

World Delirium Awareness Day 2019, delirium and risk of falls in the hospital setting.

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Abstract

Background Delirium is an acute change in cognition, common among older hospitalized patients, however, patients of all ages are at risk of delirium during a hospital stay. The International Federation of Delirium Societies promotes, each year, a World Delirium Awareness Day, to raise the awareness of, not just recognizing delirium in the hospital setting, but ensuring interventions are in place to prevent the development of delirium. Hospitalized patients with delirium have increased risk of adverse events such as falls, pressure injury, malnutrition, increased length of stay, increased health care costs, and mortality. This clinical audit aimed to estimate the risk of a subsequent fall, following an acute episode of in-hospital delirium, across a broad cross-sectional of clinical settings.

Methods Seventeen adult acute inpatient wards across the South Western Sydney, Local Health District, undertook an audit of the number of admitted patients who had had at least one episode of delirium since being admitted to hospital. Using the hospital-based incident management reporting system, the rates of subsequent falls was compared between delirium and non-delirium patients.

Results Fifty of the 473 patients (11.4%) were identified by the nursing staff to have had at least one episode of delirium since admission. The proportion of fallers among the delirium and non-delirium patients were 10% and 2%, respectively ($p = 0.004$). The rate of falls per 1000 patient days was 6.45 (95% confidence interval (CI) 2.1 to 15.1) among delirium patients, compared to 2.12 (95% CI 1.0 to 4.0) among patients without delirium. The risk of falling among delirium patients was 4.25 higher compared to non-delirium patients (adjusted hazard ratio (HR) = 4.25, 95% CI 1.26 to 14.39).

Conclusion This clinical audit has been able to show that an acute episode of delirium increases the risk of an in-hospital fall fourfold. Importantly, these results have highlighted the need for a hospital wide approach, to not just in identifying delirium, but the need to have interventions in place to reduce the risk of delirium. In other words, delirium prevention should be 'core business' of all nursing care, across the acute hospital setting.

Introduction

Delirium is an acute change in cognition, common among older hospitalized patients (Inouye et al., 2014), however, patients of all ages are at risk of delirium (Australian Commission on Safety and Quality in Health Care, 2016, Inouye, 1999, Siddiqi et al., 2006). Unfortunately, delirium is often not recognized, and therefore poorly treated in the hospital setting (Collins et al., 2010, Han et al., 2009, Iseli et al., 2007). For this reason, the *International Federation of Delirium Societies* promotes, each year, a *World Delirium Awareness Day*, to raise the awareness of, not just recognizing delirium in the hospital setting, but ensuring interventions are in place to prevent the development of delirium.

Hospitalized patients with delirium have increased risk of adverse events such as falls, pressure injury, malnutrition, increased length of stay, increased health care costs, and mortality (Australian Commission on Safety and Quality in Health Care, 2016, Inouye et al., 2014, Agency for Clinical Innovation Aged Care

Health Network, 2015). Falls have been described as one of the most commonly reported adverse events among the elderly admitted to hospital. In particular, falls in the acute hospital setting can result in serious injuries, prolong hospital stay, and can be associated with unexpected death (Cameron et al., 2012, Coussement et al., 2008, Szymaniak, 2015). Approximately 2–12% of patients fall during a hospital stay (Coussement et al., 2008), with this rate increasing with age, and has been reported to be as high as 46% among patients cared for in stroke rehabilitation units (Rensink et al., 2009). However, consistent strong evidence for the benefit of many interventions currently used in the hospital setting, to prevent falls, has not been found when systematically reviewed by experts in this area – in fact, it was concluded a “multifactorial intervention *may* reduce the risk of falls” in the acute hospital setting (Cameron et al., 2018, Cameron et al., 2012). Considering that most modern acute hospitals actively attempt to identify patients at the greatest risk of falls, and institute a number of interventions to prevent a fall, the conclusion reached by the Cochrane Review (quoted above) is quite sobering, and may indicate that only marginal gains may be obtained by implementation of further interventions to reduce falls in the acute hospital setting. It is for this reason, that we became interested in widening the scope of falls prevention when discovering the relationship between an episode of delirium in the hospital setting and a subsequent fall has been previously described (Babine et al., 2016, Lakatos et al., 2009, Sillner et al., 2019). However, previous work in this area was limited to retrospective review of the clinical notes of in-hospital fallers, finding documented evidence of delirium prior to a fall, or some prospective studies of elderly patients in the hospital setting, among which an association between delirium and falls was observed (Basic and Hartwell, 2015, Mazur et al., 2016, Stenvall et al., 2007). No studies to date have explored the relationship between an acute episode of delirium and subsequent falls risk across a broad cross-sectional of clinical settings, not just among elderly hospitalized patients. For this reason, this clinical audit was specifically aimed at estimating the risk of subsequent fall, following an acute episode of in-hospital delirium, across a broad cross-sectional of clinical settings.

