



ORIGINAL ARTICLE

The total value of time of children undergoing treatment: A contingent valuation from the perspective of parents in the orthopaedic department of a Dutch hospital

France Portrait,¹ Marco Hoozemans^{1,2} and Bernard van den Berg³¹Department of Health Sciences, VU University Amsterdam, Amsterdam, ²Coral -Center for Orthopaedic Research, Medical Centre Alkmaar, Alkmaar, Netherlands and ³Department of Economics, Macquarie University Centre for the Health Economy, Macquarie University, Sydney, New South Wales, Australia

Aim: Children spend substantial amounts of time receiving medical care (patients' time), and this patients' time plays an important role in parental choices for paediatric care. However, it is usually ignored in economic evaluations. This is a concern because economic evaluations are increasingly being used to inform child health policy decision-making. This study aims to quantify the time children spend receiving medical care and attach a monetary value to it for use in economic evaluations. It applied the parents' perspective. Consequently, the derived money values are the time values for both child and the accompanying parent.

Methods: We used the contingent valuation methodology. We collected data on 83 children undergoing orthopaedic treatment in a Dutch hospital. Accompanying parents were asked to quantify and value the patients' time of their children. We separately explored travel, waiting and treatment time. We also checked whether the monetary valuation varied across parents' financial situation, children's health and level of pain.

Results: Parents were willing to pay about €33 (confidence interval (CI) 21.2–48.1) for a 1-day reduction in treatment time; about €11.5 (CI 4.2–19.1) for an hour's reduction in waiting time; and about €4.5 (CI 1.5–7.4) for an hour's reduction in travel time. In addition, respondents with better financial conditions have, on average higher, willingness to pay.

Conclusions: To our knowledge, this is the first instance that patients' time of children has been monetarily valued. This methodology can be used to further develop economic evaluations of paediatric care and could be applied to larger samples with varying clinical conditions.

Key words: contingent valuation method; cost-effectiveness analysis; economic evaluation; orthopaedic care; paediatric care; valuation of patients' time of children.

What is already known on this topic

- 1 Children and their parents spend substantial amounts of time receiving medical care.
- 2 Patients' time plays an important role in decisions regarding medical care.
- 3 Patients' time of children is largely ignored in economic evaluations.

What this paper adds

- 1 We used the contingent valuation method to monetarily value time of children undergoing treatment from the perspective of their parents for use in economic evaluations.
- 2 We distinguished between three types of time: travel, waiting and treatment time.
- 3 Parents were willing to pay substantial amounts for reduction in time, of which they stated that 80% of the total value was for their child and 20% for themselves.

Economic evaluations are applied in many health-care systems around the world to inform health policy decision-making.¹ These economic evaluations are mainly applied to health-care interventions for adults but are also being increasingly used to evaluate interventions for children (<http://pede.ccb.sickkids.ca/pede/database.jsp>). The application of economic evaluations to paediatric care

interventions raises important methodological issues.^{2–5} Improving methods for economic evaluations of child health care is therefore crucial to better inform societal resource allocation decisions.

Children and their parents spend substantial amounts of time receiving medical care (patients' time),⁶ for instance, the time travelling to and from health-care facilities, waiting in the waiting room of the medical centre and receiving treatments or recovering from them. Patients' time also plays an important role in children's and parents' preferences for paediatric care.^{7–11} If economic evaluations take a societal perspective, the time patients spend on consuming medical care should be included in economic evaluations of paediatric care because taking a societal perspective implies that all relevant costs and effects of health-care interventions should be captured in the analysis.^{12–14}

Correspondence: Dr France Portrait, Department of Health Sciences, Room Number U453, Faculty of Earth and Life Sciences, De Boelelaan 1085, 1081HV Amsterdam, Netherlands. Fax: +31 20 5989941; email: f.r.m.portrait@vu.nl

Conflict of interest: None declared.

Accepted for publication 28 August 2018.

