Geriatric Nursing xx (2017) 1–6

Contents lists available at ScienceDirect

Geriatric Nursing

journal homepage: www.gnjournal.com

Feature Article

Predicting inpatient delirium: The AWOL delirium risk-stratification score in clinical practice

Ethan G. Brown, MD [a,*], S. Andrew Josephson, MD [a], Noriko Anderson, MD [b], Mary Reid, BSN, RN, NE-BC [a], Melissa Lee, RN, MS, CNS-BC [a], Vanja C. Douglas, MD [a,**]

[a] Department of Neurology, University of California, San Francisco, USA
[b] Department of Neurology, University of California, Irvine, USA

ARTICLE INFO

Article history:
Received 13 January 2017
Received in revised form
8 April 2017
Accepted 17 April 2017
Available online xxx

Keywords:
Delirium
Hospitalization
Clinical prediction rule

ABSTRACT

Inpatient delirium improves with multicomponent interventions by hospital staff, though the resources needed are often limited. Risk-stratification to predict delirium is a useful first step to help triage resources, but the performance of risk-stratification as part of a functioning multicomponent pathway has not been assessed. We retrospectively studied the performance of a validated delirium prediction rule, the AWOL score, as a part of a multicomponent delirium care pathway in practice on a university hospital ward. We reviewed the hospitalizations of patients 50 years or older for evidence of delirium and extracted the AWOL score from nursing documentation ($n = 347$). The area under the receiver operating characteristic curve (AUC) was 0.83 (95% CI 0.77–0.89) for all cases and 0.73 (95% CI 0.60–0.85) when cases of prevalent delirium were removed. Involving minimal additional assessment, this nursing-based risk stratification score performed well as part of a multicomponent delirium care pathway.

Introduction

Accurate and efficient delirium risk prediction is an important step of any multicomponent approach to treating delirium in the hospital. The high frequency of delirium as a complication of inpatient hospitalization, as high as 30% of some inpatient medical wards, is well known, as are the detrimental effects on length of stay, disposition, and long-term mortality.[1] Multicomponent intervention, using such strategies to improve sleep, encourage mobility, and frequently reorient patients, has been shown to decrease the rate of delirium and many of these clinical complications.[2,3] Some of these strategies could be applied to all patients to minimize delirium risk. On the other hand, multidisciplinary intervention, such as early evaluation by occupational and physical therapy or detailed pharmacy medication review, requires services and attention that cannot realistically be applied to every patient. Reliable risk stratification allows strategic allocation of these resources.

Several delirium risk stratification tools exist. One of the earliest incorporated vision impairment, illness severity, cognitive impairment measured by the mini-mental state examination, and high blood urea nitrogen to creatinine ratio.[4] Other tools include such factors as age, functional status, depression as measured by the geriatric depression scale, serum albumin and pre-operative electrolytes, history of stroke, American Society of Anesthesiology class, and type of surgery.[5–9] However, these prediction tools are difficult to implement systematically because they rely on time-intensive assessments, such as the mini-mental state examination, that are difficult to apply to every admission. In addition, risk prediction tools developed for specific populations, such as acute stroke,[10] are difficult to implement because identification of the correct population in which to apply the tool throughout a hospital system is a challenge.

The AWOL score is a delirium prediction rule that is easy to administer, was designed to be used by nurses in routine practice, and includes a brief cognitive screen.[11] The score gives one point each for Age over 80, inability to spell World backwards, disOrientation, and moderate to severe level of iLlness based on subjective nursing rating. The score was derived in a cohort of medical and neurological inpatients age 50 and older.[11] It was validated prospectively in a cohort at separate hospital (area under the receiver operating characteristic curve (AUC) 0.69), and has since

Funding source: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.
Conflicts of interest: None.

* Corresponding author. University of California, San Francisco, 1635 Divisadero Street, Suite 520, Box #1838, San Francisco, CA 94115, USA. Fax: +1 (888) 309 8891.
** Corresponding author.
E-mail addresses: ethan.brown@ucsf.edu (E.G. Brown), vanja.douglas@ucsf.edu (V.C. Douglas).

0197-4572/$ – see front matter © 2017 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.gerinurse.2017.04.006

been externally validated and found comparable to other delirium risk scores (AUC 0.74).[12]

While this suggests AWOL may be a useful risk-stratification tool, the data for these validation studies was collected by research staff. It is not known how AWOL performs once incorporated into routine hospital work-flow, when the score is assessed and calculated by bedside nurses. Practice-based research is of particular importance in decision rules designed for clinical use,[13] since the practice-based setting may unmask issues not apparent in the research setting.

