

Willingness to pay as patient preference to bariatric surgery

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Abstract

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Background An obesity epidemic is spreading worldwide. In addition to comorbidities, social and emotional problems contribute to reduce the quality of life (QoL) of obese people. Considering the heterogeneity of outcomes from clinical and surgical approaches, it is recommended that severely obese patients participate in their treatment decisions. This study evaluated preferences of severely obese patients for obesity surgical treatment using the willingness to pay (WTP) and to assess the impact of the presence of some clinical disorders, socioeconomic conditions and QoL on their decisions.

Methods The selected patients were invited to answer the WTP questionnaire using two formats of contingent valuation questions: dichotomous choice (yes/no) and a bidding game. The answers were correlated with clinical features, QoL assessed by the SF-36 and the Moorehead-Ardelt Quality of Life Questionnaire II, Brazilian socioeconomic classification, and family and personal incomes.

Results The group of patients who accepted the first bid was older and had higher frequency of sleep apnoea when compared to those who rejected the offer. A significant correlation between the bidding game value and family income was found ($r = 0.28$; $P < 0.02$). In the logistic regression model, socioeconomic classification and sleep apnoea were shown to be independently associated with acceptance the bid.

Conclusions Sleep apnoea was the comorbidity that most influenced the acceptance in dichotomous choice for bariatric surgery, probably due to the deleterious effects on daily activities induced by sleep disturbances. Our findings also suggest that the frequency of surgical procedures is below the preference of the obese population in Brazil.

Introduction

An obesity epidemic is spreading worldwide. In Brazil, according to a nation-wide survey, 40.6% of the adult population is overweight or obese with predominance in women.¹ In addition to comorbidities – such as type 2 diabetes mellitus, dyslipidaemia, hypertension, joint and respiratory diseases – social and emotional problems contribute to reduce the quality of life (QoL) of obese people.^{2,3}

Obesity has an alarming impact on health budget. In Brazil, almost 800 million American dollars are spent with hospitalizations, medical assistance and drugs. Part of this amount (333 millions) is from government, which represents 12% of total budget destined to all the diseases.⁴

Particularly regarding severe obesity, defined by body mass index (BMI) ≥ 40 kg/m², pharmacological approaches for weight loss are not effective⁵; even if submitted to intensive care (lifestyle modification and pharmacological therapies), severely obese individuals reach modest and non-sustained weight loss.⁶ Bariatric surgery represents a more effective option for these individuals, and this approach has led to more sustained weight loss among patients.^{7,8}

In USA, bariatric surgeries had a 6.5 increase from 1992 to 2003, and 200 000 procedures were estimated in 2005⁹. However, cost of the surgical procedures may be a limitation for obese individuals living in developing countries. In the same year, only 2266 bariatric surgeries were registered by the public health system in Brazil.¹⁰ In the latter, obese patients may wait from 3 until 5 years to undergo bariatric surgery. Surgical treatment has been performed for 1% of them, being 20% of the procedures performed by public health system.

Recent meta-analysis concluded that surgical treatment is more effective than clinical treatment for weight loss and the control of some comorbidities in patients with BMI of 40 kg/m² or greater. The superiority of bariatric surgery in inducing marked weight loss, in comparison with clinical approaches, has been shown in several studies.^{7,11} Among the obese individuals

included in the Swedish Obese Subjects (SOS) study, 627 clinically treated patients were followed for a 10-year period. Then, the effects on their cardiometabolic profile were compared with 251 patients who underwent surgical procedures.^{7,8} Clinically treated patients had a slight weight increase (1.6%), while the surgically treated ones experienced a 20–40 kg weight reduction, corresponding to a 10–15 kg/m² reduction in BMI.¹² After 6 years of follow-up, the latter maintained a mean weight loss of 20 kg.

It is largely recognized that surgically induced weight loss is able to improve or even cure comorbidities. Consistent benefits regarding glucose and lipid metabolism, blood pressure and sleep apnoea were found across all types of surgeries.¹³