Although patients' time may be substantial and may play an important role in decisions regarding (children's) medical care, and despite recommendations to include patients' time, it is often ignored in economic evaluations.^{12,13,15} This is mainly because monetary valuation of patients' time, both of adults and even more so of children, is not straightforward. To be included on the cost side of an economic evaluation, patients' time needs to be valued in monetary terms.¹⁶

The monetary valuation of patients' time of children raises some of the same methodological issues as the monetary valuation of the time adults spend on medical care (for a detailed discussion, see Van den Berg *et al.*).¹⁷ For instance, applying the opportunity cost method (valuing time via wages)^{13,15,18} would involve having to make assumptions about the opportunity costs of parents not participating in the labour market. Even for parents participating in the labour market, wages do not necessarily fully reflect the patients' time costs of children. As an alternative for wages, Russell¹³ and Borisova and Goodman¹⁹ encourage empirical research on the monetary valuation of patients' time using the contingent valuation method (CVM). This is in line with recommendations in the theoretical health economics literature to value time in monetary amounts.^{20,21} The CVM method uses surveys in which respondents are offered different scenarios, each describing a potential reduction in time. First, the respondents are asked whether they would adopt the proposed scenario. Then, they are asked to state the maximum amount of money they are willing to pay to receive that potential reduction in time. This monetary amount is called the willingness to pay (WTP).²²

Van den Berg *et al.*¹⁷ have developed a survey to value patients' time in monetary terms using the CVM. We extended this work by exploring how parents value the time their children spend receiving medical care. In other words, we use the perspective of the parents to value the patients' time of their children. First, by directly measuring the WTP for time reductions, we get around the question raised above with respect to using adults' wages in economic evaluation to attach a numerical value to patients' time of children.²³ Second, by using the perspective of the parents, we avoid the discussion on whether children have the linguistic or cognitive skills to assess the scenarios presented to them. Finally, taking the perspective of the parent may be the most natural approach because of their experience accompanying their children.

This paper contributes to the literature by quantifying and valuing the time children spend on medical care using the CVM and from the perspective of their accompanying parent. The derived monetary values are the time values for both child and parent as the parent accompanies the child. In other words, the monetary values of time are a summation of the values parents attach to the time of their child plus of their own time. We used a sample of Dutch children receiving orthopaedic care in a Dutch hospital. We provided a monetary valuation for three types of patients' time: travel time, waiting time and treatment time. We also included a test for scope sensitivity when developing our contingent valuation survey because of concerns that, when using CVM, there may be insensitivity to scope,²⁴ that is, that the expressed WTP value is not sensitive to the magnitude of the commodity to be valued. Finally, we checked whether the monetary valuations vary across various parental and children characteristics.

Methods

Data, study sample and ethical approval

Our respondents were identified in the waiting room of the outpatient department of orthopaedics of a large Dutch hospital from January to June 2013 and in April 2015. After providing a short introduction on the study, student assistants asked adults whether they were accompanying a child and, if so, whether they would be willing to participate in the study by completing the survey. Adults willing to take part were first asked to give informed consent and then to complete the written survey. To be able to do so, the adults had to understand the Dutch language.

The student assistants distributed the survey to about 200 adults; 93 adults signed the informed consent form and filled in the survey. Questionnaires that were filled in by the children themselves ($n = 8$) or by somebody other than the mother or the father ($n = 2$) were excluded from the study as well. The resulting study sample was made up of 83 parents accompanying a child younger than 18 years visiting the orthopaedic doctor (response rate equal to 41.5%). The study was approved by the Medical Ethics committee of the VU University Medical Center Amsterdam and by the participating hospital.

Development of the contingent valuation survey

Definition of the three types of patients' time

Travel time is the time the child spends on travelling between the place where he or she lives and the medical centre where he or she is receiving orthopaedic care.¹⁷ Waiting time is the time the child waits in the waiting room at the orthopaedic department before having his or her appointment with the orthopaedic doctor. Treatment time is the time the child spends having the medical visit with the orthopaedic doctor. We assume that the accompanying parent spends the same amount of time as the child on these three types of time (i.e. instead of staying in the waiting room or going outside for a walk or other similar things).

Scenarios to value patients' time of children

Although the scenarios are hypothetical, we tried to be as realistic as possible to connect to respondents' perceptions. All scenarios include four key elements. First, we asked parents to assume that it would be possible to reduce the time their child spends on orthopaedic care. Second, we stated that the amount of time that could be reduced. Third, we gave examples on how this time could be reduced, and finally, we asked respondents to assume that the time reductions would not influence the child's health or recovery and would not involve any additional side effects.

Stating that there would be no additional side effects was a recommendation from Van den Berg *et al.*¹⁷ Reducing patients' time of children could have an effect on their time costs and on their health. This involves a danger of double counting in economic evaluations, which means that at least one consequence of the intervention is included as both a cost and a health effect.²⁵ We tried to avoid this through the wording of the contingent valuation questions by asking the parents to assume that the new intervention would only impact the patient's time of the child and not impact his or her health.^{26–29} As we assumed that the parent joined his or her child in the treatment room, the involved

time is a summation of the child and the accompanying parent's treatment time.

