Should I Stay or Should I Go Home? A Latent Class Analysis of a Discrete Choice Experiment on Hospital-At-Home

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A B S T R A C T

Objectives: This study aimed 1) to quantify the strength of patient preferences for different aspects of early assisted discharge in The Netherlands for patients who were admitted with a chronic obstructive pulmonary disease exacerbation and 2) to illustrate the benefits of latent class modeling of discrete choice data. This technique is rarely used in health economics. **Methods:** Respondents made multiple choices between hospital treatment as usual (7 days) and two combinations of hospital admission (3 days) followed by treatment at home. The latter was described by a set of attributes. Hospital treatment was constant across choice sets. Respondents were patients with chronic obstructive pulmonary disease in a randomized controlled trial investigating the cost-effectiveness of early assisted discharge and their informal caregivers. The data were analyzed using mixed logit, generalized multinomial logit, and latent-class conditional logit regression. These methods allow for heterogeneous preferences across groups, but in different ways. **Results:** Twenty-five percent of the respondents opted for hospital treatment regardless of the description of the early assisted discharge program, and 46% never opted for the hospital. The best model contained four latent classes of respondents, defined by different preferences for the hospital and caregiver burden. Preferences for other attributes were constant across classes. Attributes with the strongest effect on choices were the burden on informal caregivers and co-payments. Except for the number of visits, all attributes had a significant effect on choices in the expected direction. **Conclusions:** Considerable segments of respondents had fixed preferences for either treatment option. Applying latent class analysis was essential in quantifying preferences for attributes of early assisted discharge.
Keywords: COPD, discrete choice experiment, hospital-at-home, latent-class conditional logit.

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Introduction

Many patients with chronic obstructive pulmonary disease (COPD) are more or less frequently admitted to the hospital for an exacerbation of their disease. The average annual frequencies have been estimated to vary from 0.11 for patients with mild COPD (Global Initiative for Chronic Obstructive Lung Disease [GOLD] grade I, as defined by lung function [1]) and 0.16 for moderate disease (GOLD II) to 0.22 and 0.28 for severe and very severe COPD (GOLD III and IV), respectively [2]. Nevertheless, the extent to which patients are prone to exacerbations varies substantially within GOLD grades [3].

Hospitalizations for exacerbations are the main cost drivers of COPD treatment [4–9]. They put pressure on scarce hospital beds of respiratory wards, especially during winter months [10]. Patients with COPD, however, are vulnerable to infections in a hospital environment. They may prefer to be in the hospital for as short a period as possible for reasons of privacy and comfort. It may therefore be attractive to treat suitable patients at home instead of in the hospital, if this is medically possible. This

approach is often called early assisted discharge. It can either substitute the entire hospital admission for home treatment (admission avoidance) or the last days of the admission (early assisted discharge) [11,12].

The GO AHEAD trial, which compared early assisted discharge with a conventional hospital admission did not lead to the conclusion that either treatment was clearly preferable from a medical or economic point of view [13,14]. No clear and significant differences were found in health outcomes or costs, although early assisted discharge was more likely to be the less costly alternative from the health care perspective. This lack of clear superiority of either treatment increases the importance of preferences of patients and their informal caregivers. Adapting a treatment program to their preferences may enhance its acceptability.

The research objective of this article was to quantify the strength of patients' and informal caregivers' preferences for different characteristics of an early assisted discharge scheme in The Netherlands and to determine when these characteristics make the new scheme more attractive than usual hospital care.

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A commonly used technique for eliciting preferences is the discrete choice experiment (DCE), in which respondents are asked to choose between alternatives, which are described by a number of attributes [15]. Statistical analysis is then used to quantify the weight of each attribute in the choices of the respondents. In health economics, one of the most widely applied methods to analyze data from such experiments is McFadden's conditional logit, otherwise known as multinomial logit (MNL) [16–18]. One of the assumptions of this technique, however, is the absence of unobserved preference heterogeneity across respondents [19]. When this assumption is violated—in other words, when some respondents have consistently different preferences than do others, which cannot be adjusted for in the analysis—the model may lead to biased results.

The most popular method to take unobserved preference heterogeneity into account is the mixed logit (MXL) model [16]. The generalized multinomial logit (GMNL) model was developed rather recently by Fiebig et al. [20]. It handles preference hetero-geneity by combining continuous normals with individual scaling.

