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ORIGINAL RESEARCH

Functional Improvement in Hospitalized Older Adults Is Independent of Dementia Diagnosis: Experience of a Specialized Delirium Management Unit

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BACKGROUND: Patients with delirium, especially when superimposed on dementia, are at high risk of functional decline.

OBJECTIVE: To examine the influence of a multicomponent delirium management program, the geriatric monitoring unit (GMU), on functional progress of delirious older patients and the impact of underlying dementia on functional recovery.

DESIGN: Prospective cohort study.

SETTING: The GMU is a specialized 5-bed unit for the care of delirious older adults within an acute tertiary hospital.

PATIENTS: Patients aged 65 years and older with delirium.

INTERVENTION: The GMU is a multifactorial delirium treatment program with core interventions focusing on early mobilization and rehabilitation.

MEASUREMENTS: Baseline measures included delirium severity (Delirium Rating Scale-98 and Confusion Assessment Method severity), Chinese Mini-Mental State Examination, functional status (modified Barthel Index [MBI]), comorbidity (Charlson's), and illness severity (modified Severity of Illness Index). Patients with and without dementia were compared for recovery in cognitive scores and functional status.

RESULTS: Of 122 patients with delirium who were admitted to the GMU over a 1-year period, 82 (67.2%) had underlying dementia. There were no significant differences in age, gender, delirium severity, illness severity, cognitive performance, and functional status at admission to the GMU between groups, although patients with dementia had significantly higher comorbidity (Charlson's 2.27 vs 1.75, $P = 0.05$). Significant cognitive and functional improvement was observed for the entire GMU cohort, with demented and nondemented groups capable of functional recovery (MBI gain of 20.43 vs 17.35, respectively, $P = 0.35$).

CONCLUSION: Elderly patients with dementia recovering from delirium have comparable potential for functional recovery as their cognitively intact counterparts in a delirium management unit focused on geriatric nursing care and rehabilitation. *Journal of Hospital Medicine* 2013;8:321–327. © 2013 Society of Hospital Medicine

Loss of functional independence is a serious complication of delirium,[1,2] with functional consequences often persisting long after the index hospital admission.[3] Preexisting dementia is a major risk factor for delirium in hospitalized older patients,[4,5] and the occurrence of delirium may alter the clinical course of an underlying dementia with negative prognostic implications, including further functional and cognitive decline,[3] increased rehospitalization rates,[6] institutionalization,[3] and death.[7] Despite the adverse functional outcomes of delirium, there remains a scarcity of well-designed intervention trials for the rehabilitation of older patients recovering from delirium.

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Studies investigating the influence of cognitive impairment on rehabilitation outcomes have yielded conflicting results. Landi and colleagues identified cognitive impairment as a negative predictor of functional recovery among older patients in a rehabilitation unit.[8] Yet, other studies had reported functional improvements with rehabilitation regardless of cognition.[9–11] However, it is not possible to determine if cognitive impairment in the earlier studies had been consequent to delirium, dementia, or both. Although there has been emerging evidence for the impact of delirium on disease trajectory among patients with dementia, it is less clear whether interventions for delirium prevention and management will yield comparable outcomes with the presence of preexisting dementia.

The geriatric monitoring unit (GMU) is a specialized 5-bed unit developed for the care of delirious older patients and is modeled after the delirium room,[12] with adoption of core interventions from the Hospital Elder Life Program[13] and use of evening bright light therapy to consolidate circadian rhythm and improve sleep in older inpatients.[14] The core interventions in this multicomponent delirium management program focused on early mobilization and rehabilitation, occurring concurrently with medical

management, to address all precipitating and predisposing factors for delirium.[15] As functional decline in an older patient can develop as early as 2 days into a hospital admission,[16] early intervention once the patient has been admitted is essential to prevent the cascade to irreversible functional loss. Hence, we sought to determine the functional progress of delirious older patients exposed to a multicomponent delirium management program and whether the presence of underlying dementia impacted the functional recovery of older patients with delirium. The secondary objective was to identify predictors of functional recovery in older hospitalized patients with delirium.

