

Gaps in patient care practices to prevent hospital-acquired delirium

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ABSTRACT

OBJECTIVE To evaluate the current patient care practices that address the predisposing and precipitating factors contributing to the prevention of hospital-acquired delirium in the elderly.

DESIGN Prospective cohort (observational) study.

PARTICIPANTS Patients 65 years of age and older who were admitted to medical teaching units at the University of Alberta Hospital in Edmonton over a period of 7 months and who were at risk of delirium.

SETTING Medical teaching units at the University of Alberta.

MAIN OUTCOME MEASURES Demographic data and information on predisposing factors for hospital-acquired delirium were obtained for all patients. Documented clinical practices that likely prevent common precipitants of delirium were also recorded.

RESULTS Of the 132 patients enrolled, 20 (15.2%) developed hospital-acquired delirium. At the time of admission several predisposing factors were not documented (eg, possible cognitive impairment 16 [12%], visual impairment 52 [39.4%], and functional status of activities of daily living 99 [75.0%]). Recorded precipitating factors included catheter use, screening for dehydration, and medications. Catheters were used in 35 (26.5%) patients, and fluid intake-and-output charting assessed dehydration in 57 (43.2%) patients. At the time of admission there was no documentation of hearing status in 69 (52.3%) patients and aspiration risk in 104 (78.8%) patients. After admission, reorientation measures were documented in only 16 (12.1%) patients. Although all patients had brief mental status evaluations performed once daily, this was not noted to occur twice daily (which would provide important information about fluctuation of mental status) and there was no formal attention span testing. In this study, hospital-acquired delirium was also associated with increased mortality ($P < .004$), increased length of stay ($P < .007$), and increased institutionalization ($P < .027$).

CONCLUSION Gaps were noted in patient care practices that might contribute to hospital-acquired delirium and also in measures to identify the development of delirium at an earlier stage. Effort should be made to educate health professionals to identify the predisposing and precipitating factors, and to screen for delirium. This might improve the prevention of delirium.

EDITOR'S KEY POINTS

- The rate of hospital-acquired delirium is a quality indicator of hospital care of frail older adults.
- The goal of this study was to identify the current practices in the prevention of hospital-acquired delirium of the elderly in a large university hospital setting.
- Prevention of hospital-acquired delirium consists of identification of predisposing factors, early detection, and aggressive management of precipitating factors that can contribute to this condition.

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Lacunes dans la façon de traiter les patients pour prévenir le delirium d'origine hospitalière

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RÉSUMÉ

OBJECTIF Évaluer les façons actuelles de traiter les patients relativement aux facteurs de prédisposition et de précipitation qui contribuent à la prévention du delirium d'origine hospitalière chez les patients âgés.

TYPE D'ÉTUDE Étude (d'observation) de cohorte prospective.

PARTICIPANTS Les patients de 65 ans et plus admis dans les unités d'enseignement de l'Alberta Hospital d'Edmonton sur une période de 7 mois et présentant un risque de delirium.

CONTEXTE Les unités d'enseignement médical de l'Université de l'Alberta.

PRINCIPAUX PARAMÈTRES À L'ÉTUDE Les données démographiques et les informations sur les facteurs de prédisposition au delirium d'origine hospitalière ont été obtenues de tous les patients. On a aussi relevé les modes de pratique clinique susceptibles de prévenir les facteurs qui déclenchent habituellement le delirium.

RÉSULTATS Sur les 120 patients recrutés, 20 (15,2%) ont développé un delirium d'origine hospitalière. Au moment de l'admission, plusieurs des facteurs de prédisposition n'ont pas été documentés (p. ex. déficit cognitif éventuel, 16 [12%], trouble de vision, 52 [39,4%] et état fonctionnel pour les activités de la vie quotidienne, 99 [75,0%]). Les facteurs précipitants incluaient l'utilisation de cathéters, le dépistage de la déshydratation et les médicaments. Des cathéters ont été utilisés chez 35 patients (26,5%) et le bilan hydrique indiquait une déshydratation dans 57 cas (42,3%). Au moment de l'admission, on n'a pas évalué l'état auditif chez 69 patients (52,3%) ni le risque d'aspiration chez 104 patients (78,8%). Après l'admission, des mesures de réorientation ont été notées chez seulement 16 patients (12,1%). Même si tous les patients avaient une brève évaluation de l'état mental à chaque jour, on n'indiquait pas si c'était deux fois par jour (ce qui aurait fourni une information importante sur les fluctuations de l'état mental) et il n'y avait pas d'évaluation du niveau d'attention comme tel. Dans cette étude, le delirium d'origine hospitalière était aussi associé à une mortalité accrue ($P < 0,004$), une plus longue hospitalisation ($P < 0,007$) et un taux plus élevé d'institutionnalisation ($P < 0,027$).