Considering the heterogeneity of outcomes from clinical and surgical approaches, it is recommended that severely obese patients participate in their treatment decisions. Willingness to pay (WTP) is a method of contingent valuation, which can be used to determine the strength of preference of the patients.¹⁴ In this method, respondents are asked about the amount they are hypothetically willing to pay for certain good, service or health care. Risks and benefits of a treatment are presented, and respondents are asked to state the maximum amount they would pay from their personal expenses to be submitted to this treatment.¹⁴ This method is based on the utility-theory premise that an individual willingness to trade money for a product, service or health status change is equal to the individual net appraisal of that particular item's perceived attributes.¹⁵ The maximum amount subtracted from a person's income, without reducing his or her utility, is the WTP for a health service, treatment or improvement in health.¹⁶ In an open-ended format of contingent valuation, respondents are asked to indicate directly the maximum WTP for a good¹⁷; in contrast to the dichotomous questions format in which they only accept or reject only the bid. In the bidding game, an initial bid is stated and the respondent either accepts or rejects this bid, which can be raised

or lowered, until the respondent maximum WTP be reached.¹⁶

Information obtained by WTP tool in developing countries may be useful to reflect expectations and preferences of obese individuals and may provide relevant data for health-care decision makers to help governmental system in resources allocation. The aim of this study was to describe the strength of preferences of severely obese patients for surgical treatment using the WTP and to assess the impact of the presence of clinical disorders, socioeconomic conditions and QoL on their decisions.

Patients and methods

This research was carried out at the Obesity and Bariatric Surgery Outpatient Clinic of the Federal University of São Paulo and was approved by the institutional ethical committee.

Eligible patients were those with BMI ≥ 40 kg/m², who had been registered on the waiting list for bariatric surgery in this Clinic. They should have been visiting the Clinic for at least 6 months, have confirmed their preference for bariatric surgery and have completed all pre-surgery exams. From the 100 patients filling-out inclusion criteria, one died before the interview, six were operated on, 13 changed to another health centre, 10 were excluded because of non-compliance to medical recommendations and five did not agree to participate. The proportion of sexes and mean age was similar between participants and non-participant group. A remaining sample of 65 patients was included in the present analysis after signing an informed consent.

Prior to surgery, all patients were examined by a multi-professional team composed of an endocrinologist, a nutritionist and a psychologist. In addition, to care for their clinical and psychological conditions, this team was also responsible for informing of the potential adverse effects of the surgery in the short term and long term.

Specific changes in QoL were assessed through the Moorehead-Ardelt Quality of Life Questionnaire II (M-A-QoLQII), in which

individuals are asked to evaluate their own self-esteem, physical activity, social life, labour, sexual activity and approach to food.¹⁸ The score range varies from -0.5 to $+0.5$ ¹⁷; the sum of these six scores generates an overall QoL score. Such score is classified into five categories (very poor: -3.0 to -2.1 ; poor: -2.0 to -1.1 ; fair: -1.0 to $+1.0$; good 1.1 to 2.0 and very good 2.1 to 3.0).

In addition, QoL was evaluated by the Medical Outcome Study 36-Item Short-Form Health Survey Version 2 (SF-36), which includes questions focusing on the limitations on physical and social activities because of physical or emotional concerns, limitations on daily activities, pain, mental disturbances and vitality. A single interviewer applied the SF-36; this procedure was adopted as some patients had limitations for reading; QoL was assessed by each of its eight domains and also by two summary measures, focusing on 'physical' or 'mental' aspects.¹⁹ The domain scaled scores (0–100) are physical function, physical role, bodily pain, general health, vitality, social functioning, emotional role and mental health. The scores from the eight domains were individually weighted into physical and mental components and combined to calculate the SF-36 physical component summary (PCS) and mental component summary (MCS) health scales.²⁰ These two health summary scales were adjusted to achieve a community mean value of 50 with a standard deviation of 10.

Data collection occurred from January 2006 to February 2007. Demographic, social and clinical characteristics of population attending the public health care centre did not change over time. The presence of comorbidities (type 2 diabetes mellitus, hypertension, dyslipidaemia, sleep apnoea and joint disorders) was recovered from the medical records and also by clinical history. Patient socioeconomic classification was based on the Brazilian Economic Classification Criteria (BECC) that defines seven categories: A1, A2, B1, B2, C, D and E. To simplify data analysis, these categories were grouped into two, one with the classes A1, A2, B1 and B2 (group 1) and the other with classes C, D and E (group 2).