The four scenarios offered to parents are listed in Figure 1. The third and fourth scenario on treatment time ensured that we tested for sensitivity of scope by comparing the WTP in the two differing treatment time scenarios.

WTP questions

According to the type of patients' time, we suggested an amount of money and then asked whether or not the parents would be willing to pay this amount to achieve the stated reduction in time. We then asked whether or not they would be willing to pay more or less than the suggested amount and, if so, how much more or less. This amount was based on the mean Dutch net hourly wage. We also followed Johannesson *et al.*³⁰ by adding a question about the certainty of the stated WTP answer. This approach corrects for the potential bias due to the hypothetical nature of the contingent valuation question.³¹ The mean WTP of respondents who are certain of their stated WTP represents the monetary value of the patients' time of children from the perspective of their parents. The exact payment questions are reported in Figure 2.

Finally, if the scenario would be adopted, the time of the children and of their parents would be affected. Consequently, the derived WTPs are a summation of the value of the child's time and of the parent's time. We further explored how much of the total value of time from the perspective of the parent could be

attributed to the child and to the parent by adding a survey question per type of patients' time (see Fig. 3). This question was only asked to a subsample (namely, 35% of our respondents) and could only be used as qualitative information on how the parents interpreted the payment questions.

Self-reported patients' time

Apart from the presented scenarios and payment questions, we asked the parents to report the average travel, waiting and treatment times they spent on accompanying their child each time the child visited the orthopaedic doctor. Per time category, we used open-ended questions and asked the parents to report the average duration in hours and minutes.

Children's health

We asked parents to report the medical reason explaining why their children were visiting the orthopaedic doctor. We also asked parents to assess their children's health using a Likert scale ranging from excellent to bad.³² We also added a Visual Analogue Scale to measure the intensity of pain the child was experiencing. The anchors of this pain scale were no pain (0) and the most intense pain imaginable (10). Finally, we asked the parents several demographic and socio-economic variables. Most importantly, for our study, we collected information on their financial situation. Financial situation was measured using five categories ranging from 1 = 'We have to borrow money to make ends meet' to 5 = 'We are able to save much money'.

Scenario I: Travel time

Suppose it would be possible to reduce your child's travel time from her/his place of living to the orthopaedics department from 4 h to 2 h. This could for instance be done by opening a few small specialised orthopaedics clinics in the community. Please consider only your child's travel time.

Scenario II: Waiting time

Suppose your child usually has to wait 1 h per medical visit at the orthopaedics department. Suppose it would be possible to reduce the waiting time at the orthopaedics department by 40 min. As a consequence your child would have to wait 20 min per medical visit. This reduction of waiting time does neither influence the effectiveness of your child's treatment nor the side effects.

Scenario III: Treatment time

Suppose your child needs to undergo a surgery. Most children have to stay in the hospital for 5 days. Suppose that due to technological innovations it would be possible to treat children more efficiently. As a consequence, most children would have to stay in the hospital for 2 days. Therefore the total treatment time in terms of hospital inpatient days will reduce from 5 days to 2 days. Assume this reduction in treatment time would neither influence the effectiveness of your child's treatment nor the side effects.

Scenario IV: Treatment time

Suppose your child needs to undergo a surgery. Most children have to stay in the hospital for 5 days. Suppose that due to technological innovations it would be possible to treat children more efficiently. As a consequence, most children will have to stay in the hospital for 4 days. Therefore the total treatment time in terms of hospital inpatient days will reduce from 5 days to 4 days. Assume this reduction in treatment time would neither influence the effectiveness of your child's treatment nor the side effects.

Fig. 1 Scenarios to measure parents' valuations of reductions in the time their children spend receiving orthopaedic care.

Would you be willing to adopt the alternative intervention and reduce the [PATIENT'S TIME]* of the child by...?
 0 Yes, I would be willing to adopt the equally effective intervention and reduce the [PATIENT'S TIME] of the child by ... because...
 0 No, I would not be willing to adopt the equally effective intervention and reduce the [PATIENT'S TIME] of the child by ... because...

The equally effective but shorter intervention would cost money. Your health insurer will not reimburse the additional costs. As a consequence you would have to pay the extra costs yourself.

Would you be willing to pay for this equally effective but shorter intervention?
 0 Yes, I would be willing to pay for this equally effective but shorter intervention.
 0 No, I would not be willing to pay for this equally effective but shorter intervention.

Please recall your net monthly income and your monthly expenses on rent/mortgage, food, clothes and so on, as well as other things you would like to spend your money on.