Methods

As part of the *World Delirium Awareness Day (WDAD) 2019* (March 13th), seventeen adult acute inpatient wards across the South Western Sydney, Local Health District, undertook an audit of the number of admitted patients who had had at least one episode of delirium since being admitted to hospital. Patients from these seventeen wards were then followed until discharge or an incident fall. This project is part of an ongoing program of nursing-led investigation, across our local health district, concentrating on *Frailty, Falls, Fracture and Delirium* (The *Triple-FD* program).

Subject and setting

The South Western Sydney Local Health District provides public hospital care for approximately a million residents, with five acute care hospitals, with approximately 230,000 separations each year. The seventeen wards [no. of wards] included in our clinical audit, offer adult acute inpatient care in the following clinical areas: (1) Aged care [3]; (2) Medical [3]; (3) Surgical [7]; Mixed medical/surgical [2]; and, (4) Rehabilitation [2]. All inpatients of these seventeen wards on the morning of WDAD (Wednesday,

March 13th, 2019) were included in the audit. Inpatients on the 13th of March, 2019 across the seventeen wards were followed-up for one of the following events: (1) an incident fall; (2) discharge without fall; or, until the 30th of April, 2019, without falling or being discharged from hospital.

Identification of delirium

All acute hospitals across our local health district use the *Confusion Assessment Method* (CAM) to identify acute episodes of delirium among any patient who appears to be disorientated or confused, or who has any change in behaviour, or level of consciousness (Inouye et al., 1990). The CAM is based on four main area of assessment: (1) *acute onset and fluctuating course* (Is there evidence of an acute change in mental status from baseline? If so, did the abnormal behaviour fluctuate during the day?); (2) *Inattention* (did the patient have difficulty focussing attention during the interview?); (3) *Disorganised thinking* (was the patient's thinking disorganised?); and, (4) *Altered level of consciousness* (overall, how would you rate the patient's level of consciousness?) (Inouye et al., 1990).

Identification of falls

Reporting of in-hospital falls (regardless of injury) is mandatory for all clinical staff, and are entered into a dedicated *Incident Information Management System (IIMS)* (Health, 2014) as part of routine documentation. All in-hospital falls up until April 30th, among clinical audit participants were included.

Ethical considerations

Using our state-wide guide on assessing ethical risk (Health, 2018), and due to the nature of this clinical audit using routinely collected data, that constitutes usual patient care and documentation, ethical review was considered to be unwarranted for the purposes of publication of the results of this clinical audit.

Statistical methods

Characteristics of patients included in the clinical audit are presented as descriptive statistics, based on delirium status. Rates of delirium and incident falls during follow-up, based on type of ward and delirium status, were calculated per 1000 patient days, and 95% confidence intervals were also calculated, comparison of groups was undertaken using Poisson regression (Breslow and Day, 1980). The risk (presented as hazard ratios (HR), and 95% confidence intervals) of an incident fall during follow-up and at least one episode of acute delirium since admission was estimated using Cox's proportional hazards models (Cox, 1972). Verification of the proportional hazards assumption of the Cox models was based on a visual inspection of smoothed Schoenfeld residual plots (Schoenfeld, 1982). All analyses were performed using the R language for statistical computing (R Core Team, 2017).

