1 = partially present, 0 = not present, NA. = not applicable). Afterwards sum scores were calculated. A maximum score of 38 points could be obtained. The lower limit for inclusion in the review was set at 70% of achievable points.

2.5. Data collection

Data extraction was performed by the primary researcher (PR) using a standardised data extraction form containing patients characteristics and treatment and organisational factors. For treatment factors, we aimed to gather data on delirium treatment algorithms, as well as analgesia, sedative, and sleep enhancement strategies.^{19,33} For organisational factors, articles were searched for factors regarding country and continent, hospital type, implementation strategies, staff knowledge, motivation, and screening compliance.^{34,35}

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