Eur J Vasc Endovasc Surg (2011) 42, 26–34

Preferences of Patients, Their Family Caregivers and Vascular Surgeons in the Choice of Abdominal Aortic Aneurysms Treatment Options: The PREFER Study

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Submitted 9 September 2010; accepted 30 December 2010
Available online 19 February 2011

KEYWORDS
Abdominal aortic aneurysm;
Preferences;
Treatment choices;
Discrete choice analysis

Abstract *Objective:* Factors influencing the choice between endovascular (endovascular aneurysm repair, EVAR) and open repair (OPEN) of abdominal aortic aneurysm (AAA) are of increasing interest. We quantified their importance among the different subjects involved in the treatment.
Methods: Pre- and postoperative patients (pts), their relatives and vascular surgeons completed questionnaires evaluating six treatment characteristics: anaesthesia; recovery time to basic everyday activities; risk of re-intervention at 5 years (RR); complexity of follow-up; risk of major complications; and additional cost of intervention (AC). Through a discrete choice experiment, hypothetical scenarios of treatment were obtained and the relative importance (RI) of each characteristic was determined through a conditional logistic regression model.
Results: A total of 160 pts, 102 relatives and 30 surgeons from nine centres completed the questionnaires. Major complications and re-intervention risk were the most important characteristics (RI = 56.0% and 27.2%, respectively) for all the respondent categories. Pts and their relatives considered very important also a possible out-of-pocket AC. Recovery time and type of anaesthesia were among the least important characteristics, including hospital additional cost for surgeons. The different categories of respondents showed different opinions towards different treatment characteristics depending also on possible previous treatment.

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doi:10.1016/j.ejvs.2010.12.025

Conclusion: Preferences for AAA treatment characteristics differ between groups of involved subjects. Understanding individuals' preferences could help in optimising treatment benefits.

Introduction

Patients with a known abdominal aortic aneurysm (AAA) requiring treatment face a difficult decision-making process. Although supported by general practitioners, specialists and family caregivers in their task, the prospect of undergoing surgical treatment for an asymptomatic disease with unpredictable progression is not desirable, at best.

Open surgical (OPEN) repair has been described in many instances as a painful, physically and psychologically demanding procedure, requiring a long and uncomfortable recovery.[1–3] The advent of endovascular repair (endovascular aneurysm repair, EVAR) could have switched this perception, leading the patients to a better attitude towards an intervention with a much lesser degree of invasiveness; however, the quality of life and other specific requirements of EVAR, namely the necessity of a close and more burdensome follow-up and an increased risk of re-intervention within few years, causes patients concern, with no significant improvement of quality of life after EVAR compared with OPEN intervention.[2,3] The two available interventions are different in several aspects related to safety, effectiveness and treatment burden. Furthermore, in an era of economic constraints, the cost of treatment is a further aspect that might interact with the other treatment characteristics, together with patients' condition and concerns, in determining the final decision. Finally, other personnel could influence patient decision making, such as patients' relatives, carers and, of course, medical staff.

Although some studies have investigated which treatment options or their characteristics could be considered relevant by patients facing the problem of the choice of AAA treatment,[4–7] a number of issues still remained unresolved. Specifically, the relative importance (RI) of each characteristic of the treatment available, the possible influence of cost and the attitude of the different subjects involved in the treatment other than patients (surgeons and patients' relatives) have been not analysed before in a large group of responders.

The objective of this study was to quantify and compare the RI (value) assigned to the characteristics of the AAA treatment options by vascular surgeons, AAA patients and their family caregivers (i.e., a relative, a partner or a friend involved in the patient's assistance) depending on their experience with treatment.

Methods

Study design and data collection

We conducted an observational, multicentre preferences study adopting the technique of discrete choice analysis (DCA).

Over the past 15 years, the framework of DCA has been increasingly using to elicit preferences for health-care interventions, and to simultaneously value health benefits and patient experience factors.[8]

The theory of DCA assumes that the value placed on medical treatments is related to their characteristics (e.g., risk of complications, invasiveness and time to recovery). To know the value of treatments for AAA, in this study, the participants were presented with a selected number of hypothetical treatment scenarios. Each scenario was described by six characteristics, each selected from those of OPEN or EVAR; however, the resulting scenario never corresponded exactly to either EVAR or OPEN. With a discrete choice experiment, a factorial combination of every six characteristic levels was performed to create the hypothetical options.[8] The different options were combined into pairs (treatment A versus treatment B, example shown in Fig. 1), and these were submitted to the participants, who were asked to choose, within each pair, the preferred option according to the characteristic levels' combination. From the respondents' choice between A and B from each pair received, we calculated which treatment characteristics can affect the preferences of the target subjects, whether a characteristic is considered negative or positive (direction of preferences) and how much one characteristic is more important than the others (RI).

