Original Article

No adverse impact of depressive symptoms on the effectiveness of postacute care service: A multicenter male-predominant prospective cohort study

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Abstract

Background: Although the clinical effectiveness of community hospital-based postacute care (PAC) services has been shown, little was known regarding the impact of depression on the clinical outcomes of older patients receiving PAC services in Taiwan.
Methods: From January 2009 to August 2010, patients aged 65 years and older referred from tertiary medical centers or acute wards of community hospitals to PAC units were invited for study. All patients received the 4-week Comprehensive Geriatric Assessment-based intervention program in the PAC units. The functional assessment was composed of Geriatric Depression Scale−Short Form (GDS), Mini-Mental Status Examination, Barthel Index, Instrumental Activities of Daily Living, and Braden Score.
Results: Among the 401 participants (mean age, 82.0 years; 95.5% males), 66 (16.5%) patients were depressed at PAC unit admission. Depressed patients had significantly lower Barthel Index (38.1 ± 2.4 vs. 47.6 ± 1.2, $p = 0.002$) and Braden Score (17.7 ± 0.3 vs. 18.8 ± 0.2, $p = 0.004$) than nondepressed patients. Improvement was noted on all measures of functional outcome among patients receiving PAC services. Furthermore, GDS was significantly improved in depressed patients (from 6.4 ± 0.2 to 2.8 ± 0.2 in depressed patients vs. from 1.6 ± 0.1 to 0.9 ± 0.1 in nondepressed patients, $p < 0.001$).
Conclusion: Depression was common when patients were newly admitted to PAC services, which was highly associated with poorer physical function. Improvement in physical function and depressive symptoms among all patients after PAC service was found, and the presence of depressive symptoms at PAC admission did not predict any adverse outcome of PAC services.
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Keywords: community hospital; depression; functional independence; intermediate care; postacute care

1. Introduction

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Population aging has become a global phenomenon, affecting both developing and developed countries, and Taiwan is no exception. Taiwan became an aging country (people aged over 65 years exceed 7% of the total population)

in 1993 and is estimated to become an aged country (percentage of elderly people exceeds 14% of the total population) in 2017, which makes Taiwan the fastest aging country in the world.[1,2] When people get older, they tend to become frail and suffer from multiple comorbid chronic conditions and disabilities.[3] Therefore, a wide range of services are needed for the multiple complex needs of older patients to promote functional recovery and physical independence, and to reduce hospital readmissions, premature long-term care facility placement, and mortality.

Intermediate care, interchangeable with postacute care (PAC), was introduced in England to support timely discharge.[4] The aim of PAC services is to improve functional independence and facilitate timely and safe transition from hospital to home, which should be delivered to patients without delay.[5] PAC services can be provided in a variety of settings, including community hospitals (CHs), nursing homes, residential care, day programs, and home-based care. Among all service models, the CH-based PAC service is cost-effective,[6] and is valued for its location, homelike environment, quiet and calm atmosphere, comfortable accommodation, encouragement of social interaction, and kind attitude of the professional care staff.[7] It has been reported that CH-based PAC services provide greater functional recovery than district general hospitals with similar cost-effectiveness.[8] In addition, CH-based PAC services also significantly reduced acute hospital readmissions without an increase in mortality or stays in institutions.[9] In Taiwan, CH-based PAC services have been developed, with their clinical effectiveness clearly shown,[10] and more characteristically, the functional improvement of PAC services significantly reduced 12-month mortality.[11]