Favourable and adverse outcomes from bariatric surgery were presented to the study sample through a press board that included their probabilities reported in literature. Despite awareness of the hypothetical payment, participants were asked to answer questions supposing that the scenario was real. They were invited to answer the WTP questionnaire using two formats of contingent valuation questions: dichotomous choice (yes/no) and bidding game. Values used in the dichotomous choice were 2.8, 5.7, 8.6, 11.4, and 14.3 Brazilian minimum wages. Bidding game resembles an auction in which the initial bid was one of the values randomly offered in the dichotomous format. The bid is raised or lowered depending on the answer, and the process goes on until the respondent's maximum WTP value.²¹

Statistical analysis

The results were expressed as mean and standard deviation (SD), except for income that was presented as median and minimum and maximum values. Participants were stratified according to the acceptance or rejection of the first bid. Sensitivity analysis was also performed considering only the participants who accepted the first bid. Unpaired Student's *t*-test was used to compare continuous variables with normal distribution; Mann–Whitney test was applied to compare income and the highest WTP values obtained by bidding game. Chi-square testing was employed to compare frequencies. The Spearman coefficient test was used to evaluate the correlation between the highest WTP and age, years of study, BMI, time on the waiting list, family income and QoL. The Kruskal–Wallis test was used to compare five groups, stratified according to the first bid offered and family income.

Stepwise logistic regression analysis was used to identify independent predictors of acceptance in dichotomous choice. Two logistic regression models were built: one including demographic and socioeconomic variables (age, sex, marital status, family and personal income, time on the waiting list and socioeconomic classification) as

independent variables and another including clinical and QoL variables. Predictors of the highest WTP values were analysed by linear regression including the same independent variables.

Results

Almost 62% of the participants were women. The mean age (SD) of the study sample was 43.9 ± 11.6 years; 63.6% were employed, 79.7% lived in their own house and almost 42% had at least 11 years of study. Mean BMI was 51.0 ± 8.0 kg/m², while mean time on the waiting list for surgery was 3.0 ± 1.7 years (Table 1).

Using dichotomous choice WTP testing, the rate of acceptance tended to be higher when lower amounts were offered. However, there was no statistical difference in frequencies according of the initial bid. For the patients who accepted the bid, the median family income was 4.3 (range: 1.4–17.1) minimum wages compared with 3.4 (0.3–28.6) for whom did not ($P = 0.025$).

Similar family incomes were observed among five subgroups stratified according the initial bid. Only in the group accepting the first bid of 2.8 minimum wages, median family income was significantly higher than that of individuals who reject the offer [5.7 (1.4–17.1) minimum wages vs. 1.2 (1.0–2.57) minimum wages $P = 0.03$].

The main characteristics of 65 participants stratified according to acceptance in dichotomous choice WTP are shown in Table 1. Participants who accepted the first bid ($n = 39$) was older, had higher median family income and frequency of sleep apnoea when compared to those who rejected the offer. Forty-six percentage of the participants who accepted the first bid were classified into the highest socioeconomic class (group 1).

Sensitivity analysis for the subset of patients who accepted the first bid showed higher proportions of individuals with age > 50 years, diabetes (75 vs. 25%; $P < 0.01$), sleep apnoea (55.2 vs. 44.8%, $P < 0.05$) and greater mean BMI (51.9 ± 4.7 kg/m² vs. 46.6 ± 5.7 kg/m²,

Table 1 Main characteristics of severely obese participants in the waiting list for a bariatric surgery, according to their acceptance in the dichotomous choice of WTP. Data expressed in mean and SD or median and minimum–maximum or percentage

	Total N = 65	Yes N = 39	No N = 26	P value
Age (years)	43.9 ± 11.6	47.0 ± 11.1	39.5 ± 11.0	0.009
Women (%)	61.8	56.4	73.1	0.173
Married (%)	52.9	61.9	38.5	0.105
Employed (%)	63.6	71.8	53.8	0.138
Own house (%)	79.7	59.6	40.4	0.899
Family income (minimum wages)	4.0 (0.3–28.5)	4.3 (1.4–17.1)	3.4 (0.3–28.5)	0.025
Years of schooling	8.0 ± 3.4	8.4 ± 3.1	7.8 ± 3.8	0.560
Time in the waiting list (years)	3.0 ± 1.7	2.8 ± 1.5	3.4 ± 2.0	0.192
Body mass index (kg/m ²)	51.0 ± 8.0	50.1 ± 5.6	52.7 ± 10.9	0.254
Diabetes (%)	36.8	38.5	34.6	0.750
Hypertension (%)	75.0	79.5	69.2	0.347
Joint disease (%)	67.6	69.2	61.5	0.521
Dyslipidaemia (%)	36.8	41.0	34.6	0.603
Sleep apnoea (%)	57.6	70.0	37.5	0.013
WTP bidding game (minimum wages)	5.7 (0.0–128.6)	11.4 (2.8–128.6)	2.5 (0.0–11.4)	<0.001
Highest socioeconomic class (%)	32.8	47.3	11.5	0.003

WTP, willingness to pay.