METHODS

Setting and Participants

This prospective cohort study recruited patients who had been admitted to the GMU of Tan Tock Seng Hospital, Singapore, during the period of November 2010 to November 2011. The admission criteria for the GMU included patients aged 65 years and older who were admitted to the geriatric medicine department and assessed to have delirium, either on admission to the general ward or incident delirium that developed during the hospital stay. The diagnosis of delirium was established in accordance with the Confusion Assessment Method (CAM) diagnostic criteria.[17] Patients were excluded if they met any of the following criteria: (1) presence of medical illnesses that required special monitoring (eg, telemetry for arrhythmias or acute myocardial infarction); (2) critically ill, in coma, or with terminal illness; (3) uncommunicative or with severe aphasia; (4) severely combative behavior with high risk of harm to self, staff, or other patients; (5) contraindications to bright light therapy (manic disorders, severe eye disorders, photosensitive skin disorders, or use of photosensitizing medications); (6) being on respiratory or contact precautions; and (7) refusal of GMU admission by patient, family, or physician-in-charge.[15]

The core interventions adopted in the GMU facilitate early mobilization through strict avoidance of mechanical restraints (and refraining from pharmacological restraints where possible), encouraging patients to mobilize early with the support of therapists and trained nurses, and daily review of the continued need for intravenous drip, urinary catheter, or supplemental oxygen to minimize immobilizing equipment. There is a strong emphasis on rehabilitation as part of the multicomponent delirium program; patients participate in daily orientation 3 times a day by a trained nurse using a reality orientation board, engage in therapeutic activities 3 times a day for cognitive stimulation and socialization, and attend daily physiotherapy and occupational therapy sessions. Additionally, we actively seek to correct any sensory impairment with visual aids (such as eye glasses), earwax disimpaction where necessary, and provision of hearing aids or portable audio amplifier. Nonpharmacological measures implemented to improve sleep at night for delirious older patients include evening bright light therapy and a sleep enhancement protocol of warm milk and relaxation music. These interventions are practiced for all patients through their stay in the GMU, with compliance ensured via a structured protocol in the daily nursing workflow and documentation sheet.

All patients fulfilling CAM criteria for delirium and admitted to the GMU were eligible for this study. However, patients who were prematurely transferred out of the GMU (for reasons such as instability of medical conditions requiring intensive monitoring or patients requiring contact precautions) were excluded from subsequent analysis. Patients with repeated GMU admissions had only their first admission included for analysis.

Ethics approval for conduct of this study was obtained from the National Healthcare Group Domain Specific Review Board.

Assessments

All patients underwent a detailed cognitive evaluation by the consultant geriatrician on admission to the GMU. A family member or other designated caregiver was routinely interviewed to establish the patient's baseline cognitive functioning prior to the current admission. The medical records of all patients were reviewed to ascertain whether a diagnosis of dementia had been previously established. In patients yet to be diagnosed, a diagnosis of dementia was made in the current admission if the corroborative history suggested presence of cognitive symptoms consistent with *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition* (DSM-IV) criteria for dementia[18] of at least 6 months' duration, in accordance with the standardized process for cognitive evaluation.[19]

Delirium subtype—hyperactive, hypoactive, or mixed delirium—was determined by the consultant geriatrician at admission to the GMU based on clinical assessment of the patient's mental state and behavior. All patients underwent baseline and daily cognitive status assessment using the locally validated 10-point Abbreviated Mental Test (AMT) and 28-point Chinese Mini-Mental State Examination (CMMSE), with higher scores reflective of better cognitive performance.[20] Delirium severity was assessed daily and scored on the Delirium Rating Scale-98 (DRS-sev, maximum severity score of 39 points)[21] and CAM severity (CAM-sev).[17] The cognitive tests and delirium severity scoring were administered by a trained assessor from the time of admission to the GMU until patient's discharge from the GMU. A comprehensive history taking (including medication reconciliation), detailed physical examination, and review of all laboratory/imaging investigations were performed routinely at admission to identify all