To create scenarios that were easily understood, we selected a reasonable number of characteristics through a preliminary study. First, a literature search was performed to select all the treatment characteristics potentially relevant to the target individuals. Second, a discussion with a panel of experienced staff surgeons and health economists with experience in the field of outcomes research finalised the list of the characteristics potentially relevant for the study purpose (Table 1). Third, a small pilot survey was performed by submitting this list to six AAA patients and seven experienced staff vascular surgeons, who scored each characteristic according to the perceived level of importance from 0 ("not important at all") to 10 ("very important"). The five characteristics receiving a mean higher level were selected (Table 2) and worded in an easy-to-understand way. A sixth characteristic was added to determine the possible role of the cost of the intervention in the decision-making process. To meet the different perception of the participants in the study, patients and relatives were asked to consider a possible out-of-pocket cost (Fig. 1(a)), while physicians were asked to consider an additional procedural cost on the hospital budget (Fig. 1(b)).

As the cognitive burden of eight pairs of treatments was considered potentially too high for some patients', the set was split into two blocks: namely each patient received only four possible scenarios, while the family caregivers and physicians received all the eight pairs. Before these, the participants received a description of the study

a – patient's family caregiver's perspective

TREATMENT CHARACTERISTICS	INTERVENTION A	INTERVENTION B
Type of anaesthesia	General	Local
Time necessary to come back to do everyday activities after the intervention (for instance washing or dressing)	2 days	4 days
Possible need to repeat the intervention within the next 5 years	In 7 out of 100 patients	In 15 out of 100 patients
Type of periodical exams and medical visits to perform after the intervention	Medical visit, duplex and CT	Medical visit and duplex
Risk of severe procedural complications (even death)	In 2 out of 100 patients	In 5 out of 100 patients
Out of pocket cost to receive the intervention (for instance because you receive the treatment in a private sector)	0 euro	2,000 euro
Which intervention would you choose?	A ☐	B ☐

b – doctor's perspective

TREATMENT CHARACTERISTICS	INTERVENTION A	INTERVENTION B
Type of anaesthesia	General	Local
Time necessary to come back to do everyday activities after the intervention (for instance washing or dressing)	2 days	4 days
Possible need to repeat the intervention within the next 5 years	In 7 out of 100 patients	In 15 out of 100 patients
Type of periodical exams and medical visits to perform after the intervention	Medical visit, duplex and CT	Medical visit and duplex
Risk of severe procedural complications (even death)	In 2 out of 100 patients	In 5 out of 100 patients
Additional cost for the hospital	0 euro	2,000 euro
Which intervention would you choose?	A ☐	B ☐

Figure 1 Example of choice set given to patients and family caregivers (1a) and to physicians (1b).

objective, of the task to be performed and of the characteristics shown in the treatment options.

Together with these tasks, the patients were also asked to describe their own Health Related Quality of Life (HRQoL) at enrolment in the study. Physicians were asked to report patient's demographic data, case history and clinical characteristics (e.g., American Society of Anaesthesiologists (ASA) class and presence of co-morbidities) and possible previous AAA treatment.

To describe their HRQoL, the patients completed the standard and widely used EQ-5D generic instrument.[9] It consists of two main parts: the first part generates a health profile (EQ-5D profile) made of five domains, namely 'mobility', 'self care', 'anxiety or depression', 'usual activities' and 'pain or discomforts', each one with three levels of severity ('no problem', 'some or moderate problems' and 'extreme problems'). The second part of the questionnaire consists of a visual analogue scale (EQ-5D VAS), measuring overall HRQoL ranging from 0 (worst imaginable health status) to 100 (best imaginable health status).

