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Cost-Effectiveness of Early Assisted Discharge for COPD Exacerbations in The Netherlands

Lucas M.A. Goossens, PhD[1,], Cecile M.A. Utens, PhD[2,3], Frank W.J.M. Smeenk, MD, PhD[3], Onno C.P. van Schayck, PhD[2], Monique van Vliet, MD[4], Walter van Litsenburg, MANP[3], Maria W. Braken, BSN[5], Maureen P.M.H. Rutten-van Mölken, PhD[1]*

[1]*Institute for Medical Technology Assessment, Erasmus University, Rotterdam, The Netherlands;* [2]*Department of General Practice, CAPHRI School for Public Health and Primary Care, Maastricht University, Maastricht, The Netherlands;* [3]*Department of Respiratory Medicine, Catharina Hospital, Eindhoven, The Netherlands;* [4]*Department of Respiratory Medicine, Atrium Medical Center, Heerlen, The Netherlands;* [5]*Zuidzorg Homecare Organization, Veldhoven, The Netherlands*

ABSTRACT

Objectives: Hospital admissions for exacerbations of chronic obstructive pulmonary disease are the main cost drivers of the disease. An alternative is to treat suitable patients at home instead of in the hospital. This article reports on the cost-effectiveness and cost-utility of early assisted discharge in The Netherlands. **Methods:** In the multicenter randomized controlled Assessment of GOing Home under Early Assisted Discharge trial (n = 139), one group received 7 days of inpatient hospital treatment (HOSP) and one group was discharged after 3 days and treated at home by community nurses for 4 days. Health care resource use, productivity losses, and informal care were recorded in cost questionnaires. Microcosting was performed for inpatient day costs. **Results:** Seven days after admission, mean change from baseline Clinical Chronic Obstructive Pulmonary Disease Questionnaire score was better for HOSP, but not statistically significantly: 0.29 (95% confidence interval [CI] −0.04 to 0.61). The difference in the probability of having a clinically relevant improvement was significant in favor of HOSP: 19.0%-point (95% CI 0.5%–36.3%). After 3 months of follow-up, differences in effectiveness had almost disappeared. The difference in quality-adjusted life-years was 0.0054 (95% CI −0.021 to 0.0095). From a health care perspective, early assisted discharge was cost saving: −€244 (treatment phase, 95% CI −€315 to −€168) and −€168 (3 months, 95% CI −€1253 to €922). Societal perspective: −€65 (treatment phase, 95% CI −€152 to €25) and €908 (3 months, 95% CI −€553 to €2296). The savings per quality-adjusted life-year lost were €31,111 from a health care perspective. From a societal perspective, HOSP was dominant. **Conclusions:** No clear evidence was found to conclude that either treatment was more effective or less costly.

Keywords: COPD exacerbations, cost-effectiveness, early assisted discharge, hospital-at-home.

Introduction

Hospital admissions for exacerbations of chronic obstructive pulmonary disease (COPD) are important drivers of the high treatment costs for the disease [1–5]. These admissions put great pressure on scarce hospital beds of respiratory wards, especially during winter months [6]. From an economic and organizational point of view, it may be attractive to treat suitable patients at home instead of in the hospital, if this is medically possible and responsible.

Treatment schemes in which patients are treated and supervised at home, as an alternative to usual hospital treatment, are often called hospital-at-home [7,8]. These schemes may either avoid admission completely or discharge patients from the hospital early and continue treatment at home.

Studies on the costs and cost-effectiveness of hospital-at-home services for patients with a COPD exacerbation have shown varying results. Shepperd et al. [9] concluded that a particular scheme in England led to significantly higher costs, whereas Skwarska et al. [10] found cost savings in a different scheme in the same country. Significant cost savings were reported for hospital-at-home services in Australia [3], Spain [11,12], and the United States [13]. The results of an Italian study were inconclusive [14].

Although these studies were performed in different countries and in different health care systems, they had some aspects in common. First, they all took a health care perspective; the costs or value of resources used outside of the health care sector were not taken into account. Second, the length of treatment was variable in each study. Physicians and/or nurses decided on the timing of discharge from the hospital or from treatment at home, depending on the patient's recovery.

The current article reports on the cost-effectiveness and cost-utility of an early discharge scheme that is different in the two aspects mentioned above. The study was performed in The Netherlands as part of the Assessment of GOing Home under Early Assisted Discharge trial. In this multicenter randomized

* *Address correspondence to:* Lucas M.A. Goossens, Institute for Medical Technology Assessment, Erasmus University, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands.

E-mail: goossens@bmg.eur.nl.

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controlled trial, one group of patients with COPD received usual inpatient hospital treatment for 7 days. The other group was discharged after 3 days and was treated and supervised at home for the remaining 4 days. The Netherlands has a nationwide infrastructure for community nursing provided by homecare organizations. Dutch hospitals do not deliver health care in the community. Therefore, the care at home in this trial was provided by community-based homecare organizations that mostly employ generically trained nurses and few specialized nurses. The clinical results of this study have been presented in detail elsewhere [15].