Results

The characteristics of the 437 patients included in the WDAD 2019 (March 13th) clinical audit of the incidence of delirium since admission are presented in **Table 1**. Fifty of the 473 patients (11.4%) were identified by the nursing staff to have had at least one episode of delirium since admission. The age of

patients ranged from 17 to 101 years, patients with delirium were older (82 years versus 70 years, $p < 0.001$), and more likely to be female (14% versus 9%, $p = 0.076$). The highest rates of delirium were reported in the Aged Care setting (32%), and lowest rates were reported in the mixed medical/surgical wards. Fourteen incident falls were reported, up until the 30th of April 2019, the median time of follow-up was 6 days (IQR 1-16), and the proportion of fallers among the delirium and non-delirium patients were 10% and 2%, respectively ($p = 0.004$). The rate of falls per 1000 patient days was 6.45 (95% CI 2.1 to 15.1) among delirium patients, compared to 2.12 (95% CI 1.0 to 4.0) among patients without delirium ($p = 0.046$). Overall 4 deaths were reported among the 437 patients (3 versus 1, $p = 0.310$, delirium and non-delirium patients, respectively).

The rates (per 1000 acute bed days) of delirium and incident falls based on type of ward are presented in **Table 2**. For example, the highest rate of delirium, per 1000 acute bed days, was observed in the aged care setting, 13.9 (95% CI 8.0 to 22.6), and the lowest rate in the mixed medical/surgical wards, 2.5 (95% CI 0.1 to 13.6.9). The highest rate of fall, per 1000 acute bed days of follow-up was observed in the mixed medical/surgical wards, 4.9 (95% CI 0.6 to 17.7), and the lowest fall rate in the aged care setting, 1.7 (95% CI 0.2, 6.3).

Kaplan-Meier plots of the cumulative risk of falling, based on delirium status are presented in **Figure 1**. Both crude and adjusted (adjusted for sex, age, and ward type) risk of falling during follow-up among delirium patients compared to non-delirium patients are presented in **Table 3**. The risk of falling among delirium patients was 4.25 higher compared to non-delirium patients (HR = 4.25, 95% CI 1.26 to 14.39), after adjusting for sex, age and ward type. The c -statistic (concordance) for the delirium only and adjusted model were 0.622 and 0.729, respectively.

Discussion

This clinical audit of adult patients admitted to a diverse group of hospitals wards across a local health district, has been able to show that an acute episode of delirium increases the risk, fourfold, of an in-hospital fall. Importantly, this observed increased risk of falling in the hospital setting, highlights the need for a hospital wide approach, to not just in identifying delirium, but the need to have interventions in place to reduce the risk of delirium, in an attempt to reduce associated adverse events such as a fall.

The findings of this clinical audit confirm the results of a number of observational studies (Sillner et al., 2019), and delirium prevention trials, that not only had shown an increased risk of falls among hospitalised patients with delirium, but a reduced risk of falling among delirium prevention intervention groups when compared to usual care (Hshieh et al., 2015a). Earlier work in this area had highlighted an association between falling and delirium in the hospital setting, but was limited to retrospective review of the clinical notes of patients who had fallen (Babine et al., 2016, Lakatos et al., 2009), or prospective observation of elderly patients cared for in the aged care setting. Importantly, this clinical audit has included a broad cross-sectional of adult acute inpatients and shown a strong relationship between an acute episode of delirium and risk of a subsequent fall.

The results of this clinical audit need to be considered in the context of some potential limitations. Firstly, the identification of delirium in the hospital setting is often subject to some error. However, the majority of this error is related to false negatives (sensitivity of 0.81) when the CAM had been compared to a more exhaustive assessment of delirium using the Diagnostic and Statistical Manual of Mental Disorders (DSM IV) (Shi et al., 2013). Importantly, false positives rates have been estimated to be low (1%) when also compared to DSM IV (Shi et al., 2013). The consequences of this would be that across the wards which were included in our clinical audit, delirium rates may be under estimated, and using the method suggested by Kelsey (Kelsey et al., 1986) (using the above estimates of sensitivity and specificity of 0.81 and 0.99, respectively), the overall observed rate of 11.4% would increase to approximately 13%. There is no suggestion that the misclassification of delirium would be related to subsequent fall status, and therefore this error would be considered non-differential in nature, among fallers and non-fallers. In other words, we expect our estimates of the risk for falls related to delirium status would not have been biased by the under recognition of delirium, due to the equality of error (non-differential error) in the recognition of delirium between patients subsequently falling and those who did not fall. However, there may also be some under-reporting of falls, and in a similar manner we expect this to be non-differential in nature between delirium and non-delirium patients.