Subjects and setting

Nine vascular surgery units throughout Italy contributed to the study (PREFER Study Group — listed in Appendix). The clinical investigators at each hospital completed the discrete choice questionnaire for reporting their own preferences. Then they enrolled up to 20 valid AAA patients consecutively admitted into the hospital and their family caregivers (i.e., a relative or a friend, who is involved and assists the patient to manage his condition), who accompanied the patient at the visit. To be valid for the study, the patients had to be assigned to either OPEN or EVAR, or should have been previously submitted to either one, according to clinical practice. Furthermore, to be able to compare the responses according to patients' and caregivers' experience with AAA treatment, each centre had to balance the sample into four subgroups: patients not treated and expecting to receive OPEN, those expecting to receive EVAR, patients already treated with OPEN and patients already treated with EVAR. The choice between OPEN and EVAR was made according to each participants' centre's attitude and was independent of our study protocol.

Untreated patients and their caregivers were also asked to complete again the questionnaire, approximately 6 months after the procedure. Hence, these participants expressed their preferences both before and after the treatment. Accordingly, their preferences provided after the treatment were analysed together with those obtained from participants, who, at enrolment, were already treated.

Table 1 Pilot study. Characteristics of AAA treatment evaluated.

1	Type of anaesthesia
2	Length of hospital stay (number of days)
3	Need of intensive care
4	Recovery time (e.g., time to the first meal, stomach pump, vesical catheter, drug therapy, time to start again walking)
5	Type of follow-up (CT scan, ultrasound scanning)
6	Need of follow-up medical visits and examinations during the years after the intervention
7	Risk of major perioperative procedural complications (myocardial infarction, death)
8	Risk of minor perioperative procedural complications (i.e., wound complications)
9	Recovery time to fully perform everyday activities, like washing and dressing)
10	Risk of sexual function impairment
11	Position and dimension of scar
12	Risk of repetition of procedure
13	Need to wear a body belt for 2 or 3 months after the intervention

Table 2 AAA treatment characteristics with appropriate levels.

Attributes (labels)	Levels (codes included in the logistic model)
Type of anaesthesia (ANAESTHESIA)	Local (0) General (1)
Time necessary to come back to do everyday activities after the intervention (for instance washing and dressing) (RECOVERY)	2 days (2) 4 days (4)
Possible need to repeat the intervention within the next 5 years (REPEAT)	In 7 out of 100 patients (0.07) In 15 out of 100 patients (0.15)
Type of periodical exams and medical visits to perform after the intervention (CHECKUP)	Clinical assessment, duplex scanning (0) Clinical assessment, duplex scanning + CT scan (1)
Risk of severe procedural complications (even death) (COMPLICATIONS)	In 2 out of 100 patients (0.02) In 5 out of 100 patients (0.05)
Additional cost to received the intervention[a] (COST)	0 € (0) 2000 € (2000)

[a] Additional cost was differently hypothesised to patients and family caregivers (additional out-of-pocket cost to receive the treatment) compared with physicians (additional cost on the hospital budget), as shown in Fig. 1.

Ethical issues

This study was conducted in agreement with the National Regulatory Requirements, International Conference on Harmonisation Guidelines for Good Clinical Practice and the 18th World Medical Assembly[10] and all subsequent amendments. The study protocol was submitted at each participating centre's Ethical Committee. Each patient and family caregiver had to sign an informed written consent to participate.

Modelling and data analyses

Responses from the DCA were analysed using a conditional binomial logistic regression model in STATA v.10.0.[8] The following model (1) was generated to analyse preferences for each AAA treatment characteristic:

$$V = \beta_1 X_{\text{ANAESTHESIA}} + \beta_2 X_{\text{RECOVERY}} + \beta_3 X_{\text{REPEAT}} + \beta_4 X_{\text{CHECKUP}} + \beta_5 X_{\text{COMPLICATIONS}} + \beta_6 X_{\text{COST}} \quad (1)$$

where V represents the overall value assigned to a given treatment, and is function of the value assigned to each characteristic level of that treatment, represented by Xs: for example, $X_{\text{ANAESTHESIA}}$ indicates the level of the characteristic 'type of anaesthesia to perform the procedure', general (coded as 1) or local (coded as 0) anaesthesia. All Xs and the codes used in the regression model are defined in Table 3.