CONCLUSION On a noté des lacunes, dans le mode de traitement des patients, susceptibles de favoriser le delirium d'origine hospitalière de même que dans les mesures permettant de détecter plus précocement le développement d'un delirium. Il faudrait former les professionnels de la santé à identifier les facteurs de prédisposition et de déclenchement du delirium, et à détecter cette condition. On pourrait ainsi mieux prévenir le delirium.

POINTS DE REPÈRE DU RÉDACTEUR

- Le taux de delirium d'origine hospitalière est un indice de la qualité des soins hospitaliers prodigués aux patients âgés vulnérables.
- Cette étude voulait identifier le mode de prévention actuel du delirium d'origine hospitalière chez les patients âgés dans un grand hôpital universitaire.
- La prévention du delirium d'origine hospitalière exige l'identification des facteurs qui y prédisposent ainsi que la détection précoce et la prise en charge des facteurs précipitants qui contribuent à cette condition.

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In older people, delirium commonly develops after admission to hospital. Hospital-acquired delirium (also known as incident delirium or in-hospital delirium) after hospital admission is the prototype adverse nosocomial event. The rate of hospital-acquired delirium is a quality indicator of hospital care of frail older adults. Risk factors that predispose and precipitate hospital-acquired delirium are now recognized. Predisposing factors that place the patient at increased risk of developing delirium (cognitive impairment, visual impairment, etc) can be identified at the time of admission. Precipitating factors (eg, dehydration, catheter use, infection) are insults that occur in the hospital and are those most likely to precipitate an episode of hospital-acquired delirium.^{1,2} Vulnerability (predisposition) of older adults combined with precipitating risk factors found in the hospital environment contribute to adverse outcomes in independent, substantive, and cumulative ways.¹ Delirium can be viewed as a “window” to the overall quality of hospital care.³ Rarely is delirium caused by a single factor. Rather, delirium is a multifactorial syndrome resulting from an interaction between patient vulnerability and other precipitants, many of which are hospital-related insults (eg, dehydration, infections, and drug therapy). A multi-component intervention using standardized protocols for the management of 6 risk factors for delirium (ie, cognitive impairment; sleep deprivation; immobility; visual and hearing impairments; and dehydration) resulted in a significant reduction in the absolute incidence of delirium ($P=.02$).⁴ Preventing delirium might reduce other adverse consequences of hospitalization, such as injurious falls, unsafe behaviour, wandering, pressure ulcers, functional decline, and death.

There are few studies to date that have examined the gaps in regular clinical practices that might prevent delirium. The goal of this study was to identify the current practices (from chart documentation) that could prevent hospital-acquired delirium in the hospitalized elderly in a large university hospital setting.

METHODS

The participants included in this study were consecutive older patients (65 years of age or older) admitted to the general internal medicine unit at the University of Alberta Hospital in Edmonton over a 7-month period who were willing to participate after informed consent (from the patient or a proxy) and who were deemed to be at high risk of delirium. All patients were screened for level of risk using a delirium-risk questionnaire, which was based on the literature. The questionnaire was evidence-based, but was not validated. The development process involved a review of the literature, identification of risk factors, and review by local experts. *High risk* was defined as any

1 of the following characteristics: 1) cognitive impairment, 2) older than 80 years of age, or 3) any 2 of the following comorbidities: functional impairment, special sensory impairments, or critical comorbid illnesses. Subjects were excluded if there was an admission diagnosis of coma, delirium, alcohol or drug withdrawal, or alcohol or drug intoxication, as well as if the Confusion Assessment Method⁵ (CAM) screening test result was positive at the time of entry into the study. Patients were also excluded if they had a short stay (<72 hours).

