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## Agency in health-care: are medical care-givers perfect agents?

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April 2007

# Agency in Health-Care: Are Medical Care-Givers Perfect Agents?

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## **ABSTRACT**

### **Agency in Health-Care: Are Medical Care-Givers Perfect Agents?**

It has been suggested in the literature that a source of incompleteness in the agency relationship between the doctor and the patient is that the provider may respond to an incomplete or biased perception of the patient's interests. However, this has not been shown empirically. This paper is novel in presenting an empirical test of the fundamental assumption of the agency model that health care professionals understand what their patients want. Discrete Choice Experiments (DCEs) are conducted simultaneously within samples of patients (women who gave birth) and care-givers (doctors and nurses), to elicit and contrast patients' authentic preferences (for five maternity ward attributes) with what care-givers believe them to be. Conclusion: agents have a biased perception of principals' preferences, and therefore a complete agency relationship does not exist. Our findings add a novel empirical contribution to the agency relationship literature. Moreover, parallel preference patterns of patients and care-givers are certainly of much interest to the field of health economics: Informing the unaware medical care-givers about the patients' preferences, will improve treatment and patients' satisfaction.

JEL Classification: I1

Keywords: principal-agent relationship, health-care, maternity wards,  
discrete choice experiment, preferences

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## **Introduction and motivation**

The concept of agency relationship has become widely accepted in health-economics, as the health-care market seems to fit into the standard agency relationship that is characterized by a principal (ill-informed individual) and an agent (informed individual), who are attempting to maximize their utility functions. The patient/principal sets the objective and the doctor/agent is the decision maker who is supposed to act on behalf of the patient and maximize her utility. Labelle et al. (1994) define a perfect agent "...the physician adopts a role that is congruent with the patient's wishes" (page 356). Very similar definitions can be found also in Evans (1984), Culyer (1989), and Pauly (1994). While there is consensus that the doctor (agent) should act on the patient's best interests, there is less agreement on the components of these interests. Culyer (1988, 1989) sees 'health' as the only relevant argument, against others who refer to broader concepts of utility, although not specifying them: Evans (1984) mentions "health and other things" (page 76) and Pauly (1994) says that "the objective of a consumer is utility not health alone". Sociologists preceded the economists in highlighting the importance of various non-medical factors (Ryan, 1994).

The patient's 'wishes', or 'utility' can be described by her preference pattern that includes the values attached to each of the various attributes of the health-care service. Full information on the patient's preference pattern is therefore crucial for the doctor in order to act efficiently on the patient's behalf.

Mooney and Ryan (1993) reach the same conclusion from a somewhat different angle, suggesting that "a necessary (but not sufficient) condition for an efficient outcome in health-care is that we establish the nature of these (the doctor's and the patient's) utility functions".

Vick and Scott (1998) are using the argument that doctors need to be well aware of the patients' preferences in order to act on their behalf, as the motivation for an empirical study that presents patients' preferences for attributes of the doctor-patient relationship.

The question that follows is: does the doctor have full information on the patient's preferences? If the answer is negative, then imperfect agency will arise even though doctors

mean to maximize the patient's utility. In Evans' (1984) words: "Thus one source of incompleteness in the agency relationship is that the provider may respond to an incomplete or biased perception of the patient's interests" (page 77)<sup>1</sup>. The suggestion that the provider is not aware of the patient's preferences is not at all surprising. However, it has not been shown empirically. This paper contrasts the patients' preference pattern for maternity ward attributes with the care-givers' perception of these preferences and thereby offers evidence for the incompleteness of the agency relationship. An empirical test of the validity of this fundamental assumption of the agency relationship is novel and has not been presented before.

Preference patterns are estimated using Discrete Choice Experiments (DCEs). Two DCEs were thus conducted within two samples: Women who recently gave birth (principals), and doctors and nurses<sup>2</sup> (agents) who treated them during labor and hospitalization. The latter were asked to answer the questionnaires *imagining that they are the hospitalized birth-giving women*. Estimation of parallel preference patterns, based on data derived from the two samples, facilitates a comparison of the authentic preferences of the principals and the perceptions of the agents.