potential precipitating factors for delirium, and the Charlson's co-morbidity[22] and modified Severity of Illness Index scored.[23] The modified Barthel Index (MBI),[24] which measures activities of daily living (ADL), was used to monitor functional progress from time of admission until discharge from the GMU, and was rated by an occupational therapist observing the patient at ADL tasks. A patient was deemed to have recovered from delirium if the CAM criteria for delirium was no longer met, with diagnosis of recovery being supported by improvement in cognitive and/or delirium severity scores as well as input from the multidisciplinary team. Patients were discharged from the GMU once assessed to have recovered from delirium, but may continue inpatient treatment in a general ward for other outstanding medical issues (such as continuation of intravenous antibiotics) or while awaiting transfer to a post-acute care facility for continued rehabilitation.

Primary Outcome

The primary outcome was recovery of physical function and the difference in total MBI score of each patient at the GMU discharge from that at the GMU admission provided an estimate of the extent of functional recovery achieved. To define clinically meaningful functional improvement, we categorized MBI scores into the following: (1) total MBI score 0 to 20 indicates total dependence, (2) 21 to 60 severe dependence, (3) 61 to 90 moderate dependence, (4) 91 to 99 slight dependence, and (5) 100 full independence.[24] The total MBI gain at discharge was considered clinically meaningful if accompanied by patient transcending into a less dependent category.

Statistical Analysis

Summary measures of baseline characteristics are presented as means ($\pm$ standard deviations) and proportions. The difference between admission and discharge AMT, CMMSE, and MBI scores was calculated for each patient and represented the extent of cognitive and functional recovery achieved at the time of discharge from the GMU. Paired sample *t* test was used to evaluate differences between admission and discharge cognitive and functional scores, as well as changes in delirium severity as measured on CAM-sev and DRS-sev, for the entire cohort of GMU patients.

To determine whether preexisting dementia impacts on cognitive and functional recovery of delirious patients, independent sample *t* test was performed to compare mean changes in AMT, CMMSE, and MBI scores for the demented vs nondemented groups. The proportion of patients achieving clinically meaningful MBI gain in each group was compared using Pearson χ^2 test.

To identify predictors of functional recovery, univariate analyses were first performed to examine the relationship between predictor variables and MBI gain. The candidate predictors were defined a priori and included (1) age, (2) gender, (3) Charlson's comorbidity score, (4) Severity of Illness Index, (5) number of precipitating causes of delirium (categorical–single, 2 or >2 precipitating causes), (6) presentation of delirium (categorical–hypoactive, hyperactive, mixed), (7) delirium severity on admission (CAM-sev and DRS-sev scores), (8) duration of delirium, and (9) presence of underlying dementia. Predictors with a univariate *P* value <0.20 were entered into a multiple linear regression model, with the dependent variable being change in MBI score. Only significant predictors ($P \leq 0.05$) were retained in the final model. All models controlled for admission MBI score.

Statistical analyses were performed using SPSS software (version 16.0; IBM, Armonk, NY). All statistical tests were 2-tailed, with *P* value ≤ 0.05 considered statistically significant.

RESULTS

Patient Characteristics

One hundred forty-six elderly patients with delirium were admitted to the GMU during the 1-year study period. One hundred twenty-two patients were analyzed after excluding 24 patients (17 patients [mean age 83.2 ± 8.7 years, 47.1% females] were transferred out prematurely due to infection control precautions or were critically ill requiring intensive monitoring; 7 were repeat admissions). The mean age of patients admitted to the GMU was 84.1 ± 7.6 years, with a predominance of females (60.7%). Most patients presented with either hyperactive (49.2%) or mixed (35.2%) delirium, with hypoactive delirium being the least common presentation (15.6%). Sepsis, notably urinary tract infection or pneumonia, was the predominant principal precipitating cause, contributing to 68.0% of delirium cases within the GMU. At admission, the GMU cohort had a mean CMMSE score of 5.30 ± 5.53, and mean MBI score of 31.61 ± 26.61. Eighty-two patients (67.2%) had delirium superimposed on dementia, whereas 40 patients (32.8%) did not have underlying dementia.