Would you be willing to pay more than €NUMBER** for a reduction of the [PATIENT'S TIME] of the child by ...?
 0 Yes: what is the maximum amount of money you would be willing to pay? I would be willing to pay once €..... to reduce the [PATIENT'S TIME] of the child by ...
 0 No: what is the maximum amount of money you would be willing to pay? I would be willing to pay once € to reduce the [PATIENT'S TIME] of the child by

How sure are you about your stated willingness to pay?
 0 Very sure
 0 Not sure

*: Travel time, waiting time or treatment time
 **: Number equalled €30 for a reduction of the travel time equal to 2 h.
 Number equalled €15 for a reduction of the waiting time equal to 40 min.
 Number equalled €70 for a reduction of the treatment time equal to 1 day.
 Number equalled €200 for a reduction of the treatment time equal to 3 days.

You have mentioned in the previous questions an amount that you would be willing to pay for the reduction of the [PATIENT'S TIME] of the child. Which part of the amount is for the reduction of your own time and which part of the amount is for the reduction of the [PATIENT'S TIME] of the child?
 % for your own time
 % for the [PATIENT'S TIME] of the child

Fig. 2 Payment questions to measure parents' valuations of potential reductions in time that their children spend receiving orthopaedic care.

Fig. 3 Payment question to separate the total value of time from the perspective of the parents in child's time and parent's time.

Statistical analyses

First, we computed, for each type of time, the mean WTP of all respondents (per hour for travel and waiting times and per day for treatment time). Please note that this assumes constant marginal use of time. Second, we calculated the mean WTP of those who were very sure about their stated WTP. Third, we calculated

the mean WTP of those who were very sure of their stated WTP and whose WTP was strictly positive. We also calculated the percentage of respondents who were very sure of their stated WTP.³¹

WTP data are generally not normally distributed but typically skewed to the right. Because of that, we tested for scope sensitivity using a non-parametric Wilcoxon signed-rank sum test.

Table 1 Characteristics study sample: 83 children receiving orthopaedics care

Variables	Orthopaedic patients
Demographic and socio-economic characteristics of child and accompanying parent	
Age of child, years, mean (SD)	9.4 (5.7)
Age of accompanying parent, years, mean (SD)	40.0 (7.4)
Gender of accompanying parent: Female, %	69.0
Marital status, %	
Married	82.5
Divorced	11.3
Level of education of accompanying parent, %	
Lower (professional) education	8.8
Intermediate education	41.6
Higher education	49.6
Income of accompanying parent: Net monthly household income, mean (SD)	€3014 (1861)
Employment status of accompanying parent, %	
Employed	75.9
Disability insurance	5.1
Unemployed	7.6
Housewife/men	8.8
Financial situation of accompanying parent: Do not have enough money to live, %	8.3
Health of child assessed by accompanying parent	
Reason for receiving orthopaedic care, %	
Accident	16.5
Hip condition	38.0
Knee condition	21.5
Spinal column condition	15.2
Shoulder condition	11.4
Congenital condition	19.0
Other conditions	20.2
Children with more than one condition, %	20.2
Current child health assessed, %	
Excellent	12.5
Very good	33.7
Good	47.5
Average	6.2
Bad	0
Pain: Mean score (0 = 'no pain' to 10 = 'the most intense pain imaginable')	3.3 (3.0)
Number of respondents	83

SD, standard deviation.

Table 2 Time children spent when receiving orthopaedic care as reported by accompanying parent

Types of children patients' time spent on orthopaedic care	<i>n</i> = 83
Travel time (one way), min, mean (CI) (% missing)	21.6 (14.3–28.6) (25)
Waiting time, min, mean (CI) (% missing)	30.7 (22.1–39.2) (31)
Treatment time, min, mean (CI) (% missing)	18.7 (11.8–25.5) (29)
Total patients' time, min, mean (CI) (including return journey)	92.9 (81.4–104.5)

CI, confidence interval.

