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Original Study

Hospital-at-home Integrated Care Program for Older Patients With Orthopedic Processes: An Efficient Alternative to Usual Hospital-Based Care

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A B S T R A C T

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Objective: To compare outcomes and costs for patients with orthogeriatric conditions in a home-based integrated care program versus conventional hospital-based care.

Design: Quasi-experimental longitudinal study.

Setting: An acute care hospital, an intermediate care hospital, and the community of an urban area in the North of Barcelona, in Southern Europe.

Participants: In a 2-year period, we recruited 367 older patients attended at an orthopedic/traumatology unit in an acute hospital for fractures and/or arthroplasty.

Intervention: Patients were referred to a hospital-at-home integrated care unit or to standard hospital-based postacute orthogeriatric unit, based on their social support and availability of the resource.

Measurements: We compared home-based care versus hospital-based care for Relative Functional Gain (gain/loss of function measured by the Barthel Index), mean direct costs, and potential savings in terms of reduction of stay in the acute care hospital.

Results: No differences were found in Relative Functional Gain, median (Q25-Q75) = 0.92 (0.64-1.09) in the home-based group versus 0.93 (0.59-1) in the hospital-based group, $P = .333$. Total health service direct cost [mean (standard deviation)] was significantly lower for patients receiving home-based care: €7120 (3381) versus €12,149 (6322), $P < .001$. Length of acute hospital stay was significantly shorter in patients discharged to home-based care [10.1 (7)] than in patients discharged to the postacute orthogeriatric hospital-based unit [15.3 (12) days, $P < .001$].

Conclusion: The hospital-at-home integrated care program was suitable for managing older patients with orthopedic conditions who have good social support for home care. It provided clinical care comparable to the hospital-based model, and it seems to enable earlier acute hospital discharge and lower direct costs.

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The progressive aging of the population and the consequent increase in the prevalence and incidence of chronic diseases in developed societies represent a challenge for health systems, not only

because health expenditure per capita increases with age but also because planning services to care for patients with chronic conditions is complex.^{1,2} To meet this challenge, various multidisciplinary interventions have been developed to maximize autonomy and to prevent hospitalization and institutionalization, especially in frail older patients.^{3–5} Recent studies and reviews show that integrated management, combining health-rehabilitative home hospitalization services, is effective in enabling early discharge or preventing

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admission in older patients with acute disabling processes such as stroke, hip fracture, or medical exacerbations.^{6–9} However, in Southern Europe, there is insufficient evidence on the efficiency of this approach compared to conventional geriatric care in which acute hospitalization is followed by rehabilitation in intermediate care settings until community reinsertion.

We developed a program of home-based integrated geriatric care and rehabilitation for the management of older patients with disabling health conditions.¹⁰ The Hospital-at-home Integrated Care Programme was found to be especially effective in hip fracture patients discharged early from the orthopedics ward of our acute hospital.¹¹ In the present study, we aimed to assess whether the postacute hospital-at-home program results in savings for the health system, compared with hospital-based postacute orthogeriatric care without negative effects on rehabilitation efficacy or hospital readmission.

Methods

The Catalan health system has been providing home-based rehabilitation services (rehabilitation physicians, physiotherapists, occupational therapists, and speech therapists) through expert community rehabilitation teams since 2006.¹² In 2009, in Badalona, Catalonia's third-largest city (240,000 inhabitants), an innovative program transferred medical follow-up, postacute health care, and rehabilitation programs for orthogeriatric, medical, and stroke patients from the acute care hospital to an expert hospital-at-home team from the department of geriatrics of Badalona Serveis Assistencials as an alternative to hospitalization for intermediate care, promoting home discharge to free up acute hospital beds. This program established a comprehensive health care program to manage acute care, postacute care, and rehabilitation services in patients' homes in which an integrated community care team, comprising geriatricians and geriatric nurses from the hospital-at-home acute hospitalization unit, and a community rehabilitation team coordinated by a home rehabilitation company, Corporación Fisiogestión, and provide care equivalent to that provided by postacute orthogeriatric units in the intermediate care hospital. The program included shared therapeutic plans established at weekly meetings attended by the entire team to review individualized therapeutic goals and plans.