Baseline characteristics of patients with and without underlying dementia are shown in Table 1. There were no significant differences in age, gender, ethnicity, and illness severity between groups with and without dementia, although patients with dementia had higher comorbidity (Charlson's comorbidity score 2.27 vs 1.75, $P = 0.054$). The presentation and severity of delirium at admission to the GMU was similar in both groups.

Patients without underlying dementia more often required multiple insults to precipitate delirium compared with patients with dementia, although this difference did not fulfill statistical significance. Although sepsis remained the primary precipitating cause of delirium in patients with and without dementia, urinary tract infection was more common among patients

TABLE 1. Baseline Characteristics of Patients Admitted to the Geriatric Monitoring Unit

	Underlying Dementia		
	Absent (n = 40)	Present (n = 82)	P Value
Demographics			
Age, mean ± SD, y	84.0 ± 8.1	84.2 ± 7.4	0.88
Male gender, n (%)	18 (45.0)	29 (35.4)	0.45
Chinese, n (%)	34 (85.0)	70 (85.4)	0.67
Presentation of delirium			0.99
Hyperactive, n (%)	20 (50.0)	40 (48.8)	
Hypoactive, n (%)	6 (15.0)	13 (15.9)	
Mixed, n (%)	14 (35.0)	29 (35.4)	
Delirium severity on admission*			
CAM-sev, mean ± SD	5.23 ± 1.17	4.74 ± 1.47	0.07
DRS-sev, mean ± SD	27.30 ± 6.37	26.32 ± 6.70	0.43
Cognitive status on admission*			
AMT, mean ± SD	2.05 ± 1.97	1.68 ± 2.22	0.38
CMMSE, mean ± SD	5.18 ± 5.13	5.35 ± 5.75	0.87
Functional status on admission, MBI score, mean ± SD*	29.48 ± 25.90	32.66 ± 27.04	0.54
Comorbidities			
Charlson score, mean ± SD	1.75 ± 1.63	2.27 ± 1.25	0.054
Severity of Illness, mean ± SD	2.00 ± 0.32	2.10 ± 0.40	0.15
Precipitating causes of delirium			
Number of precipitants, n (%)			0.41
Single precipitating cause	12 (30.0)	31 (37.8)	
2 precipitating causes	12 (30.0)	28 (34.1)	
>2 precipitating causes	16 (40.0)	23 (28.1)	
Principal precipitating cause, n (%)			0.050
UTI	17 (42.5)	27 (32.9)	
Pneumonia	3 (7.5)	23 (28.0)	
Combined UTI and pneumonia or sepsis from >1 source	3 (7.5)	9 (11.0)	
Stroke	0 (0)	3 (3.7)	
Biochemical abnormalities	2 (5.0)	4 (4.9)	
Intracranial hemorrhage	3 (7.5)	1(1.2)	
Fracture	3 (7.5)	2 (2.4)	
Postoperative state	2 (5.0)	3 (3.7)	
Others	7 (17.5)	10 (12.2)	

NOTE: **Abbreviations:** AMT, Abbreviated Mental Test; CAM, Confusion Assessment Method; CMMSE, Chinese Mini-Mental State Examination; DRS, Delirium Rating Scale-98; MBI, modified Barthel Index; SD, standard deviation; UTI, urinary tract infection.

*Admission delirium severity scores, cognitive status, and functional status were as assessed at the time of admission to the geriatric monitoring unit.

without dementia, whereas pneumonia was a more common precipitant in patients with dementia ($P = 0.050$). The cognitive performance and functional status were similar at GMU admission for both groups.