A Canadian study revealed that major depression has become a common problem among elderly medical inpatients, with a prevalence of 14.2−44.5%.[12] In Taiwan, depression is the leading geriatric psychiatric problem, and its prevalence significantly increases with age.[13] The prevalence of major depressive disorders was 1−4% among people aged 65 years and older,[14] and it is twice as high in people older than 85 years than in those who are 70 years old.[15] In addition, depressed medical patients more often presented with a higher burden of disease-specific symptoms than nondepressed patients.[16] A number of studies have revealed that depression is associated with physical dependence, functional disabilities, poor treatment adherence, and poor rehabilitation outcomes in different settings.[16−18] Moreover, the presence of depressive symptoms was associated with higher risk of in-hospital deaths and being transferred to step-down facilities for rehabilitation.[19] Furthermore, depressive symptoms are associated with poorer rehabilitation outcomes in older patients with hip fracture or stroke participating in PAC programs.[17,20] An explanation for this is that the comorbid depressive symptoms may reflect a condition of frailty and an increase in physical burden.[17] However, the adverse impact of depressive symptoms on PAC services was not universally observed.[21] Although the clinical effectiveness of CH-based PAC services has been shown in Taiwan, little is known about the impact of depressive symptoms on the clinical outcomes of PAC services. The main purpose of this study was to evaluate the impact of depressive symptoms on clinical outcomes of PAC services among older patients admitted to PAC units in Taiwan.

2. Methods

2.1. Participants and program

All patients aged 65 years and older admitted to the PAC units in five CHs in Taiwan were enrolled for the study. These PAC units provided homelike environments that were staffed as CHs. All patients, inclusive of those referred from tertiary medical centers and acute wards of CHs, were cared for by interdisciplinary geriatric teams that had received universal training programs conducted by the Center for Geriatrics and Gerontology of Taipei Veterans General Hospital (Taipei, Taiwan). The inclusion/noninclusion criteria and the comprehensive geriatric assessment (CGA)-based intervention program have been reported previously.[11] A psychiatrist was consulted to evaluate the depressive symptoms. If the patients met the diagnosis of major depressive disorder as determined by the Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders, Fourth edition[22] or if they needed pharmacological treatment, they would be excluded. In our study, management of depressive symptoms was done primarily by nonpharmacological interventions, such as physical activities, counseling, and cognitive−behavioral therapy. The research was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of Taipei Veterans General Hospital and Kaohsiung Veterans General Hospital (Kaohsiung, Taiwan). Written informed consent was obtained from all participants after they had been provided with an adequate understanding of the study.

2.2. Outcome measurements

In this study, depressive symptoms were assessed by Geriatric Depression Scale—Short Form (GDS).[23] All patients with GDS score of ≥5 at PAC unit admission were categorized as the depressed group, and those scoring < 5 were placed in the nondepressed group.[24] Cognitive function was evaluated with the Mini-Mental State Examination (MMSE) in this study.[25] Activities of daily living were evaluated by the Barthel Index (BI),[26] and the instrumental activities of daily living (IADL) were evaluated using the Lawton−Brody Instrumental Activities of Daily Living scale.[27] The Braden Scale (BS) was used to evaluate the risk of developing pressure ulcers.[28]

2.3. Data analysis

Continuous variables are expressed as mean ± standard error, and categorical data are expressed as percentages. Comparisons between continuous variables were done using Student *t* test or Mann−Whitney *U* test, whereas comparisons

between categorical data were done using the Chi-square test or Fisher's exact test where appropriate. Comparisons of the change in functional status between depressed and nondepressed patients prior to and after receiving PAC services were analyzed using the Generalized Estimating Equations.[29] Generalized Estimating Equations models were adjusted for baseline age and education. All statistical analyses were performed using a commercial software (SPSS version 17.0 for Mac; SPSS, Inc., Chicago, IL, USA). A two-tailed p value < 0.05 was considered statistically significant.

