

Original

Cost-utility analysis of an integrated care model for multimorbid patients based on a clinical trial

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ARTICLE INFO

Article history:

Received 2 February 2016

Accepted 3 May 2016

Available online xxx

Keywords:

Comorbidity

Cost-benefit analysis

Integrated healthcare

Clinical trial

ABSTRACT

Objective: To conduct a cost-utility analysis on an integrated healthcare model comprising an assigned internist and a hospital liaison nurse for patients with multimorbidity, compared to a conventional reactive healthcare system.

Methods: A cluster randomised clinical trial was conducted. The model consisted of a reference internist and a liaison nurse, who aimed to improve coordination and communication between levels and to enhance continuity of care after hospitalisation. We recorded sociodemographic data, diagnoses and corresponding clinical categories, functional status, use of healthcare resources and quality of life. Data were collected by reviewing electronic medical records and administering questionnaires. We performed univariate and multivariate analyses both for utilities and total costs. Bootstrapping methods were applied to calculate the confidence ellipses of incremental costs and efficiency.

Results: We recruited a total of 140 patients. The model assessed was not found to be efficient in general. We found an incremental cost of €1,035.90 and an incremental benefit of -0.0762 QALYs for the initiative compared to standard care after adjusting for the main variables. However, the subgroup of patients under 80 years of age with three or more clinical categories resulted in an 89% cost saving in the simulations.

Conclusions: The integrated model was not suitable for all study patients. However, the subgroup analysis identified a narrow target population that should be analysed in future studies.

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Análisis de coste-utilidad de un modelo de atención integrada a pacientes pluripatológicos basado en un ensayo clínico

RESUMEN

Objetivo: Evaluar en términos de coste-utilidad un modelo de atención integrada a pacientes pluripatológicos basado en el internista de referencia y la enfermera de enlace hospitalario, comparado con un sistema asistencial convencional reactivo por episodios.

Métodos: Se realizó un ensayo clínico aleatorizado por conglomerados. La intervención se basó en un internista de referencia y una enfermera de enlace hospitalario. Ambos trabajaron en la coordinación y la comunicación entre niveles y en la mejora de la continuidad de cuidados después de un ingreso. Se recogieron datos sociodemográficos y los diagnósticos con sus correspondientes categorías clínicas, así como el estado funcional, la utilización de recursos y la calidad de vida. Se utilizaron los registros electrónicos médicos existentes y cuestionarios administrados. Se realizaron análisis univariados y multivariados tanto para las utilidades como para los costes totales. Mediante *bootstrapping* se calcularon las elipses de confianza de los costes incrementales y la eficiencia.

Resultados: Se incluyeron en el estudio 140 pacientes. En general, la intervención no resultó eficiente. El coste incremental de la intervención frente al modelo convencional fue de 1035,90 € y la efectividad incremental fue de -0,0762 años de vida ajustados por calidad, al ajustar los datos por las variables más relevantes. Sin embargo, el subgrupo de pacientes menores de 80 años con tres o más categorías clínicas ahorró costes en el 89% de las simulaciones.

Conclusiones: La intervención integrada no resultó adecuada para todos los pacientes objetivo; no obstante, el análisis de subgrupos permitió identificar una población objetivo más concreta que debería ser analizada en estudios futuros.

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Palabras clave:

Comorbilidad

Análisis de coste-beneficio

Asistencia sanitaria integrada

Ensayo clínico

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<http://dx.doi.org/10.1016/j.gaceta.2016.05.002>

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Introduction

The number of patients with multimorbidity is becoming so high that if it is not properly addressed, care for them will soon become unsustainable.^{1,2} Two common characteristics are that their health problems cannot be cured and that their health status is progressively deteriorating.³ In order to improve their care, Yáñez-Cadena et al.⁴ have underlined the need to adopt a systematic approach to design programs that combine organizational strategies and self-care. The provision of care to these patients is an excellent opportunity for innovation in healthcare integration based on the current healthcare structure, avoiding fragmentation of healthcare, but without excessive structural changes.⁵

In January 2011, in the Basque Country (Spain), the integrated healthcare organization was established for bringing together the primary and specialized care.⁶ In this context, an integrated model was introduced, based around an assigned internist and a hospital liaison nurse. However, the effectiveness of multifaceted interventions for preventing the functional decline of elderly patients is still controversial.⁷ In a review of the literature, Smith et al.⁸ underlines the need to develop efficient interventions for patients with multimorbidity. To our knowledge, there are no published studies having demonstrated that they are really more efficient than usual care, and none assessing their economic impact in Spain. Generally, it is assumed that these models increase the efficiency and the quality of care provided to patients, and also that they are efficient. However, there is a lack of systematic evaluation, including the assessment of the relative costs and benefits. High quality evidence from well-designed studies is required to supporting decision making on the long-term funding of particular types of integrated care interventions.⁹

The objective of this study was to assess whether an integrated care model for patients with multimorbidity, based on an assigned internist and a hospital liaison nurse, is efficient compared to the current system based on episodic reactive care.