Cognitive and Functional Outcomes on Discharge

The average duration of delirium for the GMU cohort was 8.2 days, with the mean length of total hospital stay being 17.0 days. The length of GMU stay for each patient was equivalent to the duration of delirium as patients were transferred out of the GMU once assessed to have recovered from delirium. Significant cognitive improvement was observed with recovery from delirium, with AMT and CMMSE scores improving by a mean of 1.44 ± 2.38 and 3.54 ± 5.61, respectively (paired t test, $P < 0.001$). Patients demonstrated significant functional recovery at discharge from the GMU compared with their functional performance at admission to the GMU, with a mean MBI gain of 19.42 ± 17.11 ($P < 0.001$), and 59 patients (48.4%) had progressed to a less-dependent category.

Table 2 compares the cognitive and functional progress of patients with and without dementia. There was no difference in duration of delirium or length of total hospital stay between the demented and nondemented groups. Within-group comparison showed patients with and without dementia managing significant improvement in cognitive scores at GMU discharge compared with GMU admission, although the magnitude of improvement was greater for nondemented patients (CMMSE improvement +6.73 vs +1.99, $P < 0.001$). The mean MBI gain at GMU discharge compared with GMU admission was 20.43 ± 16.99 ($P < 0.001$) for patients with dementia and 17.35 ± 17.39 ($P < 0.001$) for patients without underlying dementia. There was no significant difference in the extent of functional improvement achieved between the demented and nondemented groups. Nineteen patients (47.5%) without dementia and 40 patients (48.8%) with preexisting dementia were in a less-dependent category at GMU discharge compared with GMU admission.

Seventy-nine patients (64.8% of the GMU cohort) were discharged back to their own home following the index hospitalization, 22 patients (18.0%) required further rehabilitation in a community hospital or subacute ward before returning home, and 19 patients (15.6%) were admitted to long-term care. There was no significant difference in discharge destination between patients with and without dementia (Table 3).

Predictors of Functional Recovery on Discharge

Age, gender, number of precipitating causes, severity of illness, and type of delirium had a univariate P value <0.20 and were entered into the multiple regression model. After controlling for admission MBI score in multivariate analysis, gender, presentation of delirium, and severity of illness remained independent factors for improvement in MBI score (Table 4). Female patients exhibited greater functional recovery than males. Hypoactive delirium was associated with the worst prognosis for functional recovery, with improvement in MBI score being 14.47 points lower than that achieved by patients with hyperactive delirium. Severity of illness at admission was another negative predictor of functional recovery, with each unit increase in Severity of Illness Index (higher score indicating more severe illness) associated with 10.59 points lower gain in MBI.

DISCUSSION

Our results support a delirium management unit focused on geriatric nursing care and rehabilitation in

TABLE 2. Cognitive and Functional Outcomes at Discharge From the Geriatric Monitoring Unit

		Underlying Dementia		
	Overall GMU Cohort (n = 122)	Absent (n = 40)	Present (n = 82)	P Value
Duration of delirium, mean ± SD, d	8.2	7.4 ± 7.6	8.6 ± 5.7	0.35
Length of hospital stay, mean ± SD, d*	17.0	18.6 ± 9.7	16.3 ± 8.7	0.18
Cognitive scores on discharge†				
AMT, mean (SD)	3.25 (3.00)	5.20 (2.88)	2.29 (2.58)	<0.001
CMMSE, mean (SD)	8.84 (6.81)	11.90 (6.16)	7.34 (6.64)	<0.001
Improvement in cognitive scores				
ΔAMT, mean (SD)‡	+1.44 (2.38)	+3.15 (2.68)	+0.61 (1.70)	<0.001
ΔCMMSE, mean (SD)‡	+3.54 (5.61)	+6.73 (5.74)	+1.99 (4.87)	<0.001
Delirium severity on discharge†				
CAM-sev, mean (SD)	2.43 (1.44)	2.15 (1.46)	2.57 (1.42)	0.13
DRS-sev, mean (SD)	16.83 (6.97)	14.45 (6.90)	18.00 (6.74)	0.008
Change in delirium severity scores				
ΔCAM-sev, mean (SD)‡	−2.47 (1.73)	−3.08 (1.67)	−2.17 (1.68)	0.006
ΔDRS-sev, mean (SD)‡	−9.72 (7.30)	−12.85 (6.43)	−8.17 (7.25)	0.001
Functional status				
MBI discharge, mean (SD)†	51.03 (26.20)	46.83 (24.09)	53.09 (27.07)	0.22
ΔMBI, mean (SD)‡	+19.42 (17.11)	+17.35 (17.39)	+20.43 (16.99)	0.35
Progress to less-dependent category at discharge, n (%)†	59 (48.4%)	19 (47.5%)	40 (48.8%)	1.00