We therefore reviewed the performance of the AWOL score since becoming part of clinical practice at our medical center. In November of 2013, we integrated the AWOL risk prediction score into a delirium care pathway implemented on a ward of our university hospital, in which nurses were asked to calculate the score for every new admission. The ward includes neurology, neurosurgery, and medical inpatients. As part of a larger retrospective cohort study assessing the efficacy of the delirium care pathway, here we report the performance of the AWOL score in predicting delirium in clinical practice.

Methods

Study design

We conducted a retrospective cohort study investigating the efficacy of the AWOL delirium prediction score in day-to-day clinical practice as part of a comprehensive delirium care pathway employed in a university medical center beginning in November 2013. This study's cohort was derived from a larger retrospective cohort study examining delirium outcomes before and after implementation of the care pathway.

Risk stratification and delirium care pathway

The delirium care pathway involved nursing staff calculating an AWOL score at admission to the floor for any patient over 50 years old. This age cut-off was chosen because delirium can affect younger patients and the AWOL score was designed to stratify delirium risk in patients age 50 and older. A patient was considered disoriented if he or she could not answer state, county, city, hospital, and floor correctly. Illness severity was classified by the admitting nurse as not ill, mildly ill, moderately ill, severely ill, or moribund. The elements of the score were entered into the electronic medical record and the total automatically calculated. Patients who scored 2 or higher were deemed high risk for delirium, and a multicomponent non-pharmacologic delirium prevention care plan was started.[2] In addition all patients, regardless of AWOL score, were screened for delirium every nursing shift using the Confusion Assessment Method (CAM).[14] If a patient screened positive for delirium, the primary team and pharmacists were notified, the non-pharmacologic delirium care plan was continued or started, and often Neurology was involved as a consult.

Study population and setting

Patients were eligible for inclusion if they were age 50 or older and admitted to the neurosciences unit at the University of California San Francisco Medical Center between April 1st, 2014 and March 31st, 2015. The time frame was selected because it represented a year of admissions beginning 6 months after implementation of the delirium care pathway, to allow for nurse education and training. The neurosciences unit was selected because the unit's nursing leadership identified delirious patients as a population that needed a more comprehensive and standardized care pathway. The majority of patients admitted to this unit are neurology and neurosurgical patients, although approximately 25% are on general medicine or other services as well (Table 1). From this population of 2909 patients, we randomly selected 800 hospital admissions for chart review using the "rand" function in Microsoft Excel 2010 version 2.0. Of these, all patients with an AWOL score recorded were included.

Data collection and outcome assessment

Charts were reviewed through the electronic medical record by one investigator (EB). Using a previously validated method with a reported sensitivity of 74% and specificity of 83%,[15] all inpatient notes were reviewed for any evidence of delirium, defined as development of an acute confusional state, including but not limited to mental status change, inattention, disorientation, hallucinations, agitation, or inappropriate behavior. The senior investigator (VD) adjudicated cases where the diagnosis of delirium was uncertain, and reviewed a random selection of 10 charts to establish interrater reliability. Agreement on delirium diagnosis was 100%.

Delirium, when present, was classified as either 'prevalent' or 'incident.' Prevalent delirium was defined as delirium that was present upon admission to the inpatient ward. Incident delirium was defined as delirium developing after admission to the inpatient ward. Since nurses calculated an AWOL score for every patient upon admission or transfer regardless of delirium status, we were able to determine how the tool predicted delirium in patients who were not yet delirious (incident delirium) and how it diagnosed delirium

Table 1
Subject demographics.

	All subjects with an AWOL score ($n = 347$)	All subjects without an AWOL score ($n = 448$)	p-value
Age, median years (IQR)	65 (58–74)	66 (58.5–75.5)	0.17
Female, No. (%)	175 (50.4)	229 (51.1)	0.85
Charlson comorbidity score, median (IQR)	4 (2–5)	4 (2–5)	0.63
Cognitive impairment prior to admission, No. (%)	47 (13.5)	79 (17.6)	0.11
Primary hospital service, No. (%)			0.42
Neurology	89 (25.5)	100 (22.3)	
Neurosurgery	170 (49.0)	226 (50.5)	
Hospital medicine	59 (16.9)	87 (19.4)	
Other	29 (8.36)	35 (7.8)	
Illness severity, No. (%)			
Not ill	28 (8.07)		
Mildly ill	208 (59.9)		
Moderately ill	99 (28.5)		
Severely ill	12 (3.5)		
Moribund	0		