

# Papers

## Patients' preferences for the management of non-metastatic prostate cancer: discrete choice experiment

Mark Sculpher, Stirling Bryan, Pat Fry, Patricia de Winter, Heather Payne, Mark Emberton

### Abstract

**Objective** To establish which attributes of conservative treatments for prostate cancer are most important to men.

**Design** Discrete choice experiment.

**Setting** Two London hospitals.

**Participants** 129 men with non-metastatic prostate cancer, mean age 70 years; 69 of 118 (58%) with T stage 1 or 2 cancer at diagnosis.

**Main outcome measures** Men's preferences for, and trade-offs between, the attributes of diarrhoea, hot flushes, ability to maintain an erection, breast swelling or tenderness, physical energy, sex drive, life expectancy, and out of pocket expenses.

**Results** The men's responses to changes in attributes were all statistically significant. When asked to assume a starting life expectancy of five years, the men were willing to make trade-offs between life expectancy and side effects. On average, they were most willing to give up life expectancy to avoid limitations in physical energy (mean three months) and least willing to trade life expectancy to avoid hot flushes (mean 0.6 months to move from a moderate to mild level or from mild to none).

**Conclusions** Men with prostate cancer are willing to participate in a relatively complex exercise that weighs up the advantages and disadvantages of various conservative treatments for their condition. They were willing to trade off some life expectancy to be relieved of the burden of troublesome side effects such as limitations in physical energy.

### Introduction

Several situations exist where patients face trade-offs between the risks and benefits of alternative therapies.<sup>1</sup> The conservative management of men with organ confined or locally advanced prostate cancer is such a situation. Men diagnosed at a stage when radical treatments such as prostatectomy or radiotherapy are inappropriate face several treatment options, including watchful waiting or oral steroidal or non-steroidal antiandrogen monotherapy.<sup>2</sup> Many patients choose castration, performed medically rather than surgically. Alternatively, there is the option of antiandrogen treatment combined with medical or surgical castration.

To make an informed choice, men need to be able to weigh up the slight differences in effectiveness of treatment against a spectrum of side effects associated with alternative strategies. For example, non-steroidal antiandrogen monotherapy offers potential advantages over castration for impotence, loss of libido, and hot flushes, but these may be achieved at the cost of an increased risk of gynecomastia and breast pain.<sup>3</sup>

Individuals' preferences for alternative treatments need to be considered in the light of the attributes of the treatments. Discrete choice experimentation, an approach for elicitation of preferences, is now being used widely in health care.<sup>4 5</sup> This approach identifies the key characteristics of alternative treatments, such as hot flushes, and selects a series of levels for each (for example, absent, mild, moderate). Respondents choose from several options, each of which details a series of attributes at different levels. The relative importance of attributes to individuals and the trade-offs made between them, can be assessed by changing the levels of the attributes and asking participants to make their choice again. Findings on the reliability and validity of discrete choice experimentation in healthcare settings are encouraging.<sup>6 7</sup> We used discrete choice experimentation to elicit treatment related preferences in a sample of men with non-metastatic prostate cancer.

### Methods

#### Pilot study

Before the main study, we conducted a two phase pilot study in men with prostate cancer. Fourteen men were recruited into the first phase and were interviewed by a trained research nurse. On the basis of these interviews eight attributes were selected for the main study: diarrhoea, hot flushes, ability to maintain an erection, breast swelling or tenderness, physical energy, sex drive, life expectancy, and out of pocket expenses. In the second phase, nine men were asked to complete a questionnaire based discrete choice experiment with these attributes; there was also a brief unstructured interview with a research nurse. Several men did not understand the nature of the exercise and were only able to complete exercise with guidance from the research nurse. We therefore decided to use an interview format for the main study.

#### Study format

The attributes and levels used in the exercise are described on [bmj.com](http://bmj.com). We chose mild and moderate levels only: it was explained to patients that therapy would be changed in a severe event. The mild level included symptoms that would not interfere with work, study, housework, family, or leisure activities and the moderate level included symptoms that would.