NOTE: **Abbreviations:** AMT, Abbreviated Mental Test; CAM, Confusion Assessment Method; CMMSE, Chinese Mini-Mental State Examination; DRS, Delirium Rating Scale-98; GMU, geriatric monitoring unit; MBI, modified Barthel Index; SD, standard deviation; sev, severity.

*Length of hospital stay refers to total length of stay in hospital, including time spent in the general ward. Length of stay in the GMU is equivalent to duration of delirium as patients are transferred out of the GMU once assessed to be out of delirium.

†Discharge cognitive scores, delirium severity, and functional status were as assessed at time of discharge from the GMU.

‡ΔAMT, ΔCMMSE, ΔCAM-sev, ΔDRS-sev, ΔMBI refer to the difference in scores between GMU admission and GMU discharge.

promoting positive cognitive and functional gains in older patients with delirium. In addition, we have documented that patients with dementia and recovering from delirium have comparable potential for functional recovery as their cognitively intact counterparts, despite there being less improvement in cognitive test scores and higher comorbidity compared with patients without dementia.

Persistent delirium and failure to recognize the condition have been associated with poor functional recovery.[25,26] Early recognition of delirium and actively addressing all predisposing and precipitating factors, along with emphasis on rehabilitation in a multidisciplinary unit, appear to be important factors contributing to the positive functional outcomes in our patients. In addition, none of the patients admitted to the GMU had been subject to physical restraint, and this, along with the higher nursing ratio, facilitated early mobilization essential to prevent functional decline. The overall length of hospital stay, averaging 17.0 days, compared favorably with a pre-GMU cohort, where the average length of hospital stay for delirious patients was 20.9 days. The length of stay in an acute hospital ward included waiting time for transfer to appropriate postacute facility (community hospital, subacute ward, or nursing home).

TABLE 3. Discharge Destination Following Hospitalization

	Overall GMU Cohort (n = 122)	Underlying Dementia		P Value
		Absent (n = 40)	Present (n = 82)	
Discharge destination, n (%)				0.14
Own home	79 (64.8)	24 (60.0)	55 (67.9)	
Community hospital or subacute ward (with eventual discharge home after rehabilitation)	22 (18.0)	10 (25.0)	12 (14.6)	
Long-term care	19 (15.6)	6 (15.0)	13 (16.0)	
Inpatient hospice	1 (0.8)	0 (0)	1 (1.2)	

NOTE: **Abbreviations:** GMU, geriatric monitoring unit. One patient died in the general ward after transfer out of the GMU.