3. Results

From January of 2009 to August of 2010, 537 patients admitted to the PAC units of five CHs in Taiwan were enrolled in this study after an initial evaluation using inclusion and noninclusion criteria. Twenty-one patients were excluded because of the diagnosis of major depression and treated with antidepressants. Among the remaining 516 patients, 115 were excluded for further analysis: 58 patients with unplanned immediate discharge, 28 with immediate acute ward readmissions, and 29 with incomplete data. The remaining 401 patients (mean age: 82.0 ± 0.2 years, 95.5% males) were recruited for the study. Among these 401 patients, 66 individuals (16.5%) were considered to be depressed, and depressed patients were more likely to have lower BI (38.1 ± 2.4 vs. 47.6 ± 1.2, $p = 0.002$) and BS (17.7 ± 0.3 vs. 18.8 ± 0.2, $p = 0.004$) compared with nondepressed participants (Table 1) at PAC unit admissions. After 4 weeks of CGA-based interdisciplinary treatment, all patients demonstrated significant functional improvement in all dimensions, including GDS, MMSE, BI, IADL, and BS while controlling for baseline age and education (Table 2; Figs. 1−5). However, depressed patients had greater improvement in GDS scores than nondepressed patients, and 82% (54/66) of depressed patients became nondepressed after PAC services. Moreover, comparisons of the functional gains in MMSE, BI, IADL, and BS were not different between depressed and nondepressed patients (Table 2; Figs. 1−5).

Table 1
Baseline characteristics of patients ($n = 401$).

	Nondepressed group ($n = 335$)	Depressed group ($n = 66$)	p
Age (y)	82.2 ± 0.3	81.2 ± 0.5	0.166
Education (y)	3.0 ± 0.1	2.9 ± 0.2	0.573
Male (%)	322 (96.1)	61 (92.4)	0.194
GDS	1.6 ± 0.1	6.4 ± 0.2	<0.001*
MMSE	18.4 ± 0.4	18.0 ± 0.8	0.637
BI	47.6 ± 1.2	38.1 ± 2.4	0.002*
IADL	1.6 ± 0.1	1.2 ± 0.2	0.087
BS	18.8 ± 0.2	17.7 ± 0.3	0.004*

Data are presented as mean ± SD.
*$p < 0.05$.
BI = Barthel Index; BS = Braden Scale; GDS = Geriatric Depression Scale—Short Form; IADL = Instrumental Activities of Daily Living scale; MMSE = Mini-Mental State Examination.

Table 2
Comparison the postacute care outcomes between depressed and nondepressed patients.

Variable[a]	Regression coefficient	Standard error	t	p
GDS				
Intercept	2.8			
Group 1 vs. Group 0	4.8	0.2	24.6	<0.001*
Visit 1 vs. Visit 0	−0.7	0.1	−6.3	<0.001*
Interaction of Visit 1 and Group	−2.9	0.3	−10.6	<0.001*
MMSE				
Intercept	25.6			
Group 1 vs. Group 0	−0.5	1.0	−0.5	0.621
Visit 1 vs. Visit 0	2.1	0.6	3.8	<0.001*
Interaction of Visit 1 and Group	−0.2	1.4	−0.1	0.893
BI				
Intercept	12.8			
Group 1 vs. Group 0	−9.1	3.1	−3.0	0.003*
Visit 1 vs. Visit 0	21.0	1.8	12.0	<0.001*
Interaction of Visit 1 and Group	3.8	4.3	0.9	0.374
IADL				
Intercept	0.6			
Group 1 vs. Group 0	−0.3	0.3	−1.3	0.183
Visit 1 vs. Visit 0	1.1	0.1	8.0	<0.001*
Interaction of Visit 1 and Group	−0.1	0.4	−0.3	0.743
BS				
Intercept	16.1			
Group 1 vs. Group 0	−1.0	0.3	−3.0	0.003*
Visit 1 vs. Visit 0	1.9	0.2	9.5	<0.001*
Interaction of Visit 1 and Group	0.6	0.5	1.3	0.199

*$p < 0.05$. Generalized Estimating Equations (GEE) model was adjusted for baseline age and education.
BI = Barthel Index; BS = Braden Scale; GDS = Geriatric Depression Scale—Short Form; IADL = Instrumental Activities of Daily Living scale; MMSE = Mini-Mental State Examination.
[a] Group 1, for the depressive group; 0, for the nondepressive group. Visit 0, for the baseline; 1 for the 4th week. Intercept, baseline score of the nondepressive group. Group 1 vs. Group 0, difference between depressive and nondepressive groups at baseline. Visit 1 vs. Visit 0, change between visit 0 and visit 1 in nondepressive group. Interaction of Visit 1 and Group, difference between depressive and nondepressive groups in change Visit 0 − Visit 1. The change in the depressive group is given by the change in the nondepressive group plus the interaction term.

