

Valuing the Benefit for Cancer Patients of
Receiving Blood Transfusions at Home

Nathalie Havet, *University of Lyon-Saint-Etienne, GATE,
CNRS-UMR 5824*

Magali Morelle, *University of Lyon-Saint-Etienne, GATE,
CNRS-UMR 5824, Centre Léon Bérard*

Raphaël Remonnay, *University of Lyon-Saint Etienne,
GATE, CNRS-UMR 5824, Centre Léon Bérard*

Marie-Odile Carrere, *University of Lyon-Saint-Etienne,
GATE, CNRS-UMR 5824, Centre Léon Bérard*

Recommended Citation:

Havet, Nathalie; Morelle, Magali; Remonnay, Raphaël; and Carrere, Marie-Odile (2011)
"Valuing the Benefit for Cancer Patients of Receiving Blood Transfusions at Home," *Journal of
Benefit-Cost Analysis*: Vol. 2: Iss. 3, Article 4.

DOI: 10.2202/2152-2812.1017

Valuing the Benefit for Cancer Patients of Receiving Blood Transfusions at Home

Nathalie Havet, Magali Morelle, Raphaël Remonnay, and Marie-Odile Carrere

Abstract

In the field of health care management, contingent valuation surveys (CV) are used in cost benefit analyses (CBA) to elicit patients' monetary valuation of program benefits. We considered the empirical situation of blood transfusions (BT) in cancer patients. Before planning such a CBA, we had to make sure that the CV approach could be used in a particularly critical clinical situation to estimate the marginal benefit of changing from hospital BT to home BT. The fact that the CV approach is feasible and acceptable to severely ill patients was not taken for granted a priori.

We measured patient's willingness-to-pay (WTP) for home BT in a sample of 139 patients who received transfusions either at home or in the hospital. After considering patient's participation to the survey and protest responses, we identified possible determinants of WTP values derived from previous knowledge, then we compared their expected influences to predicted influences resulting from econometric analysis to assess the validity of our results. Participation was high (90%) and few patients gave protest responses. Most patients (65%) had received home care, including 43% BT. The median WTP for home BT was 26.5 € per patient.

Good consistency was observed between the expected and predicted influences of possible determinants of WTP. The anchoring bias hypothesis was confirmed. The WTP for home BT increased with previous experience of home care, age, living far from the hospital and low quality of life. Our CV approach is thus a first contribution to the debate on the appropriateness of generalizing access to home BT. However, our results would be worth confirming with a formal cost-benefit analysis.

KEYWORDS: contingent valuation, blood transfusion, home care services, oncology

Author Notes: This research was supported by a grant from the French Ministry of Health (PHRC). The authors thank Dr Yves Devaux, Josette Chalencon, Valerie Kante for their contribution to patient recruitment, and Matthias Candusso for data collection.

1. INTRODUCTION

In recent years, contingent valuation (CV) has been increasingly used in the context of health and health care. CV is an attractive alternative to the quality-adjusted life years (QALYs) approach when it comes to comparing two types of health care management which may contribute to differences in patients' well-being during the treatment process, but with no difference in health outcomes (Ryan, 1997; Donaldson and Shackley, 1999; Ryan and Shackley, 1995). Moreover, by measuring health benefits in monetary terms—i.e. willingness-to-pay (WTP)—CV facilitates the performance of a cost-benefit analysis (CBA) and could be useful for policy decision-making. Indeed, it is possible to compute the net benefits of a program as the monetary difference between incremental benefits and incremental costs incurred as compared to an existing strategy. In the context of budget constraints, it allows decision-makers to rank the net benefits per unit of expenditure for all possible interventions and to use this ranking to allocate the limited budget among competing expenditures.

Health economics is usually concerned with efficient allocation of scarce resources. The CV method has been used for evaluating all types of health care strategies, whether preventive, diagnostic, or therapeutic, in various specific medical circumstances, such as obstetrics/maternity care (Neumann et Johannesson, 1994; Ryan, 1997; Ryan, 1998; Donaldson et al. 1998), cardiovascular diseases (Johannesson et al., 1991; Johannesson et al., 1993; Ramsey et al., 1997), obesity (Narbro et Sjoström, 2000; Cawley, 2008), cancer care (Ortega, 1998; Whynes et al. 2003), incontinence or cervical screening (Worsworth et al., 2001).

The present study considers the empirical situation of blood transfusion (BT) in cancer patients. Recourse to BT is frequent when patients have received aggressive treatment, with multiple chemotherapy and radiation courses. Blood transfusions have hitherto usually been administered in the hospital based on institutional and/or economic considerations. However, with an ever-increasing demand for acute hospital services, alternative methods of delivering this health care need to be envisaged.

Blood transfusion can be delivered at home or in the hospital day care unit with identical effectiveness and safety, and therefore identical health outcomes (Idri et al., 1996; Madgwick and Yardumian, 1999). But home administration compared to hospital administration can be viewed differently from one patient to another. On the one hand, particularly among older or more severely ill patients, transportation difficulties or waiting time at the health facility require additional effort while remaining at home decreases the patient's tiredness and thus is viewed as considerably more comfortable (Van der Pol and Cairns, 1998; Devlin et Agnew, 2008; Ademokun et al., 2005; Benson, 2006; Benson et al., 1996). Moreover, receiving home BT avoids

disruption in daily life and allows the patient to remain physically closer to family and friends. It also allows receiving undivided attention of one caregiver (Benson, 2006). Therefore, home BT could result in a better quality of life. On the other hand, transfusion at home may increase the feeling of insecurity because of increased distance to emergency care and isolation (Benson et al., 1998; Benson, 2006). Going to the hospital also allows one to clearly separate daily life from health care and to spare the family from illness.