In the model, the regression coefficients $\beta_1 - \beta_6$ identify the estimates of the level of importance assigned to a unit change of each treatment characteristic X, keeping equal the other characteristic levels. For example, β_1 indicates the level of importance of general versus local anaesthesia ($X_{\text{ANAESTHESIA}}$), β_2 the level of importance of number of days (2 versus 4) necessary to come back to basic autonomous activities (X_{RECOVERY}) and β_6 is related to the importance assigned to a 1€ increase in additional treatment cost (X_{COST}) on treatment value. The sign of the coefficients indicates the direction of preferences, that is, whether a unit change in the characteristic level has a positive or negative effect on respondents' preferences: for instance, a negative β_1 indicates that a local anaesthesia is preferred to a general one, while a positive sign indicates that local anaesthesia is preferred; negative β_2 and β_3 indicate that a reduced number of days until the recovery and of risk of repeating the intervention within 5 years are preferred; a negative β_4 indicates that a less burdensome check-up, which excludes the computed tomography (CT) examination, is preferred; and negative β_5 and β_6 indicate that a reduced risk of complications and costs are preferred. A β_s with a $p < 0.05$ was considered statistically significant. Finally, with the βs estimates obtained, we calculated the RI assigned to each characteristic compared with the others included in the treatment scenarios.

The model (1) was applied by subgrouping the participants according to their role and point of view in the context, that is, if they were patients, caregivers or physicians. Also, subgroups were created according to patients' and caregivers' experience with the treatment, that is, never treated versus already treated, and among these, OPEN versus EVAR treatment received.

Results

Questionnaires were completed by 160 valid patients, 102 family caregivers (partners, children, siblings or friends) and 30 physicians. Physicians intervened only in case of difficulty in comprehension while completing the questionnaires. Table 3 shows the characteristics of the patients at their enrolment into the study.

Among the 76 patients already treated at enrolment, three underwent two interventions: one received two EVAR procedures in 8 years and two received EVAR first and OPEN after 2 and 3 years. Fifty-four of these 76 patients' caregivers reported their own preferences at enrolment. Among the 84 untreated patients, 65 completed the questionnaire also 6 months after the treatment, together with 30 of their caregivers.

Table 3 Patients' characteristics at their enrollment into the study ($N = 160$).

Variable description		Values
Age Mean (min—max)		72.6 (49.3—88.1)
Gender		
males		92.5%
Smoking habits		
Ex smokers		65.3%
Current smokers		26.7%
Never smokers		8.0%
Past treatment of AAA		
Patients already treated		47.5%
EVAR		52.6%
OPEN		47.4%
ASA Class		
1		2.8%
2		28.7%
3		67.4%
4		1.4%
Concomitant diseases		
Dyslipidemia		36.9%
Obesity (BMI $>$ 31 kg/m^2)		23.1%
Hypertension		80.8%
Non insulin dependent diabetes mellitus		14.6%
Insulin dependent diabetes mellitus		2.6%
Cardiac disease		46.0%
Cerebrovascular disease		8.0%
Renal dysfunction/ disease (creatinine levels $>$ 2 mg/dl)		9.9%
Chronic Obstructive Pulmonary Disease		38.3%
Quality of Life (*EQ-5D*)		
Mobility	No problem	64.5%
	Some problems	35.5%
	Confined to bed	0
Self care	No problem	85.7%
	Some problems	13.6%
	Unable to do	0.6%
Usual activities	No problem	77.4%
	Some problems	20.0%
	Unable to do	2.6%
Pain/discomfort	None	60.3%
	Some	38.5%
	A lot	1.3%
Anxiety/depression	None	65.6%
	Some	29.2%
	A lot	5.2%
VAS: mean (min—max)		70.3 (15—100)

Treatment was performed 0.9 (±1.3 SD) years before in EVAR patients and 1.6 (±2.3 SD) in OPEN patients.

Overall, less than 10 patients refused to participate in the study when asked to. Among all the participants, 98.9% of the treatment pairs distributed were answered, (98.4% by patients, 99% by relatives and 100% by the physicians) with a total of 2171 observations (choices) obtained.

Major complications and re-intervention risk were overall the most important characteristics (RI = 56.0% and 27.2%, respectively) for all the respondent categories. The risk of major complications was the most important treatment characteristic for untreated patients, caregivers and physicians (Table 4), with a RI of 32—43%. In contrast, treated patients, and, in particular, those treated with OPEN (Table 5), considered the cost the most important characteristic, with a RI of 34.6%, while those treated with EVAR confirmed their higher preferences for the risk of procedural complication. On the other hand, the type of treatment experienced did not change caregivers' opinion with regard to cost and procedural risk. An additional hospital cost of the procedure was considered less important (7% RI) than all but one characteristic (type of anaesthesia) by the physicians.

