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Prevalence of delirium on admission to post-acute care is associated with a higher number of nursing home deficiencies

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Abstract

Objective—To examine the association between the prevalence of delirium among patients admitted to post-acute care and the quality of nursing home care as reflected in deficiency counts.

Design—Analysis of screening data from a randomized controlled trial (RCT) of a delirium abatement program.

Setting and Participants—We screened 4744 of 6352 RCT-eligible persons admitted to one of eight skilled nursing facilities in the Boston area over a three-year period. Quality of care was operationalized with the count of deficiencies noted by state surveyors.

Measurements—Prevalence of Confusion Assessment Method (CAM) diagnoses of delirium as completed by trained research interviewers at each facility.

Results—About 1 in 7 persons admitted to PAC met CAM criteria for delirium, but this varied from 1 in 15 to 1 in 4 across facilities. The correlation of deficiency count per 100 beds and the prevalence of CAM delirium was strong ($r=0.45$) and significant (95% Confidence interval = 0.07, 0.71).

Conclusion—Although this study is limited by small sample size, limited geographic scope, and crude assessment of quality with deficiency counts, we have found that facilities with more deficiencies admit more persons that satisfy CAM criteria for delirium. It is possible that good facilities often choose to admit and/or are referred good candidates for rehabilitation, while

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Trial Registration: The Trial to Reduce Delirium in Aged Post Acute Patients is registered at www.clinicaltrials.gov (NCT00182936) and is no longer accepting participants.

Conflict of Interest None of the authors have a conflict of interest to declare.

facilities with more deficiencies are not able to be so selective. The end result may be that delirious patients are being preferentially admitted to poorer quality facilities, increasing their likelihood of poor post-acute outcomes.

Keywords

Nursing Homes; Delirium; Quality of Care

INTRODUCTION

Delirium occurs in 20-75% of the 12.5 million older patients hospitalized annually, to devastating individual and public health effect.¹ Many hospitalized older adults with delirium do not clear by the time of discharge.² About 22% of hospitalized Medicare beneficiaries, the majority of whom are elderly, go on to use inpatient post-acute care services such as skilled nursing and long-term care hospitals.³ We have previously shown that about a fifth of admissions to post-acute skilled nursing facilities have prevalent delirium.⁴ By these estimates, at least 550,000 older adults are admitted to post-acute skilled nursing facilities with prevalent delirium every year. This estimate can be expected to climb as the population ages and hospital stays shorten.

Delirium is an important signal of quality of care, because it is common and frequently of iatrogenic origin.⁵ The percent of short stay nursing home residents with delirium two weeks after admission is one of five quality measures publicly reported by the Centers for Medicare and Medicaid Services (CMS).⁶ The presumed causal relationship underlying the use of delirium prevalence at two weeks as an indicator of quality of care holds that poor care process or structural conditions result in persistent delirium among patients or residents admitted with delirium. In this analysis our purpose was not to necessarily refute this presumed causal chain, but to determine if the causal network may be more complex: specifically, residents with delirium upon admission to post-acute care facilities may be preferentially admitted to those facilities with evidence of poorer quality of care.

We recently completed a cluster-randomized controlled trial of a delirium abatement program involving eight post-acute care facilities in the Boston area. One of the suggestive findings of our screening efforts was that poorer quality homes (to the extent that quality is reflected by higher numbers of deficiencies noted by state surveyors and recorded in the On-Line Survey and Certification Assessment Reporting (OSCAR) System⁷) were disproportionately contributing subjects to the trial. Here, we present data exploring this association and discuss the implications of this finding.

METHODS

Details of our trial have been reported elsewhere.⁸⁻¹² Briefly, using a protocol approved by our institutional review board, we recruited eight post-acute skilled nursing facilities to participate in a trial of a nurse-led delirium abatement program. Facilities were identified purposefully. We identified large nursing home chains or corporations with facilities within 25 miles of the main study site with more than 35 post acute care admissions per month. At least two and up to four facilities per chain or corporation were accrued, and accrual was capped at eight facilities due to intensive staff demands of the intervention. Facilities were randomly assigned to the abatement program or usual care, blocking by ownership. Because this analysis considers pre-intervention screening data only, we ignore treatment assignment. We report only limited information about the individual facilities (deficiency count and delirium prevalence) in order to preserve facility confidentiality.

New admissions to each facility who were 65 years or older, admitted directly from an acute medical-surgical hospitalization, and able to hear and communicate sufficiently well in English to participate were screened to determine eligibility. Exclusion criteria included severe functional impairment *prior* to acute illness, admission for terminal care (life expectancy < 6 months), and residence beyond a 25-mile radius of our research site. To participate, patients had to have a positive research designation of delirium based on the Confusion Assessment Method Diagnostic Algorithm (CAM)¹³ performed by trained non-clinician interviewers, and proxy informed consent. Our approach to CAM delirium diagnoses has been shown to be very reliable (kappa 0.95) and is discussed in detail elsewhere.¹⁴ The CAM algorithm has been shown to be very sensitive (94-100%) and specific (90-95%) for delirium.¹⁵ Over the course of three years we screened 4744 of 6352 (75%) eligible admissions within five days of admission for the presence of delirium (about 61% percent of all admitted patients). Of these, 667 (14%) met CAM criteria for delirium.