In this context, the validity of considering home BT as an alternative to hospital BT for cancer patients should be assessed by a relevant cost-benefit analysis. Such a study would require estimates of both the incremental costs and the marginal benefits of changing from hospital BT to home BT. However, it must be known beforehand whether a CV approach is acceptable in a particularly critical health situation with severely ill patients, i.e. whether they would be willing not only to participate in the survey, but also to give meaningful responses about home BT marginal benefits. The main objective of this paper is to address this preliminary step. In addition to cost considerations, understanding the patients' feelings about blood transfusion at home is a necessary step in determining the appropriateness of improving access to home BT.

This article is based on a study first reported in Havet et al. (2011). This paper will first describe the CV study design and methods. Secondly, we will report the WTP values stated by the respondents and analyse their socio-demographic and health determinants. Finally, results will be compared to expected values regarding the influence of pre-selected determinants. In fact, analyzing the determinants of WTP has hitherto received limited attention in health economics. The empirical literature about WTP has focused more on the methods used for data collection and their possible influence on the monetary values obtained (Smith, 2003; Smith, 2006; Smith, 2007^{a,b}). Nevertheless, analyzing the determinants of WTP values can be a valuable way of assessing the validity of the CV method. Possible determinants and their expected influences can be derived from theoretical predictions or from the empirical literature, then confirmed or not using WTP data. For example, a positive association between WTP and income was assessed to determine the construct validity of our survey since the health economics theory suggests that income positively influences WTP values (Donaldson, 1999; Smith et al., 1999; Drummond et al., 2005). Moreover, once the validity of WTP has been checked, analyzing the determinants of WTP allows identifying the type of patients with the highest WTP and also for whom the marginal benefit of home BT is more likely to exceed its marginal cost. In conclusion, we will discuss the implications of our study regarding the validity of the CV method and its use for shaping home care policies.

2. METHODS

2.1 Study design

A CV survey was realised at the Comprehensive Cancer Centre of the Rhone-Alps Region in Lyon. In addition to BT delivered in the hospital day-care unit, some patients also received BT at home in collaboration with the national blood service (EFS: Etablissement Français du Sang) in the framework of a regional cancer network stationed in the hospital.

This prospective, non-randomised study was conducted during a 12-month period in 2003 and 2004. All cancer patients needing a BT and who were more than 18 years of age were asked to participate. After obtaining informed consent, and less than 48 hours after BT administration, face-to-face interviews were conducted by a trained interviewer following a detailed guide. Although costly, this type of interview was chosen for minimizing hypothetical biases and improving the quality and rate of responses (Mitchell and Carson, 1989; NOAA, 1993; Smith et al., 1999).

Patients were first asked whether they had already undergone BT, either in the hospital or at home, including the current procedure when it was administered at home, and whether they had already received home care other than BT. All patients were then given a detailed presentation of the BT management, either at home or in the hospital, and were told that effectiveness and safety were identical in both cases.

2.2 WTP questioning process

All patients were given a general presentation of the CV method. We carefully explained the benefits of using this method in order to provide policy-makers with valuable information about patients' preferences. It was indeed feared that this approach might be poorly accepted by French patients, particularly when seriously ill, who are strongly attached to their national health insurance system.

Then the patients were asked to imagine a hypothetical situation where they would need another BT and where the only freely available management would be hospital BT. The interviewers asked them whether they would be willing to pay to get home BT instead. The interviewers collected the WTP for home BT using a bidding process with three steps. First, an initial bid was proposed to the patients. If they agreed to pay, the interviewers proposed a higher bid, whereas if they did not then the interviewers proposed a lower one. This step was repeated twice. If the patients refused to answer (a zero WTP value was attributed to this non-response) or when the bidding process yielded a zero value, the interviewers were instructed to ask follow-up questions to identify the reasons for this choice. Patients were randomly assigned to two initial bids (38 euros and 76 euros) to test for a possible anchoring bias

affecting content validity (Herriges and Shogren, 1994; Flachaire and Hollard, 2007). The range from 38 euros to 76 euros was chosen because it was close to the range of fees normally covered by health insurance in France for a home visit by a specialist (including call-out charges).¹

According to the prospect theory (Kahneman and Tversky, 1979), WTP was framed as a gain (Saymand and Öncüller, 2005). We considered that framing the WTP question as a gain rather than a loss would be easier to understand. Considering the payment vehicle, we chose out-of-pocket expenditure, as recommended when respondents are personally involved (Smith, 2003; Mitchell and Carson, 1989; O'Brien and Gafni, 1996). Finally, for asking WTP questions, we preferred using a bidding process rather than closed-ended questions because of our small sample size (Donaldson et al., 1998).

2.3 Selection of possible determinants of WTP values

In order to analyze the determinants of WTP values for blood transfusion at home, we collected patient demographic and medical data. From the theoretical literature, we retained two possible determinants: household income and initial bid amount. Indeed, the health economics literature suggests that income positively influences WTP values (Donaldson, 1999; Smith et al., 1999; Drummond et al., 2005) and that choosing a higher initial bid value could increase WTP responses, but would in no way decrease them (Smith et al., 1999). This income effect and the possible anchoring bias were therefore tested to determine the construct and content validity of our survey.