A strength of this clinical audit is that we have been able to include a diverse cross-section of hospitalised patients receiving, aged care, surgical, medical and rehabilitation, representing the diverse population of patients that are at risk of experiencing an acute episode of delirium in the hospital setting. Therefore, we propose that our results highlight the need to ensure delirium prevention should be '*core business*' of all nursing care across the hospital, not just in the aged care setting. As, an increasing body of evidence supports the benefits of non-pharmacological, multicomponent nurse-led interventions to reduce the incidence, severity and duration of delirium among adults cared for in the acute hospital setting (Hshieh et al., 2015b, Kang et al., 2018, Inouye et al., 2014).

The clinical implications of recognising the importance of delirium prevention in the hospital setting, in an attempt to improve the quality and safety of all patients, is not a novel by any means (Australian Commission on Safety and Quality in Health Care, 2016). However, highlighting to all nursing staff across the hospital the importance of delirium prevention, not just in the aged care setting, but among medical and surgical specialties will ensure that good quality and safe care of patients at risk delirium and falls, can be guaranteed, irrespective of the wards setting of care.

Conclusion

This clinical audit has been able to show that an acute episode of delirium increases the risk of an in-hospital fall fourfold. Importantly, these results have highlighted the need for a hospital wide approach, to not just in identifying delirium in the hospital setting, but the need to have interventions in place to reduce the risk of delirium, in an attempt to reduce the risk of associated adverse events such as a fall. In other words, delirium prevention should be '*core business*', of all nursing care across the acute hospital setting.

Declarations

Ethics approval and consent to participate

Using our state-wide guide on assessing ethical risk (Health, 2018), and due to the nature of this clinical audit using routinely collected data, that constitutes usual patient care and documentation, ethical review was considered to be unwarranted for the purposes of publication of the results of this clinical audit.

Consent for publication

This clinical audit was instigated by our local health district's Falls committee and senior aged care nursing staff.

Competing interests

None of the authors have competing interests to declare.

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Nil was obtained to conduct this project.

Authors' contributions

All authors played a role in the planning and conduct of the study. RS, BW and SF drafted the MA, and all authors read and approved the final manuscript.

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Tables

Table 1. Characteristics of patients included in the World Delirium Awareness Day audit of Delirium since admission.

	Delirium		Combined (N = 437)	p-value
	Yes (n = 50)	No (n = 387)		
Age (years), mean (SD)	82 (8)	70 (18)	71 (18), range 17-101	< 0.001
Female, n (%)	33 (66)	204 (53)	237 (54)	0.076
Ward type [no. of wards], n (%)				
Acute care [3]	16 (32)	59 (15)	75 (17)	0.004
Medical [3]	5 (10)	70 (18)	75 (17)	
Surgical [7]	24 (48)	163 (42)	187 (43)	
Intensive care [2]	4 (8)	34 (9)	38 (9)	
Rehabilitation [2]	1 (2)	61 (16)	62 (14)	
Duration (days), median (IQR)	12 (5-21)	6 (1-14)	6 (1-16)	0.009
Female, n (%)	5 (10)	9 (2)	14 (3)	0.004
Rate per 1000, days (95% CI)	6.45 (2.1 - 15.1)	2.12 (1.0 - 4.0)	2.80 (1.5 - 4.7)	0.046
In-hospital death, n (%)	1 (3)	3 (1)	4 (1)	0.310

Table 2. Incidence rates (per 1000 acute bed days) of delirium and falls, based on ward type.

Ward type [no. of pts]	Delirium		Falls	
	n, rate (95%CI)	p-value ¹	n, rate (95%CI)	p-value ¹
Aged care [75]	16, 13.9 (8.0, 22.6)	0.104	2, 1.7 (0.2, 6.3)	0.897
Medical [75]	5, 6.6 (2.1, 15.4)		2, 2.7 (0.3, 9.6)	
Surgical [187]	24, 11.7 (7.5, 17.4)		6, 2.9 (1.1, 6.4)	
Rehab [38]	4, 6.0 (1.6, 15.5)		2, 3.0 (0.4, 10.9)	
Mixed [62]	1, 2.44 (0.1, 13.6)		2, 4.9 (0.6, 17.7)	

¹ p-values from Likelihood Ratio-tests from Poisson regression models of rates, using the lowest rate ward type as the reference group.

Table 3. Risk of in-hospital fall based on delirium status.