### **The experiment**

DCE is a stated preference technique specifically designed to look at the impact of different attributes on the overall benefit obtained from a particular good or service (Lancaster, 1966). The technique involves presenting individuals with hypothetical (realistic) scenarios that vary with respect to the levels of defined attributes, and asking them to make discrete choices between pairs of scenarios. It is assumed that they choose the scenario that yields higher utility. One scenario (A) is usually kept constant while the other (B) varies. Some attributes have higher levels in B, while the others are inferior (or equal) in B. The respondent has therefore to consider 'gains' versus 'losses' and trade-off between the attributes, when making her complex 'multi-dimensional' choices<sup>3</sup>. This type of choice simulates real-life

choice of a health-care service. Well-designed and carefully implemented DCEs allow the researcher to generate data for the assessment of benefits from factors beyond health outcomes and address questions, like the question posed in this study that would not otherwise be tractable to analysis.

DCEs involve the following stages:

(1) Choosing the attributes of the service and their levels: Based on a literature survey, in-depth interviews with ten women who recently gave birth, and a pilot study, the following attributes (levels) have been identified: (a) number of beds in hospital room (three beds; two beds; or a private room); (b) attitude of staff towards the patient (reasonable; very good); (c) professionalism of the medical staff (good; very good); (d) information transferred from personnel to patient (basic; extensive); and (e) travel time from residence to hospital (45; 30; or 15 minutes).

(2) Definition of the experimental design: A full factorial design that will use all possible combinations of attributes gives rise to 72 scenarios<sup>4</sup>. In order to reduce the number of scenarios to a manageable size, the SPSS Orthoplan procedure was used to provide a fractional factorial orthogonal design. It gave rise to 16 different scenarios, each representing a hypothetical maternity ward. One scenario was randomly chosen for the constant set (scenario A), and each of the remaining 15 was compared to this chosen scenario, leading to 15 pair-wise combinations. Four pair-wise scenarios had a 'dominant option' (one alternative has superior, or same, levels for all attributes). Three of them were excluded and one was left to test for 'internal consistency'. A few women, who failed the test by preferring the inferior alternative, were excluded from the sample.

(3) Implementation of the DCE: Women who gave birth in three large public hospitals in Israel<sup>5</sup> comprise the primary study sample, along with medical staff employed in these wards. They were surveyed in maternity wards, by interviewers who provided explanations and instructions<sup>6</sup>. The staff was instructed to make choices that reproduce and represent the choices made by the hospitalized women.

Exhibit 1 presents an example of a pair-wise combination presented to the respondents.

Exhibit 1 - about here

Questionnaires have been completed by 323 women who recently gave birth and 30 staff members.

(4) Data analysis: The discrete-choice data, generated by the experiments, was used for the estimation of the preference pattern for the five attributes, employing Random-Effects Probit regressions.

Formally, assuming a linear utility function and two scenarios (maternity wards) A and B, the utility in moving from A to B is given by

$$\Delta U_{A \rightarrow B} = \sum_{i=1}^n \beta_i X_i + U_i + \varepsilon$$

Where,  $\Delta U$  is the change in utility, in moving from  $A$  to  $B$ . The dependent variable is represented by a dichotomous variable that equals 1 if maternity ward B is chosen, and 0 if A is preferred;  $X_i$  is the difference in the level of attribute  $i$  between B and A;  $\beta_i$  are the coefficients of the model that represent marginal relative importance of the attributes and correspond to relative utilities. The ratio of any two coefficients is the marginal rate of substitution (MRS) between the respective attributes;  $U_i$  is the error term due to differences amongst observations (each individual made several pair-wise choices); and  $\varepsilon$  is the error term that stems from differences between respondents.

## Results

Table 1 – about here

Table 1 presents preference patterns for women who recently gave birth, based on patients' authentic preferences (regression 1) and the perception of the care-givers (regression 2).



As is evident from a comparison of the two equations, *the medical staff has a biased perception of preferences of the women they are treating*. The ranking of the five attributes and their relative importance (coefficients) are notably different in the two preference patterns.