The risk of re-intervention was the second most important characteristic among the physicians (RI = 25%), and the third most important one for treated (RI = 22—23%) and untreated (RI = 12—13%) patients and caregivers. According to the type of treatment (Table 5), patients and caregivers experiencing OPEN considered this risk more important (RI = 19—27%) than did subjects experiencing EVAR (RI = 17—20%).

The number of days to be back to basic everyday activities was significant for the already treated patients (RI = 14.8%), regardless of the type of treatment received, but not for untreated patients, family caregivers and physicians (RI = 6—9%).

Follow-up mode was not significant for any subgroup of patients and caregivers (RI $<$ 8%), while it was for the physicians (RI = 13%), more important than the recovery time and the type of anaesthesia.

The type of anaesthesia was apparently not significant in any subgroup of respondents, with a maximum RI of 8.7%. However, when analysed separately, patients treated with OPEN preferred general anaesthesia (RI = 13.6%), while those treated with EVAR significantly preferred local anaesthesia, with an RI of 17%.

Discussion

Our study shows that a possible relative reduction of major complication and mortality risk of 50% gets generally the highest RI among patients with AAA, their caregivers and physicians, compared with the other characteristics considered in the treatment options. This result could be considered not surprising and, taken alone, could let us conclude that EVAR — which implies a lower procedural risk — is always the preferred option in AAA treatment. However, our study also shows that different aspects interact in determining the overall value of the available treatments, such as the risk of re-intervention at 5 years. If this was considered less important by untreated patients,

Table 4 Results stratified according to the role/point of view and to the experience with treatment.

Sub-groups of respondents	Patients				Family caregivers				Specialist physicians	
Treatment	Untreated		Treated		Of untreated patient		Of treated patient			
Characteristics	β° (p value)	RI(%)	β° (p value)	RI(%)	β° (p value)	RI(%)	β° (p value)	RI(%)	β° (p value)	RI(%)
Anaesthesia	−0.165 (0.174)	8.7	−0.003 (0.972)	0.0	0.071 (0.535)	3.3	0.035 (0.697)	2.1	0.108 (0.544)	3.6
Recovery	−0.084 (0.161)	8.8	−0.110 (0.016)	14.8	−0.079 (0.152)	7.3	−0.050 (0.251)	5.9	−0.116 (0.185)	7.6
Repeat	−3.143 (0.038)	13.2	−4.106 (0.000)	22.2	−3.167 (0.027)	11.8	−4.853 (0.000)	23.0	−9.459 (0.000)	24.9
Check-up	−0.109 (0.362)	5.7	−0.057 (0.530)	3.8	−0.168 (0.128)	7.8	−0.121 (0.169)	7.2	−0.397 (0.024)	13.1
Complications	−20.767 (0.000)	32.8	−11.335 (0.000)	22.9	−31.229 (0.000)	43.6	−19.768 (0.000)	35.1	−43.996 (0.000)	43.4
Cost (× 1,000)	−0.291 (0.000)	30.7	−0.268 (0.000)	36.2	−0.282 (0.000)	26.2	−0.227 (0.000)	26.8	−0.1123 (0.206)	7.4
No. of obs. (choices)	334		550		431		614		240	
No. of respondents[c]	84		141		54		78		30	
Log Likelihood[a]	430.0									
Adjusted McFadden R^{2}[b]	0.137									

$^{\circ}$ Regression coefficients (βs) are computed for the difference between the levels of each treatment characteristic. For instance, β of "ANAESTHESIA" represents the relative importance for moving from a local to a total anaesthesia to perform the intervention, every other characteristic assumed to be equal, while β of COST represents the relative importance for one unit of change in cost, from 0 to 2000 €, every other characteristics being equal.
The sign indicates the direction of preferences: in case of "ANAESTHESIA" the negative sign means that respondents preferred a total (coded as 1) over a local anaesthesia (coded as 0); regarding COST, the negative sign of coefficients means that respondents preferred a less expensive procedure over a more expensive one.

[a] Logistic regression uses maximum likelihood approach to estimate parameters.

[b] Pseudo R^2 (McFadden R^2) is a measure of the overall model goodness-of-fit.

[c] The number of respondents corresponds to the number of those reporting their preferences at each time of data collection (enrolment versus follow-up), depending on their treatment experience (already treated versus still to be treated).

Table 5 Results comparison according to type of treatment received, between patients and their family caregivers.