Finally, we explored, using Tobit models,³³ whether the stated WTPs were related to three key elements: (i) parents' financial situation; (ii) children's health; and (iii) level of pain experienced by the children. We decided to use Tobit models instead of linear regression analyses to correct for the heaping at 0 (i.e. WTP = 0 for the respondents who do not want to pay for the reduction in

patients' time). We hypothesised that WTPs increased with parents' financial situation and level of pain experienced by the children and decreased with children's health. This is because parents with a better financial situation are most probably able to pay more than other parents, and parents of children in more pain may value patients' time of their children more as shorter

Table 3 Parents' preferences for reductions of time that their children spent on orthopaedic care

	Percentage (no. missing)
Travel time return journey visit by orthopaedic doctor reduced from 4 to 2 h	
Parents who are willing to reduce the travel time by half	40.8 (7)
Parents who are willing to pay for reducing travel time	29.8 (6)
Waiting time for a visit to orthopaedic doctor reduced from 1 h to 20 min	
Parents who are willing to reduce waiting time	64.0 (8)
Parents who are willing to pay for reducing waiting time	28.4 (9)
Treatment time reduced from 5 to 2 days hospitalisation for surgery	
Parents who are willing to reduce treatment time by 3 days	94.6 (10)
Parents who are willing to pay for reducing treatment time	48.6 (10)
Treatment time reduced from 5 to 4 days hospitalisation for surgery	
Parents who are willing to reduce treatment time by 1 day	86.3 (11)
Parents who are willing to pay for reducing treatment time	44.5 (11)
Number of children	83

Table 4 Monetary valuations from the perspective of the accompanying parent for reductions of the time that their children spent on orthopaedics care

Type of patients' time	Valuation in Euro	Number of respondents	Confidence interval	P value†
Travel time return journey visit by orthopaedic doctor reduced from 4 to 2 h				
Maximum amount per 2 h reducing travel time (all respondents)	10.06	76	(5.4–14.8)	0.00
Maximum amount per 2 h reducing travel time (only those who are very sure)	9.00	55	(3.0–14.8)	0.02
Maximum amount per 2 h reducing travel time: (only those who are very sure and with a WTP > 0)	41.24	12	(22.4–60.0)	0.01
Respondents who are sure of their stated WTP (%)	80.9	68	NA	NA
Waiting time by a visit to the orthopaedic doctor reduced from 1 h to 20 min				
Maximum amount per 40 min reduction of waiting time (all respondents)	8.5	72	(4.4–12.7)	0.00
Maximum amount per 40 min reduction of waiting time (only those who are very sure)	7.5	58	(2.8–12.7)	0.01
Maximum amount per 40 min of reduction of waiting time: (only those who are sure and with a WTP > 0)	30.1	15	(15.1–45.1)	0.01
Respondents who are sure of their stated WTP (%)	79.0	43	NA	NA
Treatment time reduced from 5 to 2 days hospitalisation for surgery				
Maximum amount per 3 days reduction of treatment time (all respondents)	107.1	71	(71.1–144.3)	0.00
Maximum amount per 3 days reduction of treatment time (only those who are very sure)	101.4	48	(52.2–150.3)	0.00
Maximum amount per 3 days reduction of treatment time: (only those who are sure and with a WTP > 0)	194.4	25	(115.2–274.2)	0.00
Respondents who are sure of their stated WTP (%)	70.4	50	NA	NA
Treatment time reduced from 5 to 4 days hospitalisation for surgery				
Maximum amount per day reducing treatment time (all respondents)	34.5	72	(23.2–45.8)	0.00
Maximum amount per day reducing treatment time (only those who are very sure)	33.4	49	(18.3–48.4)	0.00
Maximum amount per day reducing treatment time: (only those who are sure and with a WTP > 0)	96.2	17	(74.4–117.9)	0.00
Respondents who are sure of their stated WTP (%)	73.2	52	NA	NA

†P values of the *t*-tests for willingness to pay (WTP) equal to 0. NA, not applicable.

patients' times may result in less suffering of their child. Only respondents who were sure of their WTPs were included in the analyses.

In all analyses, a statistical significance level of 5% was used.

Results

Sample characteristics

Table 1 presents the demographic, socio-economic and health characteristics of the 83 children included in our sample, as well as of their accompanying parent.

Almost 70% of the children were accompanied by their mother. The mean age of the children was 9.4 years, and the children were reasonably well distributed over the different age categories; 83% of the parents were married, and only 9% of them had completed elementary education or less or had low professional education. More than 75% of the parents had a paid job, and a minority of the parents stated they did not have enough money to live.

Most of the children were receiving treatment for a hip condition (38%) followed by a knee condition (21.5%). Over 93% of the parents assessed the health of their children as good, very good or excellent. Over 60% of the children had to deal with some or severe levels of pain.

Self-reported patients' time

Table 2 presents the mean time the parents invest in accompanying their children per orthopaedic visit per time category.

On average, the parents spent about 90 min per visit accompanying their child to receive orthopaedic care (consisting of 40 min of travelling, 30 min of waiting at the department and 20 min being treated).