4. Discussion

In this study, the presence of depressive symptoms was significantly associated with poorer physical function. Although the depressed patients had statistically lower BS scores at admission, both the depressed and nondepressed groups had higher BS scores (above 16 points), which indicates a lower risk of pressure sore,[28] and therefore, no significant difference in the clinical risk of pressure sore between the groups was noted. After CGA-based interdisciplinary geriatric services in PAC units, improvement of function was clearly shown in all dimensions among all patients with or without depression. Furthermore, depressive symptoms were significantly improved by PAC services in the depressed group, and functional recovery in other dimensions did not differ between depressed and nondepressed patients. The results of this study imply that CGA-based interdisciplinary care in PAC units can significantly promote functional recovery in all dimensions regardless of the presence of depressive
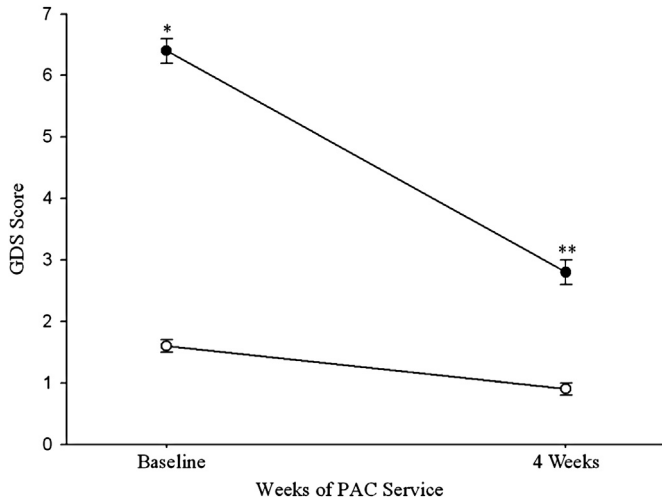
Fig. 1. Changes of GDS scores with PAC service in depressed and nonde-pressed groups. Total score (mean ± standard error) is presented for the nondepressed group (black bar) and the depressed group (gray bar). *$p < 0.05$ indicates significant differences at baseline between depressed and nonde-pressed groups. **$p < 0.05$ indicates significant differences in change at 4-week service (compared to baseline) between depressive and nondepressive groups. GDS = Geriatric Depression Scale—Short Form; PAC = postacute care.

Fig. 3. Changes of BI scores during PAC services among depressed and nondepressed groups. The total score (mean ± standard error) is presented for the nondepressed group (black bar) and the depressed group (gray bar). *$p < 0.05$ indicates significant differences at baseline between depressed and nondepressed groups. BI = Barthel Index; PAC = postacute care.

symptoms, and depressive symptoms in this setting can be successfully managed. Therefore, the presence of depressive symptoms at PAC admission did not predict the adverse outcome of PAC services.