A trained research fellow conducted the interviews, during which personal data on the patients were collected (data were also taken from medical records). The men were presented with two treatment options, each containing a set of attributes at specific levels. The interviewer read out the pair wise options and



Treatment attributes and levels and probit models are on [bmj.com](http://bmj.com)

**Table 1** Example of show card used in discrete choice experiment

	Option A	Option B
<b>Part 1</b>		
Sex drive or libido	Diminished	Diminished
Ability to get or maintain erection	No problems	No problems
Physical energy	Lacking "pep"	No problems
Treatment cost to you personally	£400	£275
Life expectancy	Option A better by two months	
<b>Part 2</b>		
Diarrhoea	Present, moderate	Absent
Hot flushes	Present but mild	Present but mild
Breast swelling or tenderness	Present	Present
Treatment cost to you personally	None	£150
Life expectancy	Option A better by two months	

used show cards as prompts to help the men choose the options they preferred (table 1).

We divided the exercise into two parts to avoid overburdening patients with too many attributes for an option. The first part included three unique attributes—the ability to maintain an erection, physical energy, and libido. The second part included three unique attributes—diarrhoea, hot flushes, and breast tenderness. Both parts included two common attributes—life expectancy and a one off out of pocket expense.

The men had to assume a life expectancy of five years, estimated as the average for the sample considering the mean age (70 years) and clinical stage of disease. The clinical stage was typically not detected by screening but rather diagnosed on the basis of problems relating to progression of the cancer. The five year average was justified because the sample included men with T1 or T2 disease with an estimated seven year survival probability of 65% and men with T3 or T4 disease with a five year survival probability of 30%.<sup>8,9</sup> The two parts of the exercise each contained eight pair wise options. We prepared eight different versions of the questionnaire, each representing a new experimental design (orthogonal main effects). Each version of the questionnaire presented different levels of the cost attribute to allow a larger number of intervals between cost levels across the survey. Study patients were randomly allocated to one of the questionnaires.

### Study sample

Our study sample was patients with non-metastatic prostate cancer who had or had never received antiandrogen therapy; there were no exclusion criteria. Potential participants were identified from records at the Middlesex Hospital, London. They were contacted in writing to obtain written informed consent. Respondents were asked to make an appointment for an interview at the Middlesex Hospital.

### Analysis

We analysed the discrete choice exercise by taking each choice between pair wise options as a specific observation. Hence each respondent provided a maximum of 16 observations. Given the non-independence of the data provided by the same respondent, a random effects probit model was used. Two separate models were specified (one for each group of attributes), with the choice responses as the binary dependent variable and the difference in levels for each of the attributes as the independent variables (see [bmj.com](http://bmj.com)). The specification of the experiment precluded the testing for interactions between attributes, but we explored the

**Table 2** Characteristics of men (n=129). Values are numbers (percentages) unless stated otherwise

Characteristic	Descriptive statistic
Mean (SD) age (years)	70 (6.8)
T stage at diagnosis:	
T1	25/118 (21)
T2	44/118 (37)
T3	35/118 (30)
T4	3/118 (2)
Median (interquartile range) prostatic specific antigen level	1.3 (0.5-5.9)
In stable relationship	93/126 (74)
Work status:	
Employed	34/127 (27)
Retired	90/129 (70)
Other	4/129 (3)
Continuing education after minimum age	78/127 (61)
Degree or equivalent qualification	55/127 (43)

interactions between attributes and patient characteristics (age, prostate specific antigen level, and T stage of cancer at diagnosis).

## Results

Between 24 May and 8 September 2000, we invited 180 men to participate in our study. Of these, 129 were interviewed. Participants were similar to those who declined for mean age and T stage at diagnosis. Table 2 shows the characteristics of the participants.

### Discrete choice experiment

Table 3 shows the results of the first part of the exercise. The coefficients for the unique attributes were all statistically significantly different from 0; negative values for libido, maintaining an erection, and physical energy indicate that the more severe the problems, the less likely the patient is to prefer that scenario; negative values for out of pocket expenses indicate that the higher the costs, the less likely the patient is to prefer that scenario. Positive values for life expectancy indicate that the greater the life expectancy the more likely the patient is to prefer that scenario. The only statistically significant interaction was between ability to maintain an erection and age; the positive value indicates that older men were less likely to be influenced by the ability to maintain an erection in choosing their preferred scenario.