Table 3 provides information on parents' preferences with respect to reducing the travel and waiting times of their children when visiting the orthopaedic doctor and with respect to having the alternative surgery.

A vast majority of parents (86% for the 1-day reduction and 95% for the 3-day reduction) preferred to reduce treatment time. Fewer parents preferred to reduce waiting time (64%) and less than half to reduce travel time (48%). The four main reasons for wanting to reduce patients' time were (i) 'most children do not like staying in a hospital' (mentioned by 26% of the respondents); (ii) 'it will reduce the child's school absence' (23%); (iii) 'the recovery of the children will be quicker and better at home' (21%); and (iv) 'the patient's time is too long' (about 15%). Of those who stated they were willing to reduce time, a minority was willing to pay out of their own pocket to reduce this time: about 45% in case of treatment time and about 30% for waiting time and for travel time.

Monetary valuation of time of children by parents

Table 4 provides information on the monetary valuations of parents with respect to reducing the three types of patients' time (after exclusion of those with missing information).

For those who were very sure of their stated WTP, the maximum WTP for an hour's reduction was the highest for waiting

Table 5 Do the monetary valuations of the accompanying parent for reduction of the patients' time of their children receiving orthopaedic care vary across income groups, child health status and level of pain experienced by the child? Estimation results using Tobit models

Variables	Willingness to pay (respondents very sure of their stated WTP)	
	Coefficient	P value
Travel time		
Financial situation†	4.82	0.450
Child health assessed by parents (VAS)	-4.27	0.307
Child level of pain assessed by parents‡	1.13	0.591
Number of responding very sure parents	51	
Waiting time		
Financial situation†	2.24	0.873
Child health assessed by parents (VAS)	13.95	0.395
Child level of pain assessed by parents‡	-3.12	0.534
Number of responding very sure parents	52	
Treatment time (reductions of 5 to 4 days)		
Financial situation†	59.53*	0.049*
Child health assessed by parents (VAS)	14.7	0.384
Child level of pain assessed by parents‡	-5.7	0.459
Number of responding very sure parents	48	
Treatment time (reductions of 5 to 2 days)		
Financial situation†	37.3*	0.041*
Child health assessed by parents (VAS)	7.80	0.525
Child level of pain assessed by parents‡	-7.31	0.199
Number of responding very sure parents	45	

* $P < 0.05$ (significant difference). †1 = 'poor' to 5 = 'very good'. ‡0 = 'no pain' to 10 = 'highest level of pain imaginable'. VAS, Visual Analogue Scale; WTP, willingness to pay.

time: €11.6. For a reduction in travel time, parents were willing to pay just over €4.5/h, followed by only about €3/h for treatment time (i.e. about €33 for a reduction of one inpatient day of 10 h).

Finally, the parents valued the reduction of the patient's time of their child, on average, much more than the reduction of their own time (80 vs. 20%). Interestingly, the parents valued the different types of patients' time similarly. This result must be interpreted with caution because it is based on answers from a maximum of 20 respondents.

Scope sensitivity

There was no statistically significant difference in WTPs per day (around €33) when reducing the hospital stay by 3 days compared with reducing by 1 day for all respondents ($P = 0.13$) and for those who were very sure of their answers ($P = 0.38$). This shows that the parents were willing to pay about three times more for a reduction of 3 days than for a reduction of 1 day. Consequently, the Wilcoxon signed-rank test shows no evidence of scope insensitivity.

Associations between parental financial situation, child health and level of pain and WTP

The results of testing for associations between parental financial situation, children's health and level of pain and WTP are presented in Table 5.

We only found significant associations between the parents' financial situation and their WTPs for reductions of treatment time: the better the parents' financial situation, the higher their WTP for reduction in patients' time of their children.

Discussion

The parents of children undergoing orthopaedic treatment were willing to pay, on average, about €33 for a day's reduction in treatment time, about €11.50 for an hour's reduction in waiting time and about €4.50 for an hour's reduction in travel time for a return journey. Please recall that the derived valuations are the summation of the child and the parent time values as the parent accompanies the child. About 50% (for treatment time) and 70% (for travel and waiting time) of the parents had a WTP equal to 0. Note that, despite the contingent valuation questions stressing that there would be no correlation between the reductions in patients' time of the child and his or her health, a few answers of the parents like 'the recovery of the child will be quicker' suggest that they may have imagined some changes in outcomes. We also originally aimed at disentangling the perspective of child and parent by adding a question to the CVM scenario (see Fig. 3). The parents valued the reduction of the patients' time of their child, on average, much more than the reduction of their own time. However, only a quarter of our respondents answered this question. Our results also shows that parents with a better financial situation wanted to pay more than others and might therefore have higher values of alternative uses of child time, for example, of education or of doing sport. Finally, our analyses showed no evidence of scope insensitivity.