Methods

Study Design

The Assessment of GOing Home under Early Assisted Discharge study was a randomized, controlled, multicenter trial comparing two management strategies for patients admitted to the hospital for a COPD exacerbation [16]. After 3 days of usual hospital treatment, patients were randomized to be either discharged home with homecare or continue hospital treatment. The total duration of this initial treatment phase was 7 days for both groups, unless the treatment failed and patients had to be either readmitted or had to prolong their hospital stay. Patients were followed for 3 months, with outcome measurements scheduled after 7 days and 3 months.

Patients

Patients admitted to one of the participating hospitals because of an exacerbation of their COPD were screened for eligibility. On the day of admission, they were considered potentially eligible for early discharge if they met the following inclusion criteria: age 40 years or older, sufficiently competent to consider informed consent, and a smoking history of 10 or more pack-years. To be randomized on day 3 of the admission, their physical and respiratory complaints (dyspnea, wheezing, and rhonchi) had to be improved compared with those on the day of admission, they should not be depending on therapies that could not be administered at home, and they should be able to visit the toilet independently. Also, the blood sugar level had to be normal or only moderately increased ($\leq$15 mmol/l or regulated independently at home).

Exclusion criteria were major uncontrolled comorbidity, mental disability, active alcohol or drug abuse, inability to understand the program, living outside the region of the participating homecare organization, indication for admission to the intensive care unit or noninvasive ventilation, and insufficient availability of informal care at home.

Intervention

During the first 3 days of the treatment, all patients received usual hospital care. The pharmacological part of this treatment consisted of systemic corticosteroids (10 days), nebulized bronchodilators, subcutaneous thrombosis prophylaxis, and stomach protection. If necessary, oxygen therapy and/or antibiotics were prescribed. Nonpharmacologic usual care consisted of physiotherapy for all patients for breathing and coughing instructions and dietary advice if indicated (body mass index $\leq$ 21 or 10% unintended weight loss in the 6 months prior to admission).

Patients randomized to early assisted discharge were discharged home on the fourth day of admission and further treated at home. Community nurses visited the patient once to three times on the day of discharge and the three following days. The main objective of the supervision of the home treatment was the observation of the patient's recovery and providing counseling and reassurance to the patient and the primary informal caregiver. The nurses also addressed medication compliance and inhalation techniques, provided support in applying breathing and coughing techniques, and, if applicable, in adhering to dietary advice. If necessary, patients could be supported in their daily life activities (e.g., washing and dressing) by the home care organization. During the 4 days of home treatment, the emphasis was on the recovery of the exacerbation. In case COPD symptoms suddenly worsened, the patients could contact the respiratory hospital ward directly and round the clock. The general practitioner was informed of the early discharge, but the respiratory physician of the hospital kept the final responsibility.

Effects

The following outcome measures were used: 1) the incremental change from day of randomization in Clinical COPD Questionnaire (CCQ) score at day 7 and 3 months; 2) the incremental proportion of patients with a clinically relevant improvement in the CCQ score (i.e., $\geq$0.4 units) [17] on day 7 and at 3 months; and 3) the gain in quality-adjusted life-years (QALYs) after 3 months using utilities as measured by the EuroQol five-dimensional (EQ-5D) questionnaire using the Dutch tariff for the valuation of health states [18]. The CCQ score can range from 0 (best possible score) to 6 (worst possible score). Based on the Dutch tariff, the EQ-5D questionnaire score can range from −0.329 (worst possible utility) to 1 (perfect health).

Costs

Costs were calculated from two perspectives, the health care perspective and the societal perspective. The former included only the direct health care costs within 3 months after randomization. The latter includes direct health care costs, non–health care costs, and costs of productivity loss for the 3-month follow-up period. This is in accordance with the Dutch recommendations that economic evaluations should be conducted from a societal perspective [19].

In the 7-day treatment phase, the duration of hospital admission and the amount of community nursing care were recorded. Patients randomized to early discharge were asked to record all additional formal health care as well as informal care and days of absence from paid work of the informal caregiver in a 4-day cost diary, a specially designed questionnaire on the amount of resources used on each day.

During the follow-up phase, the following types of resource use were recorded on a weekly basis in costs questionnaires that were distributed for each month of the trial: number and length of hospital readmissions, number of visits to the emergency department, number of contacts with pulmonologist and other specialist physicians, general practitioner, respiratory nurse, homecare, dietician, physiotherapist, and social worker, number of ambulance rides, and medication use. Direct non–health care costs recorded in these questionnaires were paid and unpaid domestic help, including the time spent by the primary informal caregiver. To capture all informal care, respondents were asked to provide information on help with domestic tasks, personal care, and practical support. They were instructed to consider only the time that they would not have spent on these purposes if the patient had not experienced the exacerbation. Indirect costs were costs of productivity losses. The days a patient was absent from paid work were recorded in the cost questionnaires.

Costs (in 2009 euros) were calculated by multiplying the volume of resource use (such as hospital days, physician visits, time spent by formal and informal caregivers, and production losses) by a cost per unit that includes total, not marginal, costs. Except for inpatient hospital days, standard unit costs from the