Table 4 shows the results of the second part of the exercise, which also considered the unique attributes of diarrhoea, hot flushes, and breast tenderness. The coefficients for the attributes

**Table 3** Results of first part of discrete choice exercise

Variable	Coefficient (95% CI)	SE	P value
Libido	-0.3089 (-0.5719 to -0.0460)	0.1342	0.021
Ability to maintain erection	-0.4243 (-0.5321 to -0.3165)	0.0550	<0.001
Physical energy	-0.7032 (-0.8219 to -0.5845)	0.0606	<0.001
Out of pocket expenses	-0.0007 (-0.0014 to -0.0001)	0.0003	0.017
Life expectancy	0.2336 (0.1707 to 0.2966)	0.0321	<0.001
Interaction between ability to maintain erection and age	0.2184 (0.0934 to 0.3433)	0.0637	0.001
Constant	-0.0541 (-0.1459 to 0.0376)	0.0468	0.248
No of observations	1000; 194.92; P<0.0001*		

\* $\chi^2$  test.

**Table 4** Results of second part of discrete choice exercise

Variable	Coefficient (95% CI)	SE	P value
Diarrhoea	-0.4193 (-0.5454 to -0.2931)	0.0644	<0.001
Hot flushes	-0.1225 (-0.2162 to -0.0287)	0.0479	0.010
Breast tenderness	-0.4329 (-0.6147 to -0.2512)	0.0927	<0.001
Out of pocket expenses	-0.0016 (-0.0025 to -0.0007)	0.0004	0.001
Life expectancy	0.2329 (0.1827 to 0.2832)	0.0256	<0.001
Constant	0.1278 (0.0262 to 0.2294)	0.0518	0.014
No of observations	992; 164.35; P<0.0001*		

\* $\chi^2$  test.

were all statistically significantly different from zero. Negative values for diarrhoea, hot flushes, and breast tenderness indicate that the more severe the problem the less likely the patient is to prefer that scenario. None of the interaction terms were statistically significantly different from zero.

Table 5 shows the marginal rates of substitution between life expectancy and other attributes—that is, how much life expectancy the men were willing to trade off to achieve an improvement by one level in one of the other attributes. For example, men were willing to trade off 1.8 months of life expectancy to change diarrhoea from a moderate to mild level or from mild to absent. Because the levels of severity differed between attributes, marginal rates of substitution between attributes should be compared with caution. The least important marginal rates of substitution were for hot flushes and the most important were for physical energy.

## Discussion

Men with prostate cancer are willing to participate in the relatively complex exercise of discrete choice experimentation to weigh up the benefits and risks of various conservative treatments, irrespective of the stage of cancer or whether they had received such treatment. To our knowledge, our study is the first to elicit preferences from patients with prostate cancer using discrete choice experimentation, and provides further evidence that this approach can be applied successfully in health care. A novel feature of our study was the use of two groups of attributes. This allowed the choices to be kept relatively simple (maximum of six attributes), and the inclusion of a common core of two

**Table 5** Patients' marginal rates of substitution between life expectancy and other attributes

Attribute	Life expectancy willing to forgo (months)	Single level improvement
Diarrhoea	1.8	From moderate to mild or from mild to absent
Hot flushes	0.5	From moderate to mild or from mild to absent
Breast swelling	1.9	From present to absent
Loss of libido	1.3	From present to absent
Problems in maintaining an erection:		
Aged <70 years	1.8	From moderate to mild or from mild to absent
Aged >70 years	0.9	From moderate to mild or from mild to absent
Lack of energy or "pep"	3.0	From present to absent

## What is already known on this topic

Various factors need to be considered in making treatment decisions in prostate cancer

Patients' views on which factors of treatment are important to them and how they trade-off these factors is under-researched

## What this study adds

Men are willing to contemplate trading off life expectancy to be relieved of the burden of side effects such as limitations in physical energy

The preferences of older men are not the same as those of younger men

attributes (cost and life expectancy) ensured trade-offs across all attributes.

The men were willing to trade off some life expectancy to be relieved of side effects. Men with metastatic cancer were not included in the study, so no patients faced imminent death, with life expectancy ranging from around 2 to 10 years. Given the difficulty in estimating, and potential ethical problems in presenting, life expectancy for each patient, the men were asked to assume a life expectancy of five years (the average in the group) as a starting point. The size of the trade-offs between life expectancy and the other attributes should be treated with caution because men with a longer or shorter life expectancy than five years may have indicated different preferences if their actual life expectancy had been presented to them.