Asking parent's WTP for reductions in patients' time of their children has two advantages, namely, avoiding using wages of parents and avoiding discussions on the linguistic or cognitive skills of children to assess the valuation scenarios presented to them. This also raises the question of whether the parents are the most appropriate to value the time their children spend on medical care. However, considering the perspective of the physicians or of the general public would require them to imagine that they have children and that they would accompany them to the hospital, which may not be entirely realistic and may complicate the valuation task.

Since 2006, all Dutch citizens have to purchase private health insurance covering a basic package of necessary care as defined by the government in a competitive market. Health insurers may therefore take actions, such as designing, pricing and marketing their products, to attract or repel enrollees.^{34,35} Dutch people are therefore used to thinking in terms of paying for health insurance and to consider their WTP when buying their health insurance. Therefore, the CVM is in the Netherlands a natural way to derive people's values regarding potential health-care options. Applying the survey questions to collect data in other settings requires careful consideration with respect to health insurance. Australia has, for example, a substantial supplementary private insurance market. People could, for instance, purchase private insurance to get around waiting times. It seems therefore fair to argue that Australians are familiar with the concept of health insurance, although their basic package is financed via general taxation (Medicare). To be able to value time in the Australian system would therefore require slight rephrasing of the survey question referring to 'basic health insurance'. This could be changed to something along the lines of 'not covered by Medicare'.

Conclusions

Our study presents a method to monetarily value patients' time using the CVM for use in economic evaluations. To our knowledge, this is the first time that patients' time of children has been monetarily valued using the perspective of their accompanying parent. This is a valuable step forward if economic evaluations are to be used to inform child health policy decision-making. We hope our paper encourages others to use our survey questions in larger samples with varying clinical conditions to ultimately further develop the methodology of economic evaluations of child care.

Acknowledgements

This paper has been financed by The Netherlands Organization for Health Research and Development (ZonMw) (project name: 'Valuation of patient time', project number: 152002032). We are also thankful to Linda Hartman and to the four bachelor students who collected the data as part of their bachelor internship. We also thank two reviewers and the editor whose questions have helped us to clarify the main message of our paper.