$P < 0.05$) compared with the counterpart. Moreover, among patients who accepted the first bid and who also were older than 50 years ($n = 19$) were more frequently in the highest socioeconomic class (57.9 vs. 41.1%) ($P = 0.01$). Stratifying according to the presence of comorbidities, family income did not differ significantly between counterparts.

Results of QoL obtained by two instruments (M-A-QoLQII and SF-36) are shown in Table 2.

Taking into consideration the overall score, almost 22% of the study sample reported poor or very poor M-A-QoLQII. No significant correlation of SF-36 domains, physical and mental summaries and M-A-QoLQII with WTP, was found.

Median of family income for the whole sample was 4.0 (0.1–28.6) minimum wage and the median of highest WTP was 5.7 (0–128.6) minimum wage. Therefore, the highest WTP was

Table 2 Scores of SF-36 domains, and M-A-QoLQII of the participants according to acceptance of the WTP dichotomous choice. Data expressed in mean and SD

	Total group	Yes	No	P value
SF-36 domains				
Functional capacity	41.7 ± 23.8	39.4 ± 22.6	41.0 ± 23.1	0.78
Role physical	68.5 ± 25.3	68.5 ± 24.0	67.4 ± 27.0	0.86
Bodily pain	44.8 ± 22.4	48.5 ± 20.2	40.0 ± 25.6	0.14
General health	49.7 ± 20.2	49.7 ± 19.1	48.8 ± 21.6	0.86
Vitality	47.1 ± 22.3	50.1 ± 18.5	41.3 ± 27.1	0.12
Social functioning	36.0 ± 18.0	37.8 ± 16.0	33.4 ± 19.8	0.33
Role emotional	69.6 ± 26.6	70.5 ± 27.5	68.9 ± 26.7	0.81
Mental health	53.4 ± 24.3	54.4 ± 22.7	48.6 ± 26.6	0.36
Physical summary	37.1 ± 8.6	37.1 ± 8.0	36.6 ± 9.0	0.81
Mental summary	41.4 ± 10.0	42.3 ± 9.3	39.6 ± 11.3	0.29
M-A-QoLQII	0.44 ± 1.4	0.7 ± 1.3	0.05 ± 1.60	0.10

M-A-QoLQII, Moorehead-Ardelt Quality of Life Questionnaire II; WTP, willingness to pay.

40% higher than the family income. For almost 26% of the patients, the WTP values would not be affordable and it would be necessary to borrow money to cover the amounts; other 34% would have to reduce their routine expenses.

Considering only the patients who accepted the bid, the highest WTP value (128.6 minimum wages) for surgery during the bidding game was almost nine times the highest amount offered (14.3 minimum wages) during dichotomous choice. For the same subset, the median (minimum–maximum) of WTP, according to bidding game method, was 14.3 (2.8–128.6) minimum wages. On the other hand, for the patients who rejected the first bid, the median (minimum–maximum) of WTP was 2.8 (0.0–11.4) minimum wages ($P < 0.001$). One patient of this group said that he would not pay any amount for the surgery.

A significant correlation between the bidding game value and family income was found ($r = 0.28$; $P < 0.02$). The median WTP of the high socioeconomic class was 11.4 (1.4–128.6) minimum wages, which were significantly higher than that observed in the low socioeconomic class: 5.0 (0–57.1) minimum wages ($P < 0.026$).

In the logistic regression including sociodemographic variables, BECC was shown to be independently associated with acceptance the bid (Table 3), while the model including clinical and QoL variables, sleep apnoea, was independently associated with acceptance (Table 4).

In linear regression model for WTP value, independent variables were years of study, family income, marital status, diabetes mellitus, socioeconomic classification and role-emotional domain. The latter variable and the highest socioeconomic class were shown to be independently associated with WTP value (Table 5).

Table 3 Logistic regression model for acceptance in the dichotomous choice of willingness to pay, adjusted for sociodemographic variables

	β	Standard error	<i>P</i> value
Socioeconomic class	1.755	0.717	0.014
Age	0.048	0.026	0.069

Variables included in the initial model: age, sex, family income, employment status, time on waiting list, marital status and socioeconomic class.

Table 4 Logistic regression model for acceptance in the dichotomous choice of willingness to pay, adjusted for clinical variables

	β	Standard error	<i>P</i> value
Age	0.050	0.026	0.051
Sleep apnoea	1.205	0.550	0.032

Variables included in the initial model: age, sex, sleep apnoea, SF-36 bodily pain, SF-36 vitality and M-A-QoL QII.