The medical literature indicates that previous experience of home care promotes preference for home care compared to hospital care. A Cochrane Collaboration literature review by Shepperd and Iliffe (2001) comparing home care to hospital care in randomized studies has concluded that patients (who have no a priori preferences since they agree to participate in a randomized trial) generally express higher satisfaction after experiencing home care compared to hospital care. Therefore, we included previous experience of home care, either for BT or for any other procedure, as a potential determinant of WTP.

From the medical literature (Devlin and Agnew, 2008; Ademokun et al., 2005; Benson, 2006; Benson et al., 1998), we assumed that the most important reasons for preferring home BT were that it avoided disruption in daily life and that it saved transportation and waiting time in the hospital. On the other hand, hospital BT was mainly preferred because it allowed patients to clearly separate daily life from health care and because it was perceived as safer. We hypothesized that, all other things being equal, patients would be all the more willing to save transportation and waiting time as they lived far from the hospital and as their quality of life, including tiredness, was low. We thus

¹ The WTP questionnaire is available from the authors upon request.

selected three possible determinants of patients' preferences: age, distance between home and hospital, and a health-related quality of life index measured by the Functional Assessment of Cancer Treatment General scale (FACT-G) (Cella et al., 1993) which varied from 0 (worst possible situation) to 108 (best possible situation).

As regards safety, we assumed that patients would be all the more sensitive to this issue as their life was threatened, which was accounted for by collecting information on disease stage. Three stage levels were used: curative, palliative and terminal.

As regards daily life, patients' preferences reflected contradictory expectations. Some patients wished to avoid disruptions in daily activities, whereas others wanted to clearly separate daily life from health care. We thus assumed that patients' feeling regarding daily life could be influenced by family environment, and we collected data on their marital status and on the presence of children at home, without foreknowledge of their influence on preferences. Other variables like standard demographics, gender and employment status were collected as controls, with no a priori assumption concerning their possible influences on WTP values.

All patients' characteristics were documented by the patients themselves, except stage of disease which was classified as curative, palliative or terminal by the oncologist in charge of the Home Care Unit at the Cancer Centre.

2.4. Statistical analysis

Summary statistics for patient characteristics and WTP amounts, including mean with 95% confidence interval (95% CI) and median, were calculated. Econometric models with limited-dependent and qualitative variables were used to explore the determinants of WTP responses for home BT and analyse the relations between WTP and predictor variables. In our estimations, the dependent variable was defined as the logarithm of the expressed WTP value for home BT.

3. RESULTS

3.1 Sample characteristics

Over the study period, all 153 patients approached consented to participate. However, 14 people could not be interviewed within the 48 hours following their BT either because of lack of availability or because they felt too tired. As a result, 139 patients were enrolled, which corresponds to a 90% response rate. Their characteristics are presented in Table I.

Table I. Patient characteristics

Characteristics	Mean ± SD or number of patients (%)
Income ⁽¹⁾	
< 800 €	16 (12.2%)
800 - 1499 €	37 (28.2%)
1500 -2 299 €	34 (25.9%)
2300 - 2999 €	22 (16.8%)
≥ 3000 €	22 (16.8%)
Experience of home BT (yes/no)	60 (43.2%) / 79 (56.8%)
Experience of home care (except home BT)(yes/no)	63 (45.3%) / 76 (54.7%)
Distance from home to hospital (km) (mean ± SD)	34.9 ± 40.6
FACT-G ⁽²⁾	61.7±13.9
Stage of disease	
Curative	70 (50.4%)
Palliative	55 (39.6%)
Terminal	14 (10.1%)
Living with a partner (yes/no)	102 (73.4%) / 37 (26.6%)
Children at home (yes/no)	40 (28.8%) / 99 (71.2%)
Male/female	69 (49.6%) / 70 (50.4%)
Age (years)	57.5 ± 12.8
Professional occupation (yes/no)	60 (43.2%) / 79 (56.8%)

⁽¹⁾ Net monthly household income before income tax (8 missing data)

⁽²⁾ Functional Assessment of Cancer Care General scale (6 missing data)

The median pre-tax net monthly household income was between 1500€ and 2300€. Almost one in two respondents had previous experience of home BT on the one hand, and of home care (except home BT) on the other (43.2% and 45.3% respectively). Distance from home to hospital was close to 35 km on average, with a high (100%) variation coefficient. Quality of life according to the FACT-G scale was rather poor, with an average index of 61.7 (range 0-108). As regards stage of disease, patients were almost equally distributed between curative stage and palliative or terminal stages. Standard demographics were as follows: patients were 57.5 year-old on average (SD=12.8) and 3.2% had a professional occupation. Finally, patients were equally distributed between males and females.