Sub-groups of respondents	Treated patients				Family caregivers of treated patients			
Treatment	OPEN		EVAR		OPEN		EVAR	
Characteristics	β° (p value)	RI(%)	β° (p value)	RI(%)	β° (p value)	RI(%)	β° (p value)	RI(%)
Anaesthesia	0.267 (0.041)	13.6	−0.268 (0.044)	17.3	0.090 (0.475)	5.7	−0.017 (0.892)	1.0
Recovery	−0.121 (0.063)	12.3	−0.095 (0.148)	12.3	−0.071 (0.256)	9.0	−0.032 (0.607)	3.6
Repeat	−4.640 (0.004)	18.9	−3.213 (0.054)	16.6	−5.389 (0.001)	27.3	−4.349 (0.006)	19.6
Check-up	−0.167 (0.198)	8.5	0.063 (0.634)	4.1	−0.169 (0.178)	10.7	−0.076 (0.538)	0.5
Complications	−7.952 (0.067)	12.1	−13.041 (0.003)	25.3	−15.328 (0.000)	29.1	−24.188 (0.000)	40.9
Cost (× 1,000)	−0.340 (0.000)	34.6	−0.189 (0.004)	24.4	0.145 (0.021)	18.3	−0.306 (0.000)	34.5
No. of obs. (choices)	292		258		289		325	
No. of respondents	73		68		37		41	
Log Likelihood[a]	1578.8							
Adjusted McFadden R^{2}[b]	0.520							

°Regression coefficients (βs) are computed for the difference between the levels of each treatment characteristic. For instance, β of "ANAESTHESIA" represents the relative importance for moving from a local to a total anaesthesia to perform the intervention, every other characteristic assumed to be equal, while β of COST represents the relative importance for one unit of change in cost, from 0 to 2000 €, every other characteristics being equal.

The sign indicates the direction of preferences: in case of "ANAESTHESIA" the negative sign means that respondents preferred a total (coded as 1) over a local anaesthesia (coded as 0); regarding COST, the negative sign of coefficients means that respondents preferred a less expensive procedure over a more expensive one.

[a] Logistic regression uses maximum likelihood approach to estimate parameters.

[b] Pseudo R^2 (McFadden R^2) is a measure of the overall model goodness-of-fit.

interestingly, it becomes similarly important to the risk of procedural complications among treated patients, especially those who underwent OPEN surgery. This is reasonable if we consider that patients are more concerned about the risk attributable to the treatment before receiving it, while this is no longer an issue after the procedure, when they probably become more sensible to the risk of re-intervention. However, a possible payment request was considered very important to patients, suggesting that also treatment costs would have a potential role in the decision-making process. The issue of hypothetical cost is important to further determine the small differences in patients' overall perception between OPEN and EVAR procedures. Although the possible fee indicated in the questionnaire seemed to be reasonable in the proponents' mind (2000 €), it got the second highest RI level, which suggests that the weight of this aspect is actually more important, compared with others, than it could be expected. Clearly, that was not the case for physicians, who were asked about an extra cost to be paid by the hospital.

The recovery time and the type of anaesthesia were not considered significantly important by physicians, caregivers and untreated patients; differently, treated patients considered these two characteristics significantly important. Gaining even one day of ability to perform basic everyday activities was important to them, regardless of the type of treatment experienced. Opposite opinions were found with regard to the type of anaesthesia, between patients treated with EVAR and those treated with OPEN; both groups showed a preference towards the type of anaesthesia they actually experienced during the treatment, which suggested an overall satisfaction with either method.

Finally, unlike the data of previous studies,[2] the burden of the follow-up procedure was not found to be a concern to patients and caregivers.

To understand patients' preferences towards OPEN and EVAR procedures, several methods of analysis have been employed in the literature, such as in-depth interviews, semi-structured interviews and questionnaire studies. In-depth interviews are conventionally understood to have a high degree of internal validity, and are considered to be a qualitative approach for explaining phenomena that are difficult to measure.[11] Berman et al. applied this method to patients undergoing AAA repair, collecting an interesting scenario of patients' opinions, thus highlighting the limitations of contemporary informed consent. However, the nature of these in-depth interviews neither allows to collect a significant number of cases nor to quantify the importance of the single treatment characteristics.[4] In this context, the opinion of nurses who assist patients with AAA before and after treatment is indicative, but does not allow a complete and unbiased analysis of the patients' general opinion about treatment.[6] Other authors employed semi-structured telephone interviews with a low response rate (56 of 100 patients on an AAA surveillance programme), determining that the risk of death was the main concern for patients with AAA.[5] Similarly, Reise et al. conducted a postal survey and obtained a 70% response rate. In this analysis, influence of medical advice reached the highest importance among responders.[7] As seen, the use of self-administered questionnaires can gather information quickly among a large number of participants, but postal surveys may have limited significance and low participation rates. The previous research examining endovascular versus surgical treatment for coronary revascularisation used therefore more complex methods normally associated with health economic analysis, such as time trade-off, gambling and willingness-to-pay techniques.[12]