Information about nursing home quality of care was based on deficiencies detected by state surveyors and recorded in the On-Line Survey and Certification Assessment Reporting (OSCAR) System.⁷ As summarized by a recent Institute of Medicine report,⁷ OSCAR is a computerized national database used for maintaining and retrieving survey and certification data for facilities that participate in Medicare or Medicaid. The database includes survey deficiency data collected by state licensing and certification agencies. Deficiency data are based on the findings of state surveyors and vary in terms of scope and severity. State surveyors make deficiency determinations using protocols developed by the Centers for Medicare and Medicaid Services (CMS).

Surveys assess medical, nursing, and rehabilitative care, dietary and nutrition services, activities and social participation, sanitation, infection control, and the physical environment. Surveyors collect data from different sources including medical record and care plan review, and review compliance with legal requirements concerning residents' rights. Surveyors also observe facility operations and interview residents, family members, and staff to determine whether facilities are providing appropriate care. A deficiency is cited if a nursing home fails to meet one or more of the Federal requirements. Deficiencies are categorized into one of 16 areas including quality of care, mistreatment, nutrition and diet, pharmacy service, resident assessment, resident rights, environmental and administrative. Surveyors also qualify the scope and severity of the deficiency. Scope refers to the number of residents potentially or actually affected (isolated, pattern, and widespread) and severity refers to potential/actual harm to residents (immediate jeopardy, actual harm, no actual harm with a potential for more than minimal harm, no actual harm with a potential for minimal harm.).¹⁶ For our study, we accessed deficiency data collected via the OSCAR system by accessing the CMS Nursing Home Compare world-wide-web page (<http://www.medicare.gov/NHCompare>). We used the count of deficiencies, regardless of category, scope and severity, as an index of increasingly poor quality of care in a global sense. The mean number of deficiencies per facility in Massachusetts was 5.5 in 2005.¹⁶

Our analysis involved assessing the correlation of deficiencies and the prevalence of delirium among post-acute care admissions. Our unit of analysis was the facility. Patients were screened and enrolled at the eight facilities over a three year period. Recruitment field efforts were launched in October 2000 and continued through December 2003. During this interval facilities were visited by State surveyors a median of four times (range 2-7) at a median of 1 year intervals (range .1-1.8 years). We constructed our analytic data base by associating admissions and deficiency data by using survey dates to define periods of observation for individual facilities, and linked admissions during a given period to deficiency counts at the beginning of the period of observation. If contiguous periods had the same deficiency count, those periods were merged to increase the stability of the

estimate of the prevalence of delirium among admissions in that facility-period (by increasing the denominator). Our final analytic file included 26 facility-period observations. To account for non-normality in the distribution of deficiencies and the prevalence of delirium, both variables were Blom transformed¹⁷ prior to estimating measures of association and hypothesis testing. To account for correlated observations within facility, we used multilevel modeling techniques.¹⁸ To account for facility size, the association delirium presence was associated with the number of deficiencies per 100 beds. The multilevel modeling approach is justified given the high intraclass correlation coefficient for delirium ICC=0.31) and small cluster size (26/8=3.25) results in a modest design effect (DEFF=1.7). Data management and bivariate correlation coefficients were conducted using Stata software (v 10) (Stata Corporation, College Station, Texas), and multilevel models were estimated with Mplus software (v 5.2) (Muthén and Muthén, Los Angeles, CA).

RESULTS

Summary facility data are presented in Table 1. Bed size is suppressed to protect facility anonymity. Deficiency counts at each survey period and the prevalence of delirium among patients admitted during the prior period are plotted in Figure 1. Individual facilities are noted with letters in Figure 1 and Table 1.

The correlation of the deficiency data and prevalence of delirium data presented in Table 1 is very strong: the Pearson correlation coefficient was 0.79 (95% confidence interval, CI = 0.18-0.96). The correlation of delirium prevalence and deficiencies per 100 beds is also strong ($r = 0.70$, 95% CI = 0.00, 0.94). The results in Figure 1, which display facility-period associations, suggest a more modest degree of association. Nevertheless, formal evaluation of the relationship of delirium prevalence at admission (Blom-transformed) with number of deficiencies per 100 beds (also Blom-transformed) and accounting for clustering with multilevel modeling, reveals a robust and significant association (fully standardized regression coefficient, $r = 0.21$, 95% CI = 0.09, 0.33).