3.2 Stated WTP values

Among the 139 enrolled patients, (i) 3 patients (2%) expressed comprehension problems with the WTP question and their responses were excluded from the empirical analysis; (ii) 86 (62%) participated in the bidding process which resulted in 74 (86%) strictly positive WTP responses and 12 (14%) zero values, either because of low income or without any justification, which were

considered as “true” zeros; (iii) the remaining 50 (36%) patients did not express any willingness to pay for home BT and therefore the interviewers assigned a zero WTP value to their non-responses. For these 50 patients, follow-up questions allowed us to distinguish between “genuine” zero values and “protest” responses. We were able to determine that 8 of these 50 zero responses were “protest” zeros on the basis of statement such as “I have paid health insurance premiums all my life and I should not have to pay anything more,” “the goal of this kind of study is that we pay more and more for care” or “I do not want to pay for blood when the donors are unpaid volunteers.” For the other 42 patients, who clearly expressed that they would prefer to receive BT in the hospital rather than at home, the zero WTP values assigned by the interviewers were considered as real zeros, as opposed to the protest responses. Consequently, 128 respondents gave a willingness-to-pay value (including 54 “true” zeros), 8 gave “protest” responses and 3 non-responses for analysis. Sixty-three percent ((74+12)/136) of patients would prefer to receive potential future BT at home versus in hospital. The distribution of WTP values for blood transfusion is described in Figure I. Among the 128 patients who expressed their WTP, the mean (\pm SD) and the median (95% CI) WTP values were 40.9 euros (\pm 53.2) and 26.5 euros (31.6 - 50.2), respectively.

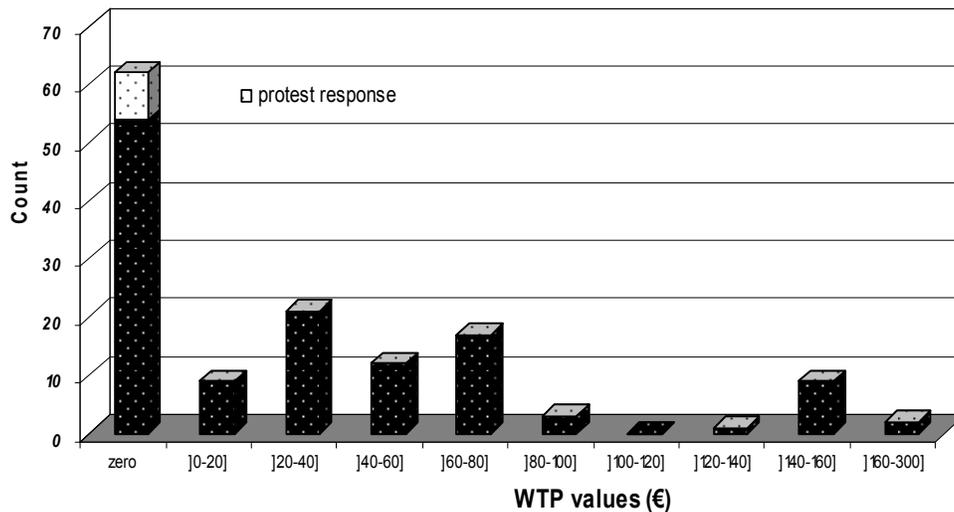


Fig I. Distribution of willingness-to-pay (WTP) values for home blood transfusion in euros.

3.3 The determinants of WTP values

Zero values should receive particular attention in this econometric analysis of WTP determinants because the patients giving zero responses represented 45% of the whole sample (62/139). However, since only 8 protest bidders were identified, it was not reasonable to estimate a double-hurdle model (Dalmau-Matarrodona, 2001) which explicitly emphasizes protest responses.

Indeed, the double-hurdle model decomposes the behaviour of individuals in the decision-making process in two parts: first, the reasons for deciding to participate or not in the contingent market offered, i.e. to give or not a protest response (participation equation: first hurdle), and second, the decision on the amount to consume, that is how much they are willing to pay for the procedure (consumption equation: second hurdle). Consequently, the variables influencing the choice of a respondent to reveal or not his real preferences cannot be identified when the number of protest responses is too small.

Nevertheless, discarding protest responses, even when in limited number, could produce biased results. That is why we used a truncated regression model (Mahmud, 2006) in which the estimation is based on strict positive WTP only and takes into account the elimination of all zero values to obtain valid results for all patients. To check for the robustness of our results, we also estimated the flexible specification of the censoring mechanism proposed by Donaldson et al. (1998), called the type II Tobit model (Amemiya, 1984). This model permits the coexistence of different response patterns for the question of how much and whether to pay for the care under evaluation. Because zero responses may have explanations other than a genuine zero WTP, we considered that positive WTP values and zero values could significantly differ in their determinants. In fact, positive WTP values stem from an economic decision-making process whereas zero values are a mixture of significant economic responses and protest responses. One set of parameters determines the impact of the characteristics on the probability to record a positive WTP value, and the second set characterizes the determinants of the positive WTP amount. The results of the truncated and type II Tobit regression models are reported in Table II.²

The type II Tobit and truncated regression models gave similar results for the intensity of the preferences for home BT. Nevertheless, the standard errors of the parameters obtained with truncated regression were slightly smaller, suggesting that this model achieves the most precise estimation. The income effect and the anchoring bias hypothesis were confirmed: all other things being equal, the WTP value for home BT increased with higher income ($p < 0.01$) and with higher initial bid ($p = 0.001$).

Several patient characteristics were also significantly associated with WTP for home BT: experience of home care, distance from home to hospital, stage of disease, professional and familial statuses and age ($p < 0.05$), as well as health-related quality of life ($p < 0.1$). However, neither previous experience of home BT nor gender seemed to influence WTP values.