The patients rank highest the professionalism of the staff (coefficient of 1.8154); second the attitude of the staff (1.4567); followed by information transferred from staff to patients (0.8402); and travel time (coefficient around 0.5, with indifference between 15 minutes less or 30 minutes less than the reference group of 45 minutes). The number of beds in the hospital room is not valued at all, as is demonstrated by the insignificant coefficients of the ‘number of beds’ variables. The patients are indifferent between three beds (reference), two beds and a private room.

In sharp contrast to the preferences as expressed by the hospitalized women, the medical staff *believes* that the type of room is the most important attribute: a private room is believed to be valued well above staff professionalism, which ranks second (respective coefficients of 1.9102 and 1.1561). Very close behind ranks attitude of staff (1.1359); followed by a very short travel time (0.9605); a two beds room (0.4777); and shorter travel time by 15 minutes (0.3821). All coefficients are significant.

In order to add statistical robustness to the differential findings of the two separate regressions, a pooled regression of the two samples has been run. It includes the main-effects and interactions of main-effects with a dummy variable that equals 1 if the respondent is a care-giver. The coefficients of the interaction terms (last column of Table 1) represent the differences between the valuations of the care-givers and the patients: Care-givers believe that women value significantly and dramatically more the room facilities (a differential of 1.8859 in the relative valuation of a private room and of 0.4345 for a two-bed room). The other significant differences are: staff professionalism (much less); information (less, significant at 6.2%); and very short travel time (less, significant at 9%).

The most noteworthy finding is that private rooms in Israeli maternity wards do not convey utility to patients, whereas staff thought that this would be of the utmost importance. If the 'number of beds' attribute is ignored for a moment, it seems that the *ranking* of the four other attributes (in terms of coefficient size) is similar in the two preference equations. However, a closer look that considers also the statistical significance of differences between coefficients *within* each of the preference patterns, demonstrates that this conclusion is erroneous:

Whereas in equation 1 (patients) there are statistically significant differences between the valuations of 'professionalism', 'attitude of staff', 'information' and 'travel time'; in equation 2 (doctors and nurses), the coefficients of 'professionalism' and 'attitude of staff' are not significantly different (i.e., these two attributes have the top rank), as well as the coefficients of 'information' and 'travel time of 30 minutes' that also do not differ significantly. On the other hand, patients have a similar valuation of travel time of 30 minutes and of 15 minutes, while doctors and nurses think that women value '15 minutes travel' more than '30 minutes travel' (See Notes at the bottom of Table 1). It can therefore be concluded that the two estimated patterns of preferences are different and not only the valuations of the room facilities (number of beds).

### **Concluding remarks**

A full discussion of the potential sources of the observed differences will probe the literature on preference construction and elicitation and is beyond the scope of this letter. Two probable interpretations are: (1) Choices and information could be related- had the patient the same information that the care-giver has, she would have made different choices that are more compatible with those of the agent. This hypothesis can not be tested with the available data, however, there is little reason to believe that more (medical) information will lead to a significant change in the patient's valuation of (e.g.) the number of beds in the room; (2) The patient has the fresh experience of a delivery and makes ex-post choices, while the care-giver chooses ex-ante. To examine this hypothesis, the same DCE was replicated within a sample

of women pregnant with their first child. While their preferences are somewhat different (experience matters), there are still very significant differences in the valuation of number of beds, and professionalism (results available upon request).

The clear empirical finding is that the agent has a biased perception of the principal's preferences and therefore perfect agency does not exist. This is evident from DCEs conducted in maternity wards In Israel. Similar experiments replicated for other health events and in other countries will contribute to the robustness of our findings.

Our findings add a *novel empirical contribution to the agency relationship literature*.

Moreover, the topic of the paper – whether health care professionals understand what their patients want – is certainly of much interest to the field of health economics. Informing the unaware medical care-givers about the patients' preferences, will improve treatment and patients' satisfaction.

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**Exhibit 1**  
**Discrete Choice Question**

Please choose a (hypothetical) maternity ward for your delivery, either ward A or ward B.

Each maternity ward differs with respect to a number of attributes.

- Assume that all other attributes (on top of the 5 listed ones) are identical in the two wards.
- In each question, Maternity ward A is the same and Maternity ward B is different.
- Which maternity ward would you prefer? (Please tick box below).
- Please answer all questions.