Methods

Study design

We carried out a cost-utility analysis based on a prospective and multi-center cluster randomized trial, with two groups of patients with multimorbidity, randomized by doctor's list. Cluster randomization trials are experiments in which intact social units or clusters of individuals rather than independent individuals are randomly allocated to intervention groups. As the organizational change was naturally applied at the cluster level we applied in our study this design to avoid treatment group contamination. This approach did not incorporate blinding and therefore its results showed a lower level of evidence.¹⁰ The participating providers were the seven primary healthcare centers of the Goierri-Alto Urola health district, together with the referral hospital, Zumarraga hospital. Patients' randomization was based on the primary care clinicians' randomization carried out before this study started. Patients were recruited consecutively from each health center when they met three inclusion criteria: to have at least one hospitalization episode during the past year, to be classified as multimorbid patients according to the criteria of the Junta de Andalucía² and to have given written informed consent. Exclusion criteria included patient refusal to participate in the study, living in a nursing home or being on hemodialysis. A total of 140 patients were recruited, 70 in each group. The duration of the intervention period in this study was 1-year.

Intervention

The intervention was focused on the management of care for these patients. That is, we did not change the type of clinical care provided. The intervention consisted on the implementation of an integrated health care model for multimorbid patients based on improving communication between primary care and hospital professionals. Specifically, intervention group (IG) multimorbid patients were managed by the primary care team (general practitioner and nurse) with the support of a reference internist and a liaison nurse. Reference internist gave direct support in the Health Centre and ensured smooth and flexible communication with primary care doctors. Moreover, every time patients with multimorbidity went to the hospital they were seen by their assigned internist, regardless of the required service. As soon as the patient was identified as being multimorbid the liaison nurse carried out a complete assessment (clinical, functional, psychosocial and quality of life). This information was aimed to enhance continuity of care after hospitalization in coordination with primary care to avoid re-hospitalizations. Furthermore, the liaison nurse provided health education to improve self-management of each specific disease. In the control group (CG), patients received usual care corresponding to routine practice, with no strengthening of the coordination between primary and hospital-based care. The protocol was approved by the local ethics committee.

Study variables

We collected data from medical records on the following demographic and clinical variables: age, sex, referral health center, and clinical diagnoses, as well as the corresponding clinical categories. Data about resources consumption during 12 months included hospital admissions, emergency department attendances, visits to specialists, visits to primary care doctors and nurses and diagnostic tests recorded in the Osakidetza-Basque Health Service data base. In addition, we recorded Barthel Index scores,¹¹ as a measure of functional status regarding basic activities of daily living at baseline; and EuroQol (EQ-5D) utility scores,¹² as a measure of quality of life at baseline and the end of the study period, that is, before and 1 year after implementation of the new model.

Estimation of cost and quality-adjusted life years

We calculated for each patient cost and quality-adjusted life years (QALYs) during the 12 months follow-up. For estimating costs, we multiplied the rates of resources use by the unit cost obtained from the Accounting Department (stay day: €414.00/day; emergency department consultation: €140.69; 24-hour health clinic consultation: €39.01; specialized consultation: €141.04; primary care consultation: €23.11; home care visit: €69.32; CT scan: €77.63; and ultrasound scan: €33.46). The cost of the intervention per attended patient (€341.68) was calculated by dividing the salary of the liaison nurse by the number of patients under her care.

For the estimation of QALYs, we considered scores on the EQ-5D questionnaire before and 1 year after introduction of the intervention. The efficiency for each period of the intervention was calculated with area under the curve analysis, assuming linear interpolation between consecutive time points and taking into account the follow-up period for all patients included.¹³

Statistical analysis

First, we tested the randomness of the samples, univariate analysis was performed using the chi-squared test or Fisher's exact test to identify any socio-demographic or diagnostic variables that

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