More precisely, elderly patients or patients living far from the hospital stated a higher WTP for home BT than other patients. Those with a higher health-related quality of life stated a lower WTP for home BT, which means

² For the type II Tobit model, only the second set of parameters, which characterizes the determinants of positive WTP, are presented. The parameters of the other equation are available from the authors upon request.

that home BT was all the more appreciated as patient quality of life (including tiredness) was low. This is in agreement with the medical literature which suggests that sparing painful transportation and waiting time are strong reasons for preferring home BT. Conversely, the WTP for home BT was lower by 40% for advanced-stage (palliative or terminal) than for early-stage (curative) patients. Previous experience of home care proportionally increased the WTP for home BT. Lower WTP values for home BT were obtained for patients living with a partner. All other things being equal, WTP for home BT was lower for patients with a professional occupation.

Table II. Results of the regression models of WTP (log) values

	Type II Tobit Coeff.	Truncated model Coeff.
Intercept	2.962 ^{***} (0.601)	3.115 ^{***} (0.509)
Income (€) (<i>ref</i> : income < 8 00€)		
[800-2300[-0.293 (0.266)	-0.330 (0.251)
[2300-3000[0.739 ^{**} (0.298)	0.708 ^{**} (0.287)
≥ 3000	0.826 ^{***} (0.321)	0.751 ^{***} (0.275)
Experience of home BT (1=yes)	0.254 (0.228)	0.176 (0.162)
Experience of home care (1=yes)	0.380 ^{***} (0.128)	0.386 ^{***} (0.126)
Distance from hospital (continuous scale)	0.004 ^{**} (0.002)	0.004 ^{**} (0.002)
FACT-G (continuous scale)	-0.010 [*] (0.005)	-0.010 [*] (0.005)
Stage of disease (1=curative)	0.353 ^{**} (0.150)	0.377 ^{***} (0.139)
Living with a partner (1=yes)	-0.379 ^{**} (0.172)	-0.393 ^{**} (0.168)
Children at home (1=yes)	0.286 [*] (0.148)	0.258 [*] (0.135)
Gender (Male=1)	0.110 (0.138)	0.119 (0.136)
Age (continuous scale)	0.017 ^{**} (0.007)	0.017 ^{**} (0.007)
Professional occupation (1=yes)	-0.439 ^{***} (0.151)	-0.445 ^{***} (0.149)
Initial bid (1=76€, 0=38€)	0.428 ^{***} (0.130)	0.426 ^{***} (0.130)
N	122	68
σ	0.469	0.461

Notes: *, ** and *** represent the significance level at 1%, 5% and 10%, respectively. Standard errors are in parentheses.

Even if the level of WTP did not seem to vary with previous experience of BT at home, it did depend on previous experience of home care other than BT. This is consistent with non-economic literature findings suggesting that previous experience of home care favours further preference for home care compared to hospital care. The fact that WTP for home BT was higher at early stages is concordant with the safety concern hypothesis noted above since receiving hospital BT instead of home BT was all the more appreciated as patients' lives were threatened. Finally, the lower WTP values obtained for patients living with a partner could result from a wish of clearly separating daily life from healthcare.

Compared with econometric results, none of the expected influences of pre-selected possible determinants was invalidated (Table III).

Table III. Expected and predicted influences of possible determinants of WTP (log) values

Explanatory variables	Expected influence	Predicted influence
Income	+ ^a	+ **
Initial bid	+ ^a	+ ***
Experience of home BT	+ ^b	NS
Experience of home care, except BT	+ ^b	+ ***
Distance to hospital	+ ^b	+ **
FACT-G	- ^b	- *
Curative stage	+ ^b	+ ***
Living with a partner	? ^b	- **
Children at home	? ^b	NS
Gender	?	NS
Age	+ ^b	+ **
Professional occupation	?	- ***

^a According to health economics literature. ^b According to medical literature.
* p<0.1; ** p<0.05; *** p<0.01

4. DISCUSSION

Home care may be an interesting alternative to hospital care, especially for chronic diseases. Accordingly, it is more and more used for cancer care, particularly for severely ill patients, including those in the palliative or terminal stages of illness (Francks et al., 2000; Emmanuel, 1996; Zimmerman et al., 2008).

In an era of rising health care costs and budget constraints, public health decision makers require precise estimates of the possible consequences (e.g. social, economic and financial impacts) of policy programs in order to determine the most appropriate option. For that purpose, economic valuation

of the costs and benefits of health care interventions has become a central concern. When considering home care as a possible alternative to hospital care in a given health care situation, the costs and the benefits to the patients of the two options should be carefully compared. Apart from health outcomes, commonly captured by the QALY approach, non-health benefits such as process utility may play a major role in the choice of care.

The purpose of this study was to check the validity of the WTP method as a policy-making tool before planning a formal cost-benefit analysis. Could the CV approach be used in a particularly critical clinical situation, i.e. among cancer patients, to estimate the marginal benefit of changing from hospital BT to home BT? Indeed, the fact that the CV approach is feasible and acceptable to severely ill patients was not *a priori* obvious.

In our study, the large majority of respondents were willing to state their WTP for home BT and indicated a preference for home. Only 8 gave protest responses, which corresponds to a less than 10% protest rate. Protest responses could result from emotional and ethical concerns, as well as from social responsibility considerations (Jorgensen et al., 2000; Sayman and Onçüller, 2005; Meyerhoff et al. 2006), all dimensions being encountered here. Emotional and ethical aspects could be particularly important for patients at palliative or terminal stages; some of them even claimed that “health is invaluable.” Social responsibility could also be an important concern since a survey using a WTP approach could call into question the principle of solidarity.