In a study of older hospital inpatients, delirium independent of dementia was predictive of sustained poor cognitive and functional status in the year following hospitalization.[3] Thus, although delirium has been generally regarded as a transient and reversible condition, it is also increasingly recognized that recovery may not always be complete. This is a likely explanation for the low cognitive test scores at discharge from the GMU, albeit improved compared with admission, even among patients without dementia. The present study lacks data on longer-term cognitive outcomes following delirium resolution. However, delirium is reportedly a risk factor for subsequent development of dementia,[27] and contributes to accelerated cognitive decline in patients with existing dementia.[28]

Despite reports of adverse outcomes of delirium superimposed on dementia, few intervention studies have specifically examined the management of delirium in older adults with dementia. In our study, preexisting dementia did not preclude delirious patients

TABLE 4. Multivariate Model for Functional Improvement at Discharge

	Model 1		Final Model	
Predictor	B	*P* Value	B	*P* Value
Age	0.245	0.184		
Female (vs male)	6.421	0.023	7.393	0.009
Number of precipitating causes	2.044	0.229		
Hypoactive delirium (vs hyperactive delirium)	−15.383	<0.001	−14.472	0.001
Severity of illness	−10.596	0.003	−10.591	0.003

NOTE: Model 1: adjusted R^2 0.299, $F = 8.13$. Final model: adjusted R^2 0.288, $F = 10.46$. Both models adjusted for admission modified Barthel Index score. B = slope of MBI change.

from functional improvement, adding to the still-limited literature reporting positive rehabilitation outcomes in patients with cognitive impairment.[10,29] In addition, patients with dementia did not take longer to recover from delirium than those without dementia, nor did they appear to require a longer duration for making similar functional gains given that length of hospital stay did not differ between the 2 groups. Illness severity and presentation of delirium, rather than preexisting dementia, predicted poor functional recovery. The complex etiology of delirium, representing an interaction between baseline patient vulnerability (predisposing factors) and exposure to noxious insults or precipitating factors, suggests that highly vulnerable patients (eg, dementia) may develop delirium with a relatively innocuous insult, as opposed to the multiple noxious insults anticipated in nonvulnerable patients.[30] Although Severity of Illness Index was similar, patients without dementia had a trend for more than 1 precipitating factor, and serious medical conditions, such as intracranial hemorrhage, fracture, and need for surgical intervention were more likely to be present, factors that can expectedly influence functional recovery. Patients with hypoactive delirium had the worst functional outcome, consistent with previously observed poor prognosis in hypoactive delirium.[31,32] Our findings, if corroborated by future studies, may offer a means to attenuate the trajectory of functional decline observed in patients with delirium superimposed on dementia. This will be of particular relevance as earlier studies had observed a high risk of institutionalization in patients with delirium superimposed on dementia compared with dementia alone.[3,33]

One limitation of this study was the failure to adjust for premorbid functional status due to the lack of information on baseline function prior to the current hospital admission. Even though we demonstrated functional improvement at discharge compared with admitting functional status, we were not able to ascertain if the patients had returned to their premorbid level of cognitive and physical functioning when discharged from the GMU. This study was also limited by its observational nature, the small sample size, and short-term outcomes. However, the beneficial impact of the GMU on functional improvement in patients with delirium was supported by observed higher MBI gain compared with a pre-GMU cohort (mean MBI gain, 7.5 ± 11.2; discharge MBI, 45.8 ± 32.9). Data collection for 6-month and 1-year outcomes is presently in progress to determine sustainability of any improvement achieved. Our exclusion criteria limits generalizability of the benefits of the GMU to patients considered medically unstable, in whom delirium is prevalent. However, such patients are likely too ill to participate in the intense rehabilitation practiced in the GMU.

We have shown that patients with delirium can engage and benefit from a rehabilitation program, their low cognitive test scores at admission notwithstanding, suggesting that early initiation of rehabilitation should be encouraged regardless of the cognitive and functional performance at presentation. In addition, we found that patients with delirium superimposed on dementia benefit from a multicomponent delirium treatment program to the same extent as delirious patients without dementia, which may contribute to improved quality of life and reduction in burden of care. As delirium is a complex medical problem with multiple predisposing and precipitating factors, a multicomponent intervention program as practiced in the GMU is likely to yield more consistent outcomes than a single intervention strategy. With the widely reported poor prognostic significance of delirium superimposed on dementia, more well-designed controlled trials are urgently needed to identify intervention strategies that will aid the management of this group of hospitalized elders.

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