Table 5 Linear regression model for highest willingness to pay value adjusted for clinical and sociodemographic variables

	β	Standard error	<i>P</i> value
Socioeconomic class	2366.1	1587.1	0.022
Role emotional	3385.1	1619.5	0.040

Variables included in the initial model: family income, marital status, diabetes mellitus, socioeconomic classification and SF-36 role-emotional domain.

Discussion

In the present study, we evaluated strength of preference of the patient for surgical treatment of severe obesity through the WTP tool. Price sensitivity was used to identify an overall evaluation of the value an individual patient placed on this particular intervention, taking into consideration not only benefits but also the potential surgical complications and long-term adverse effects. Using WTP, 98.5% of the patient on the waiting list agreed to pay some value to undergo surgery as soon as possible. This finding, associated with the long duration on waiting list (3.0 ± 1.7 years), may suggest that there is a pent-up demand of patients from the public health system in Brazil for bariatric surgery.

According our findings, sleep apnoea was the comorbidity that most influenced the acceptance in dichotomous choice for bariatric surgery. To re-inforce the impact of such abnormality, in multivariate analysis, obstructive apnoea also remained significantly associated with the acceptance of the initial bid. Actually, several studies have reported the deleterious effects on daily activities because of sleep disturbances.^{22,23} Patients were informed that the probability to

cure of the apnoea is almost 100%.^{24,25} Both facts have most likely contributed to patients deciding to speed their obesity treatment. Otherwise, improvements in diabetes, dyslipidaemia, hypertension and joint disease did not motivate the acceptance of initial bid.

Expected correlations between QoL and acceptance in the dichotomous choice model were not found in our study, as reported by others.^{26,27} Our small sample should be contributing to these negative results. Additionally, the fact of these patients being under intensive clinical treatment while on the waiting list, assuring them a reasonable QoL, may be minimizing their suffering and their willingness to hasten the surgical procedure.

Considering that treatment decisions are not made by isolated individuals, but involve complex set of social interactions, WTP considers family income, and patients recognize that they will probably need to deprive themselves of other possible major purchases. A higher socioeconomic level was associated with acceptance in the dichotomous choice model, which was expected. Consistent with this finding was the fact that higher family income was associated with higher values also in the bidding game. In studies of contingent valuation, family income is the most important influence,^{14,28} which favour the veracity of our results.

Univariate analysis suggested that older age was associated with more frequent acceptance the first bid, but not logistic regression. Considering the reduced sample size, we cannot exclude an independent effect of age in accepting the bid.

The acceptance of initial bid was not influenced by family income, except for the group to whom the lowest value was offered. Other variables – such as income and comorbidities – which could interfere in their decision seemed to have no impact.

Some bias attributed to the WTP tool, such as compliance bias, starting point bias and range bias, did not seem to be present in our study, except by the strategic bias.²¹ One patient said that he would pay a much higher value for the surgery than the true cost of the procedure

(128.6 minimum wages) and another who would pay nothing. Such responses could be interpreted as a protest answer.

Our main data regarding the bidding game are in agreement with the dichotomous choice model. According to economic principles, validity of a WTP is suggested when the amount to be paid is proportional to income.^{29,30} In agreement to our findings, Delfino *et al.*, using family income to validate WTP as a tool to assess cost benefit in health services, also observed a direct association of WTP and income.²⁶ Liu *et al.* found that WTP was strongly and positively associated with greater income as well as higher body weight and adverse personal weight perceptions.³¹ Finally, Narbro *et al.* verified that obese patients are willing to pay approximately twice their monthly salary for effective treatment, and a higher WTP is associated with higher weight and poorer perceived health.³²

Some limitations to our study should be raised. Our sample was based on those who have already identified bariatric surgery as their preference. Therefore, our tool reflects only the strength of preference within this patient population. Although patients knew that the scenario proposed in both formats of contingent valuation (dichotomous and bidding game) was hypothetical, the median value reached by the bidding game (11.4 minimum wages) was similar to the amount paid by the Brazilian public health system for bariatric surgery. This may suggest that patients did not inflate their WTP.

Despite the availability of qualified medical centres for bariatric surgery in a developing country like Brazil, their limited number leads to long stays on a waiting list and progressive deterioration physical status and QoL. The imbalance between demand for surgery and frequency of surgical procedures has implications for the individual and for the society. Our data indicate that individuals with severe obesity see in bariatric surgery a way to control their disease and comorbidities, particularly sleep apnoea. Other studies are necessary to support the use of the WTP tool of contingent valuation to define patient preferences taking into con-

sideration their impact on quality of life and also economic concerns.

Conflicts of interest

The authors do not have any commercial interest conflict.

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