The prevalence of depressive symptoms in PAC units in England was 38%[30] and was 27.8% in nursing homes in the United States,[21] which were higher than that in this study. The relatively lower prevalence of depression in this study (16.5 %) may be caused by the potential nonparticipation of patients with severe depression or the suppression of expression about depressive mood in traditional Chinese culture.[31] Although a reciprocal relationship between depression and
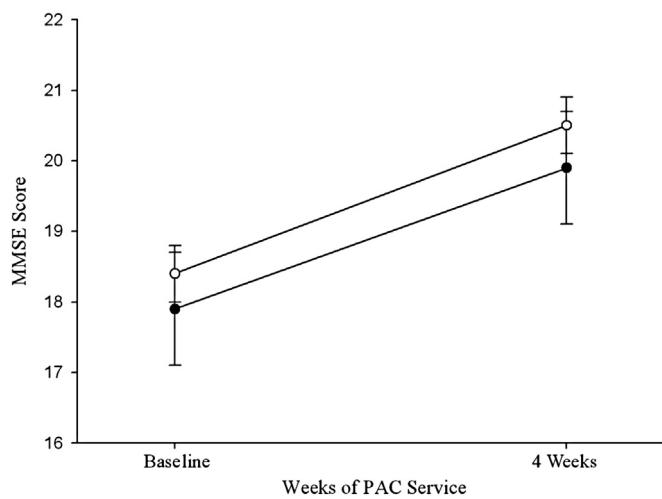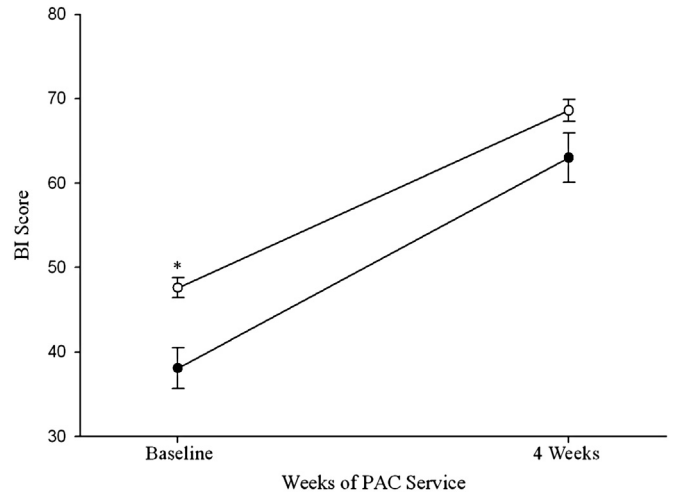
physical disability in older people has been shown, disability and depressive symptoms can eventually be mutually rein-forcing over time.[32] A large-scale prospective study enrolling 17,593 older adults from 11 European countries has shown that depressive symptoms were improved along with the improvement of physical activities.[33] The results of this study were compatible with those of the above-mentioned studies, in that the presence of depressive symptoms was associated with poorer physical function at PAC unit admission. Nevertheless, this study showed that physical, mental function, and depres-sive symptoms can be improved mutually among patients with and without depression during PAC services.

Although depression has been recognized as a predictive factor for poorer clinical outcomes, this study clearly showed

Fig. 2. Changes of MMSE scores during PAC services among depressed and nondepressed groups. The total score (mean ± standard error) is presented for the nondepressed group (black bar) and the depressive group (gray bar). MMSE = Mini-Mental State Examination; PAC = postacute care.
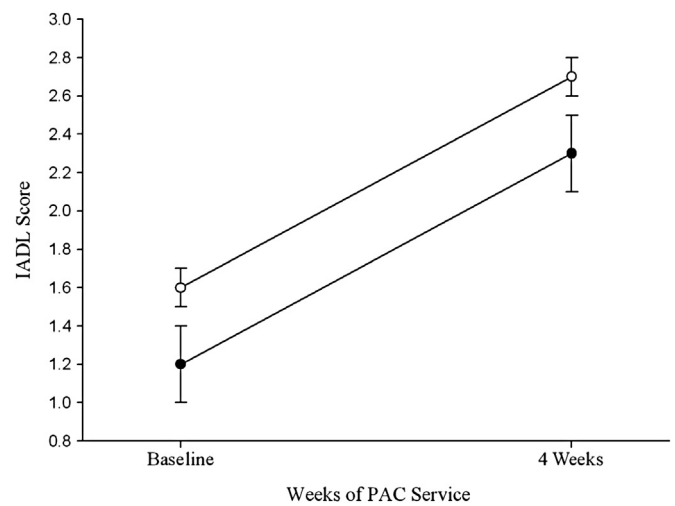