DISCUSSION

We observed a strong association between deficiency count and the prevalence of delirium among admissions to post-acute skilled nursing facilities. Facilities vary with respect to quality of care and we infer this variability is related to the tendencies of facilities to accept and/or have referred post-acute patients with delirium. Since we know that recognition of delirium is generally poor,^{5, 19, 20} we suspect that this selective admission is not driven by delirium *per se*, but instead this selective referral (or admission) may generalize to other clinical complexities. Good facilities can choose to admit and/or are referred good candidates for rehabilitation, and facilities with more deficiencies are not able to be as selective.

In her recent review, Inouye points out delirium is an indicator of poor quality of care in hospitals.¹ While poor quality of care may cause delirium, clinical characteristics of patients recorded at the time of post-acute admission are not indicative of quality of care provided by the skilled nursing facility. Taken together, our results suggest that a self-perpetuating cycle of poor quality of care and poor functional and clinical outcomes may be related to the higher prevalence of delirium among post-acute admissions to poorer quality post-acute skilled nursing facilities.

The possibility that differential prevalence of delirium at admission is a consequence of a specific conscious bias among acute hospital placement staff or post-acute facility staff is remote, because underrecognition of delirium is common.^{5, 19, 20} Moreover, in our study

we have no indication that deficiency count is related to post-acute care facility staff recognition of delirium. It is important to note that our diagnoses of delirium were made by trained research staff and not shared with facility staff. Rather, we suspect that the underlying cause is differential referral patterns. The bias may be based on subjective impressions of good candidates for rehabilitation on the part of referral personnel and/or clinical staff, who preferentially direct such candidates to facilities that are perceived of as being high quality (typically facilities with few deficiencies). Alternatively, or coincidentally, high quality nursing facilities may have screening personnel that are better able to recognize patients that could benefit from a longer stay in the acute hospital, and tend to refuse to admit delirious patients.

There are limitations of our study. The most important is this was a secondary analysis of a study designed to test a wholly different set of research questions. While we are able to capitalize upon aspects of the parent study (e.g., prevalence of delirium determined by trained researchers using criteria operationalized by the CAM algorithm), other aspects of the available data present limitations for the current analysis. These include that the sample of facilities is very small and may not generalize to other post acute care facilities. However, our sample's average number of deficiencies matches the average number of deficiencies in Massachusetts.⁶ An additional limitation is the use of deficiency data collected via the OSCAR system as a measure of quality of care. As summarized by a recent Institute of Medicine report, deficiencies are valid indicators of quality of care. Arguments regarding limitations of the use of deficiency data as an index of quality of care typically cite between and within state variability in adherence to CMS guidelines.⁷ We feel that such variability is minimized given the relatively small geographic area over which facilities in this study were located.

A further limitation is that our deficiency count is very crude. We do not distinguish among different types of deficiencies, which vary by category, scope and severity. Moreover, we do not distinguish deficiencies that are relevant to residents in long-term beds versus those relevant to short-term skilled nursing or rehabilitation beds.

In summary, our findings suggest that delirious patients, who are among the most vulnerable admitted to post-acute care, are being preferentially admitted to poorer quality facilities, potentially further increasing their likelihood of poor post-acute outcomes.²¹ From a policy perspective, the coming era of pay-for-performance supports the need for effective screening, prevention and treatment programs for delirium among older adults hospitalized or referred to post-acute care for functional rehabilitation. From a clinical perspective, good evidence exists that delirium can be prevented in hospitalized patients.^{22, 23} More research on recognition and treatment of delirium is needed in post-acute care settings. With greater clinical expertise with regard to confusional states and with suitable resources, some patients with delirium could be helped to resolve their delirium promptly in post-acute (and other) care settings, and thereby achieve desired clinical goals (e.g., functional recovery).

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Figure 1.

illustrates the association of the prevalence proportion of delirium among admissions to post-acute care and the number of deficiencies per 100 beds for eight Massachusetts facilities over a three year period. Individual facilities are identified with letters (see Table 1). The association is summarized with a fully standardized multilevel regression coefficient (r) of prevalence on number of deficiencies per 100 beds, where prevalence and deficiencies were Blom-transformed to diminish the influence of outliers.

Table 1

Facility deficiencies and prevalence of delirium.

Facility	Deficiencies	Patients Screened	Patients with Delirium	
		(N)	(N)	(%)
A	0	266	30	(11)
B	1	495	32	(06)
C	2	1026	120	(12)
D	5	470	39	(08)
E	7	404	69	(17)
F	8	372	55	(15)
G	11	972	146	(15)
H	13	739	176	(24)
All Facilities		4744	667	(14)

Note: Deficiencies are expressed as the mean number of all deficiencies recorded by State Surveyors averaged over all observation intervals during the study period.