The results are averaged across the sample and so there is inevitable variation between the men. Our results are therefore no substitute for careful assessment of individual patient preferences in a clinical setting but do provide some basis for clinicians to prioritise issues they discuss with patients. The implications on physical energy from conservative treatment, for example, may be an important starting point for decisions on treatment.

Our findings could be used by clinicians to help patients choose between conservative treatments; knowing about the preferences of other men with prostate cancer might help patients to clarify their own thoughts. Our findings could also help in the design of new studies in prostate cancer.

We looked at the application of discrete choice experiments in prostate cancer only. The ability and willingness of men to engage in this exercise is encouraging for future research. Perhaps the most common therapeutic dilemma that patients and clinicians face is the timing of androgen suppression. Should a patient start therapy early, once progression of prostate cancer has been identified? The potential benefits of this approach might include a slowing down of disease progression and perhaps reducing the likelihood of death related to the cancer. Alternatively, the patient could defer treatment for an agreed time. This would avoid the immediate side effects of treatment and possibly reduce the medium to long term adverse effects. This type of trade-off is made by many patients with progression of disease everyday, and discrete choice experimentation could gain some insight into the way patients make this difficult choice.

We thank Rob Sheldon (Accent Marketing and Research) for help with the design and analysis of the study, Wendy Coucill for her work on the pilot study, and the patients.

Contributors: MS and ME initiated the research and designed the study with SB, HP, and PF. PF undertook the interviews. SB and MS undertook the

analyses, and MS produced the main drafts. MS and SB will act as guarantors for the paper. They accept full responsibility for the conduct of the study, had access to the data, and controlled the decision to publish.

**Funding:** This study was funded by an unrestricted grant from AstraZeneca. **Competing interests:** MS, SB, and ME have been paid as consultants for AstraZeneca.

**Ethical approval:** Approval was obtained from the local research ethics committee.

- 1 Kassirer JP, Pauker SG. The toss-up. *N Engl J Med* 1981;305:1467-9.
- 2 Adolphson J. The natural history of early prostate cancer and the impact of endocrine treatment. *Eur Urol* 1999;36(suppl 2):3-8.
- 3 Iverson P, Tyrrell CJ, Kaisary AV, Anderson JB, Baert L, Tammela T, et al. Casodex (bicalutamide) 150-mg monotherapy compared with castration in patients with previously untreated nonmetastatic prostate cancer: results from two multicentre randomised trials at a median follow-up of 4 years. *Urology* 1998;51:389-96.
- 4 Bryan S, Buxton M, Sheldon R, Grant A. Magnetic resonance imaging for the investigation of knee injuries: an investigation of preferences. *Health Econ* 1998;7:595-604.
- 5 Ryan M, Farrar S. Using conjoint analysis to elicit preferences for health care. *BMJ* 2000;320:1530-3.
- 6 Bryan S, Gold L, Sheldon R, Buxton M. Preference measurement using conjoint methods: an empirical investigation of reliability. *Health Econ* 2000;9:385-95.
- 7 Bryan S, Parry D. Structural reliability of conjoint measurement in health care: an empirical investigation. *Appl Econ* 2001;34:561-7.

- 8 Messing EN, Manola J, Sarosdy M, Wilding G, Crawford ED, Trump D. Immediate hormonal therapy compared with observation after radical prostatectomy and pelvic lymphadenectomy in men with node-positive prostate cancer. *N Engl J Med* 1999;341:1781-8.
- 9 Blackard CE, Byar DP, Jordan WP, Jr. Orchidectomy for advanced prostatic carcinoma. A re-evaluation. *Urology* 1973;1:553-60.  
(Accepted 25 November 2003)

doi 10.1136/bmj.37972.497234.44

---

Centre for Health Economics, University of York, Heslington, York YO10 5DD  
Mark Sculpher *professor*

Health Economics Facility, Health Services Management Centre, University of Birmingham, Birmingham B15 2RT  
Stirling Bryan *professor*

Institute of Urology, Royal Free and University College Medical School, London W1P 7PN

Pat Fry *research fellow*

Patricia de Winter *research nurse*

Mark Emberton *senior lecturer*

Meyerstein Institute of Oncology, Middlesex Hospital, London W1T 3AA

Heather Payne *consultant in clinical oncology*

Correspondence: M Sculpher

mjs23@york.ac.uk