Fig. 4. Changes in IADL scores during PAC services among depressed and nondepressed groups. The total score (mean ± standard error) is presented for the nondepressed group (black bar) and the depressed group (gray bar). IADL = Instrumental Activities of Daily Living; PAC = postacute care.
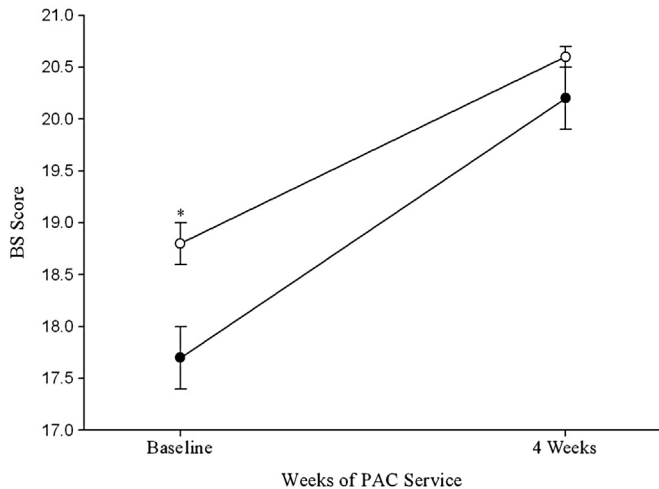
Fig. 5. Changes of BS scores during PAC services among depressed and nondepressed groups. The total score (mean ± standard error) is presented for the nondepressed group (black bar) and the depressed group (gray bar). *p < 0.05 indicates significant differences at baseline between depressed and nondepressed groups. BS = Braden Scale; PAC = postacute care.

that depressive symptoms at PAC unit admission may not hinder the functional improvement, and that depressive symptoms *per se* can be successfully treated by CGA-based interdisciplinary interventions. Therefore, it is worth screening for and actively treating depressive symptoms in PAC units. An association between rehabilitation outcome and mood status has been reported, whereas depression adversely influenced rehabilitation goal attainment.[17,19,20] It is possible that depressive symptoms exert a direct impact on functionary recovery through inability, less efficiency, or loss of motivation to participate in rehabilitation programs, or medical or nursing management.[16,18,34] Nevertheless, the negative impact of depression may be overcome by CGA-based interdisciplinary intervention from results of this study. Staff with sufficient knowledge of depression recognition is of great importance, and PAC services that encourage patients to actively participate in all treatment programs also reduce their depressive symptoms. Moreover, the depression symptoms of patients receiving PAC services may be caused by the depressogenic effects of physical disabilities of medical illnesses, so the PAC services promoting function recovery also help to reduce depressive symptoms. There is ample evidence suggesting that chronic medical condition-related disabilities may result in the onset and chronicity of depressive symptoms.[35,36] Late-life depression may be partly attributable to functional limitations caused by physical diseases, especially if these limitations have reduced the individual's ability to engage in usual social activities and contacts.[35,36] Because the CH-based PAC services aim to promote functional independence,[9,11] better functional recovery may also reverse the depressogenic effects related to the physical limitations caused by medical conditions.

There are several limitations of this study. First, because this study was not a randomized controlled trial, it is not clear whether the depressive symptoms would have improved by themselves 4 weeks after the patients had been referred to the CHs. Furthermore, the participants may have a stronger motivation to make use of PAC services and, therefore, the benefits of PAC services in functional recovery may be somewhat overestimated owing to the potential nonparticipation of patients with severe depression. However, because of the proven clinical effectiveness of PAC services, it is difficult to conduct randomized controlled trials for ethical considerations. Second, it is plausible that patients with severe depression may have refused to participate in the study, so the impact of CH-based PAC services on severe depression remains to be determined. Third, selection bias cannot be ruled out, not only because those patients with more severe depressive symptoms may not have participated in this study, but also because there were 28 patients excluded from this study due to immediate acute ward readmission. Those 28 patients might not have responded to the PAC care so favorably as the 401 study participants did. Fourth, our study enrolled mostly male Chinese patients (95.5% male). Female patients may respond differently to PAC treatment, and generalizations of our findings to other populations should not be made. Finally, our study did not enroll patients who met the inclusion criteria but chose not to participate in the PAC program, and further compared the difference between patients under PAC services and those who were not. Therefore, we could not exclude the possibility that the improvement of our assessments may be attributed to the natural course of the illness itself. Future studies are necessary to explore this issue.