The rate and strength of preference for home BT measured in our patients are consistent with other findings related to other home care interventions for cancer, especially to home chemotherapy (Rischin et al., 2000; Borrás et al., 2001; Caplan et al., 1999; King et al., 2000). The high preference for home BT in our patient population is not surprising because these patients were treated in a Regional Comprehensive Cancer Centre where home care services are routinely provided and which has prioritized home blood transfusions for over a decade. For these patients, blood transfusion is thus not an isolated care, but part of cancer management.

The analysis of determinants of WTP values did not call the validity of the CV method into question. None of the hypothesized influences was invalidated by our econometric results. The income effect and the anchoring bias hypothesis were confirmed, which respectively argues for the construct and content validity of our survey. Regarding the possible influence of patients’ characteristics, the WTP for home BT compared to hospital BT increased with previous experience of home care, with age, with distance from home to the hospital and with low quality of life. Conversely, the WTP for home BT was lower for advanced-stage (palliative or terminal) patients than for early-stage (curative) patients. Some authors have highlighted that home care could also improve satisfaction or quality of life in palliative patients (Zimmermann et al., 2008; Shepperd and Illife, 2001). Given that these authors have not compared patients’ opinions across disease stages, their

findings are not inconsistent with ours. In addition, we believe that previous experience of home care in general, by reassuring patients and allowing them to build trusting relationships with care givers, plays a central role in the construction of preferences.

The overall acceptability of the CV survey and the good consistency between expected and predicted influences of patients' characteristics on WTP values may imply that the CV approach could be used among cancer patients to obtain an accounting of marginal benefit changing from hospital BT to home BT. Our CV approach is thus a first contribution to the debate on the appropriateness of generalizing access to home BT.

However, additional conceptual and empirical issues must be resolved to determine the socially efficient delivery of BT. A first limitation of our study is to restrict valuation to current users of BT only. Indeed, as blood transfusion is completely covered by national health insurance in France, the use of the WTP method as a measure of benefits from patients, i.e. from only users of services, can be questioned (Shackley and Donaldson, 2000; Haefeli et al. 2008). Shackley and Donaldson (2000) argued that for a mainly publicly financed care, the WTP obtained from the general population is more relevant than the values obtained from patients, since the users of services do not directly bear financial consequences at the private level. The costs are shared at the community level. Then, if the non-users values – options values from currently non-diseased respondents at future risk of disease and externalities or spillover effects from the general population – are excluded, this could yield a biased estimate of the total value of the program (O'Brien and Gafni, 1996; Haefeli et al. 2008). Nevertheless, following Haefeli et al. (2008), we believe that the combination of current patient values with the mainly publicly funded health-care system could be relevant because it is the patients who bear the opportunity costs of any decision. Moreover, one can argue that some members from the general population will often have difficulties in clearly comprehending the hypothetical scenario used to elicit their preferences, when they did not experience the good or service in question. In our study, all patients would have experienced blood transfusions at the hospital, and all would have information on its close substitute. This would reduce the hypothetical bias associated with hypothetical questions and would produce a realistic valuation which is helpful to decision-makers, who have themselves no experience of the type of care upon they are making judgements (Olsen and Smith, 2001). Lastly, in France, as in other western countries (e.g., The United Kingdom or The United States) eliciting a patient's preferences is a central concern in the Health System.³ The French Law on patients' rights and quality of life (Law of March 4th, 2002) stipulates that all patients are entitled to

³ In France, the focus on individual patients' preferences results from the socio-political pressure initiated in the eighties by AIDS associations, further heightened by the tainted blood scandal and more recently by demands from cancer patients.

participate in decisions regarding their own health (Moumjid et al., 2007). Policy makers cannot henceforth ignore patients' preferences.

Finally, a true cost-benefit analysis would require us to collect individual costs for the study population, i.e. notably to measure real individual resource consumption at each step of the transfusion, whether at home or at hospital. This includes the costs of transportation of blood products to the patient's home and the biological wastes, the transportation of patients to hospital (by taxi or by medical vehicle) versus the transportation of medical personnel to a patient's home; the act of delivery blood at home or in the hospital; material and drugs costs. Moreover, several alternative organizations for home BT could be considered depending on who coordinates (i.e. in the framework of a "Hospital at Home Network" or of EFS), who administers the transfusion and monitors the patient (i.e. a doctor from the EFS, a community practitioner or a private duty nurse).

To the best of our knowledge, there is no published study addressing this issue in the French context. The only available appraisal of BT costs is provided by the report on "the organization of therapeutic BT in France" by Buthion (2009). Based on theoretical scenarios, Buthion estimated the theoretical cost (lower and upper bounds) of several alternatives for home BT from the healthcare payer's perspective and calculated the theoretical cost gap between each alternative and hospital BT. This report showed that this gap is hard to measure: it is closely related to the distance between home and hospital, and to the modalities of home BT, i.e. the transportation of blood products to the patient's home, the methods used for remunerating the personnel who administers the transfusion and monitors the patient.

Consequently, without access to adequate economic data at the individual level, only partial and preliminary conclusions can be drawn from our WTP estimates in terms of implications for policy-making. Firstly, we can already conclude that home BT is an inferior good for at least one-third of the sample, namely the patients who gave a zero WTP value because they would prefer to receive BT in the hospital rather than at home. Secondly, from the analysis of WTP determinants, we can determine the type of patients with the highest WTP, for example, patients living far from the hospital and weaker and older patients.