	<i>Hazard Ratio (95% CI)</i>			
	<i>Crude</i>	<i>p-value</i>	<i>Adjusted</i>	<i>p-value</i>
Delirium	3.18 (1.06 - 9.51)	0.039	4.25 (1.26 - 14.39)	0.020
Male (versus female)	1.50 (0.52 - 4.33)	0.452	1.57 (0.53 - 4.68)	0.418
Age (10-years increase)	0.99 (0.71 - 1.38)	0.952	0.96 (0.66 - 1.40)	0.836
Ward type				
Aged care	1.0 (ref)			
Medical	1.48 (0.21 - 10.6)	0.693	1.96 (0.25 - 15.4)	0.521
Surgical	1.58 (0.32 - 7.8)	0.578	1.67 (0.33 - 8.5)	0.538
Rehab	1.60 (0.22 - 11.4)	0.641	2.05 (0.27 - 15.5)	0.488
Mixed	2.31 (0.32 - 16.7)	0.406	3.66 (0.46 - 29.2)	0.221

Delirium alone concordance (c-statistic) = 0.622, adjusted model concordance = 0.729.

Figures

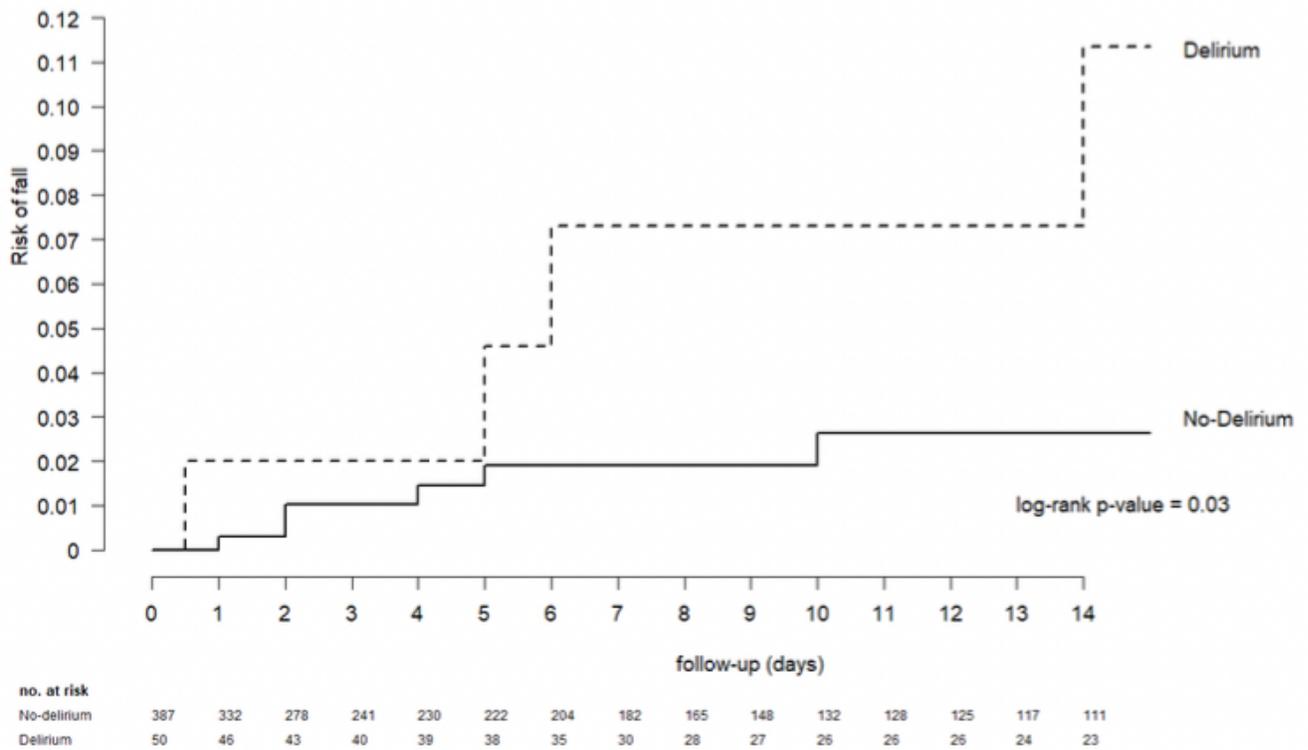


Figure 1

Kaplan-Meier plot of the risk of fall based on delirium status.