For the purpose of our study, *cognitive impairment* was defined as an abnormal score on the Mini-Cog test^{6,7} or documentation of a history of mild cognitive impairment; cognitive impairment, no dementia; or dementia in the health record. The Mini-Cog is a brief bedside screening interview that has been shown to be valid and reliable in dementia assessment.⁵ The Mini-Cog assessment instrument combines an uncued 3-item recall test with a clock-drawing test. *Functional impairment* was defined as dependence in 2 or more activities of daily living (ADLs) using the Katz et al ADL scale.⁸ *Sensory impairment* was defined as a history of legal blindness, deafness, or hearing aid use. In our study, a critical comorbid illness was any 1 of the following: decompensated congestive heart failure, acute exacerbation of chronic obstructive pulmonary disease, respiratory failure, renal failure, moderate to severe liver disease, hyperosmolar non-ketotic state, Parkinson disease, and documented solid organ or hematologic neoplasm. Demographic data and the risk variables above were obtained for all high-risk patients who were enrolled.

Delirium, the primary outcome, was identified prospectively based on twice-daily assessments by trained study personnel and confirmed by specialists in geriatric medicine using CAM.⁵ Confusion Assessment Method screening includes testing for fluctuating confusion, inattention, disorientation, and altered level of consciousness. No interaction between the research evaluators and the clinicians providing direct patient care occurred throughout the study. All of the available information was recorded in parallel files kept by the research coordinators. If the care team failed to identify the delirium within 24 hours of first recognition by the research team, this was recorded in the hospital record. All patients enrolled in the study were followed daily from admission until the patient developed delirium. Observation continued until the patient was discharged from the service.

Best practices to prevent delirium and its consequences include minimizing risk factors and early recognition. We recorded the number of subjects for whom a minimal cognitive assessment was recorded by health care staff at least twice daily. A minimal cognitive assessment was defined as any documentation of orientation, level of consciousness, attention span, or behavioural problems.

Common preventable risk factors for hospital-acquired delirium include sensory (ie, vision and hearing) impairment, dehydration, drugs, and infections (eg, urinary tract infection [UTI] and aspiration pneumonia). We monitored practices that increase and diminish the risk of delirium or its risk factors. Practices associated with an increased risk of delirium were the use of urinary catheters, and selected medications (eg, sedatives such as benzodiazepines, high doses of narcotics, and anticholinergics). Likewise, the practices that could diminish the risk of delirium included documentation of vision and hearing status, fluid status monitoring, and reorientation measures (orienting the patient to place and time), as well as the assessment of aspiration risk and basic ADLs.

The study conformed to the Declaration of Helsinki and was approved by the research ethics board of the University of Alberta.

Statistical analysis used in the study includes descriptive statistics. Those with and without hospital-acquired delirium were compared for baseline characteristics and outcomes. Data are reported as medians for continuous variables and as percentages for discrete variables. Delirious and non-delirious patients were compared using Mann-Whitney *U* test for continuous variables and the Fisher exact test for categorical variables. The database was translated into SAS data and analysis was performed using SAS version 9.1.2.

RESULTS

A total of 375 patients were screened. Of the 132 patients enrolled, 20 (15%) developed hospital-acquired delirium. The baseline characteristics of the study subjects are shown in **Table 1**. The median age of the subjects who developed hospital-acquired delirium was 81 years old (range 74 to 87 years of age) and 50% were women. The median age for those who did not develop hospital-acquired delirium was 79 years old (range 73 to 86 years of age). Sociodemographic variables and medication history were found to be similar in the 2 groups. Dementia, abnormal Mini-cog score, and abnormal clock drawing differed significantly between groups ($P \leq .05$).

For most patients at the time of admission, there was no documentation of the predisposing and precipitating variables that could influence the prevention of delirium (**Table 2**): possible cognitive impairment 16 (12.1%), vision 52 (39.4%), hearing 69 (52.3%), and aspiration risk 104 (78.8%). Functional status of ADLs was not recorded in 99 (75.0%) patients. Catheter use was noted in 35 (26.5%) patients in the study. After admission, reorientation measures were documented for 16 (12.1%) patients; fluid intake-and-output measurements were recorded in 57 (43.2%) patients. Although all patients had brief

Table 1. Baseline characteristics of study subjects: N = 132.