In conclusion, the presence of depressive symptoms is common at admission to PAC units and associated with poorer functional status. CH-based PAC services significantly promote functional recovery regardless of depressive symptoms, and depressive symptoms *per se* can be successfully managed by the CGA-based interdisciplinary care in PAC units. Because the depressive symptoms have no adverse impact on the effectiveness of PAC service, patients with depressive symptoms should not necessarily be excluded from such service.

Acknowledgments

References

1. Chen LK. A new era of research on clinical gerontology and geriatrics in Asia. *J Clin Gerontol Geriatr* 2010;**1**:1.
2. Chen CY. Meeting the challenges of eldercare in Taiwan's aging society. *J Clin Gerontol Geriatr* 2010;**1**:2−4.
3. Covinsky KE, Palmer RM, Fortinsky RH, Counsell SR, Stewart AL, Kresevic D, et al. Loss of independence in activities of daily living in older adults hospitalized with medical illnesses: increased vulnerability with age. *J Am Geriatr Soc* 2003;**51**:451−8.
4. Steiner A. Intermediate care—a good thing? *Age Ageing* 2001;**30**:33−9.
5. Young J, Green J. Effects of delays in transfer on independence outcomes for older people requiring postacute care in community hospitals in England. *J Clin Gerontol Geriatr* 2010;**1**:48−52.

6. Young J. The development of intermediate care services in England. *Arch Gerontol Geriatr* 2009;**49**(Suppl. 2):S21−5.

7. Green J, Forster A, Young J, Small N, Spink J. Older people's care experience in community and general hospitals: a comparative study. *Nurs Older People* 2008;**20**:33−9.

8. Green J, Young J, Forster A, Mallinder K, Bogle S, Lowson K, et al. Effects of locality based community hospital care on independence in older people needing rehabilitation: randomised controlled trial. *BMJ* 2005;**331**:317−22.

9. Garasen H, Windspoll R, Johnsen R. Intermediate care at a community hospital as an alternative to prolonged general hospital care for elderly patients: a randomised controlled trial. *BMC Public Health* 2007;**7**:68−76.

10. Lee WJ, Peng LN, Cheng YY, Liu CY, Chen LK, Yu HC. Effectiveness of short-term interdisciplinary intervention on postacute patients in Taiwan. *J Am Med Dir Assoc* 2011;**12**:29−32.

11. Chen LK, Chen YM, Hwang SJ, Peng LN, Lin MH, Lee WJ, et al. Effectiveness of community hospital-based post-acute care on functional recovery and 12-month mortality in older patients: a prospective cohort study. *Ann Med* 2010;**42**:630−6.

12. McCusker J, Cole M, Dufouil C, Dendukuri N, Latimer E, Windholz S, et al. The prevalence and correlates of major and minor depression in older medical inpatients. *J Am Geriatr Soc* 2005;**53**:1344−53.

13. Chou KL, Chi I. Prevalence and correlates of depression in Chinese oldest-old. *Int J Geriatr Psychiatry* 2005;**20**:41−50.

14. Blazer DG. Depression in late life: review and commentary. *J Gerontol A Biol Sci Med Sci* 2003;**58**:249−65.

15. Palsson SP, Ostling S, Skoog I. The incidence of first-onset depression in a population followed from the age of 70 to 85. *Psychol Med* 2001;**31**:1159−68.

16. Ciechanowski PS, Katon WJ, Russo JE. Depression and diabetes: impact of depressive symptoms on adherence, function, and costs. *Arch Intern Med* 2000;**27**(160):3278−85.