**Question 1**

<b>Attributes</b>	<b>Maternity ward A (constant)</b>	<b>Maternity ward B</b>
Number of beds	2 beds	3 beds
Attitude of staff towards you	reasonable	reasonable
Professionalism of staff	good	good
Information	extensive	basic
Travel time to hospital	30 minutes	15 minutes

Prefer maternity ward A

Prefer maternity ward B

**Table 1**  
**Preference Patterns for Maternity Ward Attributes: Preferences of Women who Gave Birth Versus the Perception of Care-Givers (Doctors and Nurses), Probit Random-Effects Regressions (Main-Effects) Israel, 2003**

Independent variables	(1) Women in maternity wards (patients)	(2) Care-givers: doctors and nurses	(2) - (1) Differences between care- givers and patients
Number of beds (reference: 3 beds)			
Two beds	0.0523 (0.67)	0.4777 (2.86)	0.4345 (2.25)
Private room	0.1097 (1.38)	1.9102 (7.57)	1.8859 (6.93)
Attitude of staff	1.4567 (17.11)	1.1359 (6.19)	-0.2478 (1.22)
Professionalism of staff	1.8154 (20.34)	1.1561 (5.68)	-0.5581 (2.54)
Information transferred	0.8402 (11.61)	0.4496 (2.79)	-0.3375 (1.86)
Travel time (reference: 45 minutes)			
30 minutes	0.4794 (5.09)	0.3821 (1.99)	-0.0881 (0.41)
15 minutes	0.5094 (5.25)	0.9605 (3.52)	0.4994 (1.69)
Number of observations*	2099	360	2459
Number of respondents	323	30	353
Log Likelihood	-919.81	-152.32	-1073.26
$\rho$	0.4461	0.2797	0.4261
$\chi^2$ for Likelihood ratio test of $\rho=0$ (significance level)	172.02 (0.00)	17.04 (0.00)	186.81 (0.00)
Notes: The coefficients of the following pairs of main-effects are not significantly different (at a significance level of 0.05)	Travel time of 15 and of 30 minutes	Two beds and Information; Attitude and Professionalism; Information and Travel time of 30 minutes	

\* Doctors and nurses filled out a questionnaire with all 12 pair-wise choices. Women in maternity wards had questionnaires with either 6 or 7 discrete choices (the 'dominant option' pair was included in both versions).

- Notes:**
- Stata 8 was used for estimation (Random-Effects Probit, with no constant).
  - Numbers in parentheses are absolute Z-statistics.
  - Maternity ward A (the constant set) has the following attributes: Number of beds – 3; Attitude – reasonable; Professionalism of staff - very good; Information – extensive; Travel time – 45 minutes.
  - The regressions of the two groups were estimated separately. The significance of the difference between the main-effects is derived from a pooled regression of the two groups with interactions to check for differences and their significance. The reported difference is the coefficient of the interaction term. It is not identical (but similar) to the difference between the two separate coefficients, due to the non-linearity of Random-Effects Probit regression.
  - Adding socio-economic background control variables (e.g., education, age, income, ethnic origin and immigration status) did not change the basic results for the main-effects.

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Endnotes:

<sup>1</sup> There are also other possible sources of imperfection of the agency relationship in health care, such as physician-induced demand (e.g., Ganyor, 1994; Calcott, 1999) or, the doctor serving as an agent of both the patient and the hospital, maximizing the utility of the former and the profits of the latter (Lundback, 1997).

<sup>2</sup> In most agency health-care studies the doctor-patient relationship has been examined and therefore only the doctor was defined as the agent. Nurses are the primary care-givers in maternity wards and they also act as agents.

<sup>3</sup> DCEs have been developed in Mathematical Psychology (e.g., Luce and Tukey, 1964). Applications in health have been relatively recent, with papers dating from the early 1990s (Ryan and Gerard, 2003). Ben Akiva and Lerman (1985) provide a comprehensive review of the design and analysis of DCEs.

<sup>4</sup> As there are two attributes with 3 levels each and the rest three attributes have two levels each.

<sup>5</sup> Israel has a public health-care system. Few women give birth at home or in private maternity wards.

<sup>6</sup> It is recognized in the literature that interviews are the most effective and appropriate means for DECs, although they are rarely used, due to their high costs. Postal questionnaires are regularly used.