5. CONCLUSION

Our results show that it is possible to elicit and to adequately measure cancer patients' preferences for home BT, and thereby to go one step further and plan an economic valuation for relevant cost-benefit analysis. It would be also interesting to compare WTP values obtained from general population (*ex ante* values) and from current users (*ex post* values) in further studies. Combining WTP and cost data within a formal CBA framework is a crucial area for future research.

REFERENCES

- Ademokun, A., Kaznica, S., Deas, S.: Home blood transfusion: a necessary service development. *Transfus Med.* 15, 219-222 (2005).
- Amemiya, T.: Tobit models: a survey. *J Econometrics.* 24, 3-61 (1984).
- Benson, K., Balducci, L., Milo, K., Heckel, L., Lyman, G.: Patient's attitude regarding out-of hospital blood transfusion. *Transfusion.* 36, 140-143 (1996).
- Benson, K., Popovsky, M.A., Hines, D., Hume, H., Oberman, H.A., Glassman, A.B., Pisciotto, P.T., Thurer, R.L., Stehling, L., Anderson, K.C.: Nationwide survey of home transfusion practices. *Transfusion.* 38, 90-96 (1998).
- Benson, K.: Home is where the heart is: do blood transfusions belong there too? *Transfus Med Rev.* 20(3), 218-229 (2006).
- Borras, JM., Sanchez-Hernandez, A., Navarro, M., Martinez, M., Mendez, E., Ponton, JL. et al.: Compliance, satisfaction, and quality of life of patients with colorectal cancer receiving home chemotherapy or outpatient treatment: a randomised controlled trial. *BMJ.* 322(7290), 826-30 (2001).
- Buthion, V.: Organisation de la transfusion sanguine thérapeutique: Etude des modalités alternatives de la transfusion sanguine thérapeutique organisable en ambulatoire. Rapport de recherche. <https://sites.google.com/site/buthionvalerie/in-the-news/parution>. (2009).
- Caplan, GA., Ward, JA., Brennan, NJ., Coconis, J., Board, N. et al.: Hospital in the home: a randomised controlled trial. *Med J Aust.* 170(4), 156-60 (1999).
- Cawley, J.: Contingent valuation analysis of willingness to pay to reduce childhood obesity. *Econ Hum Biol.* 6(2), 281-292 (2008).
- Cella, DF., Tulsky, DS., Gray, G. et al. The Functional Assessment of Cancer Therapy Scale: development and validation of the general measure. *J. Clin. Oncol.* 11(3), 570-579 (1993).
- Dalmau-Matarrodona, E.: Alternative Approaches to obtain optimal bid values in contingent valuation studies and to model protest zeros. Estimating the determinants of individual's willingness to pay for home care services in day case surgery. *Health Econ.* 16, 101-118 (2001).
- Devlin, B., Agnew, A.: An evaluation of domiciliary blood transfusion service for palliative care patients in Northern Ireland. *Community Pract.* 81,32-5 (2008).
- Donaldson, C.: Valuing the benefits of publicly-provided health care: Does 'ability to pay' preclude the use of willingness to pay. *Soc. Sci. Med.* 49, 551-563 (1999).
- Donaldson, C., Jones, A., Mapp, T., Olson, JA.: Limited dependent variables in willingness to pay studies: applications in health care. *Appl. Econ.* 30, 667-677 (1998).

- Donaldson C., Shackley P.: Does “process utility” exist? A case study of willingness to pay for laparoscopic cholecystectomy. *Social Science and Medicine*. 44(5), 699-707 (1999).
- Drummond, MF., Sculpher, MJ., Torrance, GW., O’Brien, B., Stoddart, GL.: *Methods for the economic evaluation of health care programmes*. Third Edition. Oxford, Oxford University press (2005).
- Emanuel, EJ.: Cost saving at the end of life. What do the data show? *JAMA*, 275, 1907-1914 (1996).
- Flachaire, E., Hollard, G.: Starting point bias and respondent’s uncertainty. *Resource and Energy Econ*. 29, 183-194 (2007).
- Franks, PJ., Salisbury, C., Bosanquet, N., Wilkinson, EK. et al.: The level of need for palliative care: a systematic review of the literature. *Palliat Med*. 14(2), 93-104 (2000).
- Haefeli, M., Elfering, A., McIntosh, E., Gray, A., Sukthankar, A., Boos, N.: A Cost-Benefit Analysis Using Contingent Valuation Techniques: A Feasibility Study in Spinal Surgery. *Value in Health*. 11(4), 575-588 (2008).
- Havet, N., Morelle, M., Remonnay, R., Carrère, M-O.: Cancer patients’ willingness to pay for blood transfusions at home: results from a contingent valuation study in a French cancer network. *Eur J Health Econ.*, June, forthcoming, (2011).
- Herriges, JA., Shogren, JF.: Starting Point Bias in Dichotomous Choice Valuation with Follow-Up Questioning. *J. Environ. Econ. Manage*. 30(1), 112-131 (1996).
- Johannesson, M., Johansson, PO., Kristrom, B., Gerdtham, UG.: Willingness to pay for antihypertensive therapy -further results. *J. Health Econ*. 12, 95-108 (1993).
- Johannesson, M., Jonsson, B., Borgquist, L.: Willingness to pay for antihypertensive therapy- results of a Swedish pilot study. *J. Health Econ*. 10, 461-474 (1991).
- Jorgensen, BS., Wilson, MA., Heberlein, TA.: Fairness in the Contingent Valuation of Environmental Integrated knowledge for ecological economics: a database to support ecosystem services evaluation. *Ecological Economics* 36, 133-148 (2000).
- Kahneman, D., Tversky, A.: Prospect Theory: An Analysis of Decision Under risk. *Econometrica*. 47, 263-291 (1979).
- King, MT., Hall, J., Caleo, S., Gurney, HP., Harnett, PR.: Home or hospital ? An evaluation of the costs, preferences, and outcomes of domiciliary chemotherapy. *Int J Health Serv*. 30(3), 557-79 (2000).
- Mahmud, M.: Contingent Valuation of Mortality Risk Reduction in Developing Countries: A Mission Impossible? *Keele Economics Research Papers*. 1 (2006).
- Meyerhoff, J., Liebe, U.: Protest Beliefs in Contingent Valuation: Explaining Their Motivation. *Ecological Economics*. 57(3), 583-594 (2006).