Study Population

During a 2-year period, we recruited patients aged >65 years, attended by an acute orthopedic surgery/traumatology unit (at the emergency department or at hospitalization ward) after a fracture or arthroplasty. Inclusion criteria were good orthopedic prognosis, decline in functional status in relation to baseline characteristics, susceptible to rehabilitative treatment and clinical status sufficiently stable to enable active participation in a rehabilitation program. On discharge from the acute orthopedic surgery/traumatology unit, patients who met the inclusion criteria were admitted to the hospital-at-home integrated care unit (HHU) if an effective primary caregiver was willing to accept responsibility for the home-based program and the patient agreed to hospitalization at home. Otherwise, patients were admitted to the hospital-based postacute geriatric rehabilitation unit (GRU). Age, main diagnosis, Charlson index,¹³ and number of geriatric syndromes show the clinical orthogeriatric profile of both groups.

Treatment

The HHU intervention focused on managing the timely transfer from the acute hospital to the patient's home and providing multidisciplinary care from the first geriatrics rehabilitation team visit to the patient's home. All patients underwent Comprehensive Geriatric

Assessment to develop a care plan focusing on cardiorespiratory function and nutritional status, detection of delirium and cognitive impairment, treatment of pain, and prevention of pressure ulcers. Rehabilitation assessment considered the need to apply techniques to reduce joint stiffness, strengthen muscles, reduce edema and pain, reeducate transfers and basic activities of daily living, and recover the ability to walk. Moreover, the patient's need for technical assistance to improve everyday activities and to deal with the physical environment was assessed. Nursing visits were limited to 7 per week; physiotherapy and occupational therapy sessions were limited to 5 per week. Each therapy visit lasted 35 to 45 minutes.

Patients in the GRU group received the same geriatric assessment and nursing care, as well as physiotherapy and occupational therapy following hospital ward guidelines (maximum duration 1 hour per session, limited to 5 sessions per week).

To manage exacerbations of chronic conditions (eg, infection, medical decompensation, and cognitive fluctuation) without referring patients to the acute hospital emergency department, both units had access to diagnostic techniques (laboratory and imaging tests) and acute treatments (eg, intravenous antibiotics, corticoids, and diuretics, nebulizers for bronchodilator therapies) from the acute hospital.

Outcome Measurements

We compared HHU and GRU on 3 aspects: (a) degree of functional recovery; (b) direct cost of care; and (c) resource savings resulting from a reduction in acute hospital stay.

Degree of functional recovery

To assess limitations in activities of daily living, we used the Barthel Index (BI).^{14,15} To measure Relative Functional Gain we used the Heinemann Index¹⁶ for calculating the functional gain/loss ratio, where functional gain was the difference between Barthel Index at end of treatment and at admission, and functional loss was the difference between Barthel Index at preadmission and at admission. Functional recovery was also analyzed separately in 3 clinical subgroups: patients with hip fractures, patients who had undergone arthroplasty, and patients with other fractures (upper extremities, vertebrae, or pelvis).

Direct cost

The total cost of care per patient was calculated by multiplying the resources used by the unit cost of each resource (Table 1). The cost of acute hospitalization in the orthopedics ward was estimated by

Table 1
Unit Cost Calculated for HHU and GRU Groups

Unit Cost	Cost per Patient (Euros/Unit)	
	HHU*	GRU†
Stay at acute hospital‡ (euros per day)		
Up to 5 d	680	680
More than 5 d	485	485
Cost per day, except HHU rehabilitation staff (per visit)		
Rehabilitation physician	33‡	9.04
Physiotherapist	20‡	3.54
Occupational therapist	20‡	1.06
Nursing staff	12.9	21.74
Geriatrician	10.6	9.04
Orderlies	—	2.45
Nurse assistant	—	29.84

*Accounting source: Badalona Serveis Assistencials geriatric services and home rehabilitation service provider Corporación Fisiogestión.

†Accounting source: Badalona Serveis Assistencials geriatric services.

‡Source: Public rates from the Department of Health of Catalonia.

§Rehabilitation staff for HHU.

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