In the context of segmented samples of respondents, latent class (LC) analysis is particularly suited. It groups respondents into a prespecified number of LCs with distinct preferences. This allows for the estimation of class-specific preference parameters and of the probability of class membership [21]. One of the developers of the DCE methodology, Louviere [22], has argued for a more frequent use of LC models because they would often fit the data at least as well as random parameter models while estimation and interpretation are easier.

In a review of DCE methods in this field, de Bekker-Grob et al. found that it was applied only once in the period from 1990 to 2008 [16], in a study on appointments with general practitioners [23]. To our knowledge, the only more recent example of LC analysis in health economics is a study on preventive treatment of tuberculosis [24].

In this article, we investigated to what extent these three models were able to accommodate the preference heterogeneity for early assisted discharge.

Methods

Selection of Attributes

A literature search led to a selection of characteristics of early assisted discharge treatments for COPD. These were considered potential attributes for the DCE. The attributes had to describe the process, not the outcomes of treatment. The provisional attributes were discussed with physicians connected to the trial and with patients with COPD who were admitted to the hospital. They were invited to mention additional attributes and levels. Attribute levels were chosen to reflect a wide range of possibilities and being able to have an effect on choices, without becoming unrealistic or unimaginable to respondents.

The final questionnaires contained the following attributes for early assisted discharge treatment: 1) specialization of the community nurse; 2) number of home visits; 3) number of different nurses involved in the treatment; 4) co-payment; 5) whom to contact in case of worsening disease; 6) burden on informal caregivers; and 7) risk of readmission to the hospital before the scheduled end of home treatment. Table 1 presents the levels of each attribute.

Design of the DCE Questionnaire

Choice sets consisted of three labeled alternatives: two early assisted discharge treatments and the usual hospital treatment (see Fig. 1 for an example). Because many characteristics of early assisted discharge are not applicable to usual hospital treatment

Table 1 – Attributes and levels for early assisted discharge options in questionnaire.	
Treatment attribute	Levels
Specialization of community nurse	Generic
	Pulmonary
Number of home visits per day	1
	2
	3
Number of nurses involved in treatment at home	1 or 2
	More than 2
Co-payment (€)	0
	50
	100
Contact in case of emergency	General practitioner
	Pulmonary ward, hospital
Burden on informal caregivers (h/d)	1
	3
	5
Risk of readmission (%)	1
	5
	10

and vice versa, only the early assisted discharge treatments were described by attributes. Because all respondents were hospital-ized, they were assumed to be familiar with hospital treatment, which was constant over all choice sets.

No co-payment was assumed for hospital admissions. In The Netherlands, patients do not have to pay for a hospital admission once the relatively low deductible (the amount of expenses that must be paid out of pocket before an insurer will pay any expenses) has been paid. This contrasts with home care services for which a co-payment does exist.

To extract as much choice information as possible, respond-ents who preferred the hospital option in a certain choice set were subsequently asked which of the early assisted discharge options they preferred.

No opt-out was presented because all patients with COPD who are admitted to the hospital for an exacerbation cannot be left untreated. Respondents were asked to assume that all treatments were equally effective in medical terms; that is, after 7 days, a patient's health state would be the same under all treatment options.

SAS 9.1 software was used to generate a d-efficient design for the questionnaire, which consisted of 36 choice sets divided into three versions. Each questionnaire contained 12 choice sets, to which we added 2 fixed choice sets with a dominant alternative, that is, an alternative that is better on all attributes, to test the respondents' comprehension of the task. Choice sets were pre-sented in random order.

Respondents

The questionnaires were presented to all patients with COPD and their informal caregivers who participated in the GO AHEAD trial, which was carried out in five hospitals in The Netherlands from November 2007 to March 2011. In the early assisted discharge arm of this randomized trial, patients spent 3 days in the hospital, after which they were treated in their own homes by community nurses for 4 more days. Patients in the control group remained in the hospital for 7 days. Participants had diagnosed COPD, were 40 years or older, had no major uncontrolled comorbidities, and had no indication for admission to an intensive care unit or for noninvasive ventilation. After 3 days in the hospital, they had to be clinically stable in order to be randomized.