The type of analysis employed in the present study is unique and straightforward in the analysis of treatment

choice regarding AAA. First, by obtaining preferences on hypothetical treatment scenarios resulting from different combinations of single treatment characteristics, it is possible to precisely evaluate the relative importance of each one of them. This would not be clearly possible by simply asking an overall preference between the two treatment options, namely EVAR and OPEN. Second, this method allows us to obtain a large amount of data with a self-completion procedure and to quantify the relative importance of each treatment characteristic that could influence individuals' choice. The self-completion approach allows also minimising the presence of biases that could be present from a direct interview approach. Moreover, not only did we analyse the preferences of patients — which are clearly most important in the treatment choice — but also those of both family caregivers and physicians, who may influence patients' choices. Finally, a comparison of preferences between subjects with different treatment experience was possible, leading to additional information on how the experience may change their opinion.

This study has some potential limitations, which should be considered in further research. First, because preferences could depend also on the type of health-care system of the different countries, our results may be not generalised to the worldwide target population. For instance, the cost issue can be variably perceived in the different countries, with diverse impacts on individuals' perceptions and opinions. Second, to produce cognitively efficient choice situations, we did not analyse all treatment characteristics: the exposure to radiation, nephrotoxicity of contrast medium and the length of the procedure were not considered in the analysis, as we opined the low risk associated with these factors could be particularly difficult to be discussed with the average educated patients and caregivers. Other aspects that may be relevant to a number of patients, such as the length and position of the scar and the possible sexual impairment (in younger patients), were excluded according to the results of the pilot study and considerations reached with the panel of experts involved. This implies that we cannot exclude the fact that other characteristics not analysed in this study may be important to some specific categories of patients or in other health-care systems. However, our study shows some interesting results for subjects involved in the treatment of AAA, different as regards their role and point of view, and their past experience with the treatment. As the differences in the results of EVAR and OPEN appear similar in the long run,[13] the choice between the two treatment methods may rely on patients' preferences, to suit their requirement, and our results may be important in this sense.

In conclusion, the safety of the procedure is generally considered the most important aspect of AAA treatment; however, other treatment characteristics, apparently less important, show high RI with different perceptions in patients, their relatives and surgeons. These data should be taken into consideration when informing patients undergoing AAA treatment, to obtain a complete and satisfactory interaction with them.

Acknowledgements

Technical support during data collection and the paper writing was provided by P Cortesi and M Cristiani, Centre for Health Technology Assessment and Outcomes Research, University of Milano, Italy. We are grateful to all questionnaire respondents.

Conflict of Interest

The authors have no conflict of interest to disclose.

Funding

The work has received an unrestricted grant by Medtronic Italia SpA, and was conducted in agreement with the National Regulatory Requirements, International Conference on Harmonisation Guidelines for Good Clinical Practice and the 18th World Medical Assembly[10] and all subsequent amendments.

Ethical Approval

The study protocol was submitted at each participating centre's Ethical Committee. Each patient and family caregiver had to sign an informed written consent to participate.

Appendix

PREFER Study Group List

Hospital Center	Investigator
University of Bologna — S. Orsola — Malpighi Hospital- Bologna	A Stella G Faggioli F Fratesi
University of Florence — Careggi Hospital — Firenze	C Pratesi M Di Mare
Eporediese Clinic — Ivrea	F Peinetti M Maione
Niguarda Ca' Granda Hospital — Milano	M Puttini F Riolo
Cardarelli Hospital — Napoli	C Ruotolo G Sabino
S. Matteo Hospital — Pavia	A Odero A Bozzani
San Filippo Neri Hospital — Roma	N Mangialardi V Alberti
University of Siena — Le Scotte Hospital — Siena	C Setacci P Sirignano
Trieste Associated Hospitals — Cattinara Hospital — Trieste	R Adovasio L Ukovich

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