CHARACTERISTICS	PATIENTS WITH HOSPITAL-ACQUIRED DELIRIUM, N (%) N = 20	NON-DELIRIOUS PATIENTS, N (%) N = 112	P VALUE
Age > 80 y	10 (50.0)	53 (47.3)	.81
Sex, male	10 (50.0)	64 (57.1)	.62
Dementia	5 (25.0)	10 (8.9)	.05*
Cognitive impairment, no dementia	2 (10.0)	12 (10.7)	>.99
Stroke	4 (20.0)	31 (27.7)	.58
Abnormal Mini-Cog score	13 (65.0)	32 (28.6)	.004*
Abnormal clock drawing	17 (85.0)	55 (49.1)	.003*
Functional impairment	9 (45.0)	36 (32.1)	.31

*These values are statistically significant.

Table 2. Predisposing and precipitating variables that lacked documentation among subjects (N = 132) at admission

VARIABLE	NO. OF PATIENTS WITH NO DOCUMENTATION
Visual impairment	52 (39.4)
Hearing impairment	69 (52.3)
Aspiration risk	104 (78.8)
Fluid status measurement	75 (56.8)
Reorientation measures	116 (87.9)
Minimal cognitive assessment more than once daily	132 (100)
Attention span testing	132 (100)
Activities of daily living (functional status)	99 (75.0)
Cognitive impairment by abnormal Mini-Cog score	16 (12.1)

mental status evaluations—which included level of alertness, orientation, and behaviour problems, such as agitation—performed once daily by the nurses, these evaluations did not occur twice daily nor was there any formal testing for attention span. These factors might have interfered with the efforts to identify the development of delirium at an earlier stage. Research assistants recorded the ADLs for all patients and found 9 (45.0%) out of 20 delirious patients and 36 (32.1%) out of 112 non-delirious patients to be dependent on others for 2 or more basic ADLs.

Table 3 shows the outcomes of delirium. Hospital-acquired delirium was associated with a high in-hospital mortality of 25.0% ($P = .004$), an increased median length of stay (18 days for delirious vs 5 days for non-delirious patients; $P = .007$) and increased risk of

Table 3. Outcomes of patients with hospital-acquired delirium vs non-delirious patients

OUTCOME MEASURES	PATIENTS WITH HOSPITAL-ACQUIRED DELIRIUM	NON-DELIRIOUS PATIENTS	P VALUE
Mortality, n/N (%)	5/20 (25.0)	4/112 (3.6)	.004*
Length of stay, median (range), d	18 (4-36)	5 (3-10)	.007*
Institutionalization, n/N (%)	5/20 (25.0)	8/112 (7.1)	.027*

*These values are statistically significant.

subsequent institutionalization (25.0% vs 7.1%; $P=.027$). The Breslow-Day test for homogeneity of the odds ratio was not significant for both the age and dementia stratification, so neither age nor dementia acted as a confounder in the association between delirium and the outcome variables of mortality, length of stay, and institutionalization.

DISCUSSION

The development of delirium in hospitalized elderly patients (ie, hospital-acquired delirium) is common and leads to increased morbidity and mortality in this patient population. In this study, several care gaps for the prevention and timely recognition of delirium (and recognition of predisposing and precipitating risk factors that might have contributed to the prevention of hospital-acquired delirium) were identified. Although delirium is characterized by a fluctuating course and inattention for over the course of 24 hours, only a once-daily cognitive assessment by a nurse was common. As physicians depend partly on health records (ie, nursing notes) to identify a fluctuating course, the recognition of delirium can be delayed by infrequent observation or documentation. Moreover, there was no formal assessment of the hallmarks of delirium: attention and fluctuation; rather, assessment was restricted to a general impression of alertness, orientation, and agitation. Thus, the type of information recorded might also be less than adequate for developing a timely diagnosis of hospital-acquired delirium. This study also identified a lack of delirium-prevention practices, which, if observed, might have reduced the incidence of delirium in this population. These practices included poor documentation of cognitive impairment, special sensory impairment, hydration level, and aspiration risk; excessive urinary catheter use; and a lack of reorientation practices.

Measures to identify possible cognitive impairment were not performed in 16 (12%) patients. Identification of cognitive impairment is important, as it is an important predisposing factor for in-hospital delirium.⁹ The Mini-Cog is a brief cognitive screening test, which has been

shown to be helpful in identifying cognitively impaired patients.⁵ In this study at the time of admission, there was a history of mild cognitive impairment and dementia in 29 (22%) patients, whereas 45 (34%) patients had abnormal Mini-Cog scores.