References

- 1 Drummond MF, McGuire A. *Economic Evaluation in Health Care: Merging Theory with Practice*. New York, NY: Oxford University Press; 2001.
- 2 Ungar WJ. *Economic Evaluation in Child Health*. Oxford: Oxford University Press; 2009.
- 3 Ungar WJ, Gerber A. The uniqueness of child health and challenges to measuring costs and consequences. In: Ungar WJ, ed. *Economic Evaluation in Child Health*. Oxford: Oxford University Press; 2009; 3–32.
- 4 Ungar WJ. Challenges in health state valuation in paediatric economic evaluations. Are QALYs contraindicated? *Pharmacoeconomics* 2011; **29**: 641–52.
- 5 Mabugu T, Revill P, Van den Berg B. The methodological challenges for the estimation of quality of life in children for use in economic evaluation in low-income countries. *Value Health Reg. Issues* 2013; **2**: 231–9.
- 6 Carr D, Ibuka Y, Russel LB. How much time do Americans spend seeking health care? Racial and ethnic differences in patient experiences. *Res. Sociol. Health Care* 2010; **28**: 71–98.
- 7 Levesque J, Bogoch ER, Cooney B, Johnston B, Wright JG. Improving patient satisfaction with time spent in an orthopaedic outpatient clinic. *Can. J. Surg.* 2000; **43**: 431–6.
- 8 Scott A, Watson MS, Ross S. Eliciting preferences of the community for out of hours care provided by general practitioners: A stated preference discrete choice experiment. *Soc. Sci. Med.* 2003; **56**: 803–14.
- 9 Tivorsak TL, Britto MT, Klostermann BK, Nebrig DM, Slap GB. Are pediatric practice settings adolescent friendly? An exploration of attitude and preferences. *Clin. Paediatr.* 2004; **43**: 55–61.
- 10 Burnett HF, Ungar WJ, Regier DA, Feldman BM, Miller FA. Parents' willingness-to-pay for biologic treatments in juvenile idiopathic arthritis. *Value Health* 2012; **15**: A42.
- 11 Ruggero L, McCabe P, Ballard KJ, Munro N. Paediatric speech-language pathology service delivery: An exploratory survey of Australian parents. *Int. J. Speech Lang. Pathol.* 2012; **14**: 338–50.
- 12 Basu A. Estimating costs and valuations of non-health benefits in cost-effectiveness analysis. In: Neumann PJ, Sanders GD, Russell LB, Spiegel JE, Ganiats TG, eds. *Cost-Effectiveness Analysis in Health and Medicine*. New York, NY; Oxford: Oxford University Press; 2016; 201–36.
- 13 Russell LB. Completing costs, patients' time. *Med. Care* 2009; **47**: S89–93.
- 14 Drummond MF, Sculpher MJ, Torrance GW, O'Brien BJ, Stoddart GL. *Methods for the Economic Evaluation of Health Care Programmes*. New York, NY: Oxford University Press; 2005.
- 15 Jowsey T, Yen L, Mathews P. Time spent on health related activities associated with chronic illness: A scoping literature review. *BMC Public Health* 2012; **12**: 1044.
- 16 Garber AM, Phelps CE. Economic foundations of cost-effectiveness analysis. *J. Health Econ.* 1997; **16**: 1–31.
- 17 Van den Berg B, Gafni A, Portrait F. Development of a method to monetarily value patients' time. *Soc. Sci. Med.* 2017; **179**: 182–90.
- 18 Yabroff KR, Davis WW, Lamont EB et al. Patient time costs associated with cancer care. *J. Natl. Cancer Inst.* 2007; **99**: 14–23.
- 19 Borisova NN, Goodman AC. Measuring the value of time for methadone maintenance clients: Willingness to pay, willingness to accept, and the wage rate. *Health Econ.* 2004; **12**: 323–34.
- 20 Propper C. Contingent valuation of time spent on the National Health Services lists. *Econ. J.* 1990; **100**: 193–9.
- 21 Johannesson M, Johannsson PO, Söderqvist T. Time spent on waiting lists for medical care: An insurance approach. *J. Health Econ.* 1999; **17**: 627–44.
- 22 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* 1996; **16**: 288–99.
- 23 Mihalopoulos C, Vos T, Pirkis J, Carter R. The population cost-effectiveness of interventions designed to prevent childhood depression. *Pediatrics* 2012; **129**: e723–30.
- 24 Smith VK, Osborne LL. Do contingent valuation estimates pass a scope test? A meta-analysis. *J. Environ. Econ. Manag.* 1996; **31**: 287–301.
- 25 Johannesson M. Avoiding double-counting in pharmacoeconomic studies. *Pharmacoeconomics* 1997; **11**: 385–8.
- 26 Shipton D, Badley EM, Mahomed NN. Critical shortage of orthopaedic services in Ontario, Canada. *J. Bone Joint Surg. Am.* 2003; **85A**: 1710–5.
- 27 Morris J, Grimmer-Sommers K, Kumar S et al. Effectiveness of a physiotherapy-initiated telephone triage of orthopedic waitlist patients. *Patient Relat. Outcome Meas.* 2011; **2**: 151–9.
- 28 Lubetzky H, Friger M, Warshawsky-Livne L, Shvarts S. Distance and socioeconomic status as a health service predictor on the periphery in the southern region of Israel. *Health Policy* 2011; **100**: 310–6.
- 29 Miyajiri F, Newton PO, Samdani AF, Shah SA. The impact of surgical waitlist times on scoliosis surgery: The surgeon's perspective. *Spine* 2014; **40**: 823–8.
- 30 Johannesson M, Johannsson PO, Kristriim B, Gerdtham UG. Willingness to pay for antihypertensive therapy – Further results. *J. Health Econ.* 1993; **12**: 95–108.
- 31 Blumenschein K, Blomquist GC, Johannesson M, Horn N, Freeman P. Eliciting willingness to pay without bias: Evidence from a field experiment. *Econ. J.* 2008; **118**: 114–37.
- 32 Crossley TF, Kennedy S. The reliability of self-assessed health status. *J. Health Econ.* 2002; **21**: 643–58.
- 33 Tobin J. Estimation of relationships for limited dependent variables. *Econometrica* 1958; **26**: 24–36.
- 34 Schut FT, Van de Ven WPMM. Rationing and competition in the Dutch health care system. *Health Econ.* 2005; **14**: 59–74.
- 35 Enthoven AC, Van de Ven WPMM. Going Dutch – Managed competition health insurance in The Netherlands. *N. Engl. J. Med.* 2007; **357**: 2421–3.