- Mitchell, RC., Carson, RT.: Using Surveys to Value Public Goods: The Contingent Valuation Method. Baltimore: John Hopkins University Press (1989).
- Moumjid, N., Brémond, A., Mignotte, H., Faure, C., Meunier, A., Carrère, MO.: Shared decision-making in the physician-patient encounter in France: a general overview. *Arztl. Fortbild. Qualitatssich.* 101(4), 223-228 (2007).
- Narbro, K., Sjostrom, L.: Willingness to pay for obesity treatment. *Int J Technol Assess Health Care.* 16(1), 50-59 (2000).
- National Oceanic and Atmospheric Administration (NOAA). Natural resource damage assessments: proposed rules. *Fed Reg.* 59, 1062-1191 (1993).
- Neumann, PJ., Johannesson, M.: The willingness to pay for in vitro fertilization: a pilot study using contingent valuation. *Med Care.* 32 (7), 686-699 (1994).
- O'Brien, B., Gafni, A.: When Do the "Dollars" Make Sense? Toward a Conceptual framework for contingent valuation studies in health care. *Med. Decis. Making.* 16, 288-299 (1996).
- Olsen, JA., Smith, R.: Theory versus practice: A review of willingness to pay in health and health care. *Health Econ.* 10, 39-52 (2001).
- Ortega, A., Dranitsaris, G., Puodziunas, AL.: What are cancer patients willing to pay for prophylactic epoetin alfa? A cost-benefit analysis. *Cancer.* 83(12), 2588-2596 (1998).
- Ramsey, SD., Sullivan, SD., Psaty, BM., Patrick, DL.: Willingness to pay for antihypertensive care: evidence from a staff-model HMO. *Soc Sci Med.* 44(12), 1911-1917 (1997).
- Ryan, M.: Should Government Fund Assisted Reproductive Techniques? A Study Using Willingness to Pay. *Appl. Econ.* 29(7), 841-849 (1997).
- Ryan, M.: Valuing Psychological Factors in the Provision of Assisted Reproductive Techniques Using the Economic Instrument of Willingness to Pay. *J Econ Psychol.* 19(2), 179-204 (1998).
- Ryan M., Shackley P.: Assessing the benefits of health care: how far should we go? *Quality in Health Care.* 4, 207-213 (1995).
- Sayman S., Onculer A.: Effects of study design characteristics on the WTA-WTP disparity: A meta analytical framework. *J Econ Psychol.* 26, 289-312 (2005).
- Shackley, P., Donaldson, C.: Willingness to pay for publicly-financed health care: how should we use the numbers? *Appl. Econ.* 32, 2015-2021 (2000).
- Smith, RD.: Construction of the contingent valuation market in health care: a critical assessment. *Health Econ.* 12, 609-628 (2003).
- Smith, R.D.: It's Not Just What You Do, It's the Way That You Do It: The Effect of Different Payment Card Formats and Survey Administration on Willingness to Pay for Health Gain. *Health Econ.* 15, 281-293 (2006).

Havet et al.: Valuing Benefit for Cancer Patients Receiving Home Blood Transfusions

- Smith, R.D.: The role of 'reference goods' in contingent valuation: should we help respondents to 'construct' their willingness to pay? *Health Econ.* 16, 1319-1332. (2007^a)
- Smith, R.D.: Use, option and externality values: are contingent valuation studies in health care mis-specified? *Health Econ.* 16, 861-869.(2007^b)
- Smith, R., Olsen, J.A., Harris, A.: A review of methodological issues in the conduct of willingness to pay studies in health care III: issues in the analysis and interpretation of WTP data. Centre for Health Program Evaluation, Monash University, working paper 86 (1999).
- Van der Pol, M., Cairns, J.: Establishing patient preferences for blood transfusion support: an application of conjoint analysis. *J Health Serv Res Policy.* 3, 70-6 (1998).
- Whynes, D.K., Frew, E., Wolstenholme, J.L.: A Comparison of Two Methods for Eliciting Contingent Valuations of Colorectal Cancer Screening. *J. Health Econ.* 22(4), 555-574 (2003).
- Wordsworth, S., Ryan, M., Waugh, N.: Costs and benefits of cervical screening IV: valuation by women of the cervical screening programme. *Cytopathology.* 12(6), 367-376 (2001).
- Zimmermann, C., Riechelmann, R., Krzyzanowska, M., Rodin, G., Tannonck, I.: Effectiveness of specialized care: A systematic review. *JAMA,* 299, 1698-1709 (2008).