Considering the high prevalence of catheter use (27%) and the poor documentation of hydration (57%) in our study population, there remains potential to prevent both UTIs and delirium. Urinary tract infections and nosocomial pneumonias are well-recognized causes of delirium in hospitalized patients^{1,10,11}; UTIs are particularly problematic for the elderly and are related to the use of catheters, poor hydration, poor hygiene, and poor mobility and toileting. The incidence of bacteriuria in catheterized patients rises from 5% within 24 hours to 50% within 1 week and 100% within 1 month.¹² Among patients with bacteriuria, up to 25% will develop symptoms of UTI and about 3% will develop bacteremia.¹³ Because catheter insertion is convenient and a simple form of continence care, it often leads to indiscreet and prolonged use, placing older adults at risk of UTIs.

Aspiration risk was not identified in 79% of patients, despite the fact that nosocomial pneumonia is the second most frequent cause of hospital-associated infections (after UTIs) and the leading cause of infection-related deaths.¹¹ Delirium is a frequent complication of pneumonia with increased morbidity and mortality.^{14,15} Delirium might be the only manifestation of pneumonia in elderly patients without other symptoms such as fever.¹⁶ Recent studies stress the importance of aspiration as a frequent mechanism, even in community-acquired pneumonia. Silent aspiration of microorganisms from oropharyngeal secretions is also a main cause of pneumonia in the elderly.¹⁷ Dehydration and poor oral hygiene are risk factors for aspiration pneumonia in the hospitalized elderly,¹⁸ especially in patients who do not have traditional risk factors, such as stroke or nasogastric tube use. Dehydration could lead to inadequate salivary flow, alteration of the normal oral chemical balance, and growth of Gram-negative bacteria, which combined with minimal oral hygiene sets the stage for pneumonia.¹⁹

Dehydration can precipitate renal failure, infection, pressure sores, constipation, and delirium. Older adults are at increased risk of dehydration. In a study of hospitalized people aged 70 years and older by Eaton et al, the prevalence of dehydration was 26%.²⁰ In this study, fluid status measurements were done in only 43% of the patients. In this study there was documentation of vision status in 60% of patients and hearing status in 48% of patients. Poor vision and hearing (special sensory impairment) have been shown to be risk factors for delirium.^{9,21}

Delirium is an independent predictor of adverse outcomes, including mortality and institutionalization.^{22,23} In this study, incident delirium in the hospital was also

associated with increased mortality, increased length of stay, and increased institutionalization. Among the 5 subjects who died in the delirious group, terminal delirium related to cancer was seen in 2 patients, hospital-acquired infections, including an aspiration pneumonia and UTI, contributed to delirium in 2 patients, while high doses of narcotics and meperidine use, as well as a UTI and aspiration pneumonia, all contributed to delirium in 1 patient.

This prospective study included patients who were free of delirium at baseline and were followed twice daily using a validated delirium-screening instrument (ie, CAM) until the time of discharge. This is a preliminary study to compare delirium recognition and prevention practices between patients with hospital-acquired delirium and non-delirious patients. This study, to our knowledge, is the first observational study that focuses on basic care gaps identified by chart documentation of health care professionals, which might contribute to delirium prevention and recognition practices in usual medical care. Inadequate basic care practices in older adults can rival the effect of unsafe clinical procedures or interventions and necessitates redesign of health care delivery.

Prevention of delirium would also be likely to decrease length of hospital stay and prevent institutionalization. Efforts should be taken to educate and improve delirium prevention care. We hypothesize that the implementation of a "basic clinical care protocol" for the management of high-risk hospitalized elderly patients will reduce the incidence of delirium and its associated adverse outcomes (eg, injurious falls) in this population.

Limitations

This study had limitations. It was an observational study based on patient file analysis. As an observational study that is based on patient file analysis, there is a risk of inadequate recording of good practices. Only a prospective randomized trial can adequately determine the effect of the modification of care gaps on the prevention of delirium. In addition the study was performed in one hospital centre, and our findings might not generalize to other settings. Sleep disturbances and immobilization, which are risk factors for delirium, were not evaluated in this study.

Conclusion

Gaps in practices to identify delirium and to prevent its occurrence exist among hospitalized high-risk patients. Remediation of these gaps would be expected to improve the quality of delirium prevention care in the hospital.

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Contributors

All authors contributed to the concept and design of the study; data gathering, analysis, and interpretation; and preparing the manuscript for submission.

Competing interests

None declared

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