17. Morghen S, Bellelli G, Manuele S, Guerini F, Frisoni GB, Trabucchi M. Moderate to severe depressive symptoms and rehabilitation outcome in older adults with hip fracture. *Int J Geriatr Psychiatry* 2011;**26**:1136−43.

18. Alexopoulos GS, Buckwalter K, Olin J, Martinez R, Wainscott C, Krishnan KR. Comorbidity of late life depression: an opportunity for research on mechanisms and treatment. *Biol Psychiatry* 2002;**52**:543−58.

19. Cullum S, Metcalfe C, Todd C, Brayne C. Does depression predict adverse outcomes for older medical inpatients? A prospective cohort study of individuals screened for a trial. *Age Ageing* 2008;**37**:690−5.

20. Becker G, Kruse A, Tronnier J, Roepke-Brandt B, Natus A, Theissen H, et al. Rehabilitation processes and sustainability: first results of a rehabilitation study of geriatric stroke patients. *Z Gerontol Geriatr* 2006;**39**:365−70.

21. Webber AP, Martin JL, Harker JO, Josephson KR, Rubenstein LZ, Alessi CA. Depression in older patients admitted for postacute nursing home rehabilitation. *J Am Geriatr Soc* 2005;**53**:1017−22.

22. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders*. 4th ed. Washington, DC: American Psychiatric Association; 1994.

23. Liu CY, Lu CH, Yu S, Yang YY. Correlations between scores on Chinese versions of long and short forms of the Geriatric Depression Scale among elderly Chinese. *Psychol Rep* 1998;**82**:211−4.

24. Burke WJ, Roccaforte WH, Wengel SP. The short form of the Geriatric Depression Scale: a comparison with the 30-item form. *J Geriatr Psychiatry Neurol* 1991;**4**:173−8.

25. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res* 1975;**12**:189−98.

26. Collin C, Wade DT, Davies S, Horne V. The Barthel ADL Index: a reliability study. *Int Disabil Stud* 1988;**10**:61−3.

27. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. *Gerontologist* 1969;**9**:179−86.

28. Bergstrom N, Demuth PJ, Braden BJ. A clinical trial of the Braden Scale for predicting pressure sore risk. *Nurs Clin North Am* 1987;**22**:417−28.

29. Zeger SL, Liang KY. An overview of methods for the analysis of longitudinal data. *Stat Med* 1992;**11**:1825−39.

30. Yohannes AM, Baldwin RC, Connolly MJ. Prevalence of depression and anxiety symptoms in elderly patients admitted in post-acute intermediate care. *Int J Geriatr Psychiatry* 2008;**23**:1141−7.

31. Chan B, Parker G. Some recommendations to assess depression in Chinese people in Australasia. *Aust N Z J Psychiatry* 2004;**38**:141−7.

32. Ormel J, Rijsdijk FV, Sullivan M, van Sonderen E, Kempen GI. Temporal and reciprocal relationship between IADL/ADL disability and depressive symptoms in late life. *J Gerontol B Psychol Sci Soc Sci* 2002;**57**:338−47.

33. Lindwall M, Larsman P, Hagger MS. The reciprocal relationship between physical activity and depression in older European adults: a prospective cross-lagged panel design using share data. *Health Psychol* 2011;**30**:453−62.

34. Gillen R, Tennen H, McKee TE, Gernert-Dott P, Affleck G. Depressive symptoms and history of depression predict rehabilitation efficiency in stroke patients. *Arch Phys Med Rehabil* 2001;**82**:1645−9.

35. Prince MJ, Harwood RH, Thomas A, Mann AH. A prospective population-based cohort study of the effects of disablement and social milieu on the onset and maintenance of late-life depression. The Gospel Oak Project VII. *Psychol Med* 1998;**28**:337−50.

36. Zeiss AM, Lewinsohn PM, Rohde P, Seeley JR. Relationship of physical disease and functional impairment to depression in older people. *Psychol Aging* 1996;**11**:572−81.