Beliefs about surgery: Development and validation of an instrument to assess cognitive representations about surgery, in the context of a chronic illness

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Abstract

Objectives

Within a trial of medical and surgical treatments for gastro-oesophageal reflux disease (GORD), involving randomised arms and preference arms, we tested the applicability of the Beliefs about Medicines Questionnaire (BMQ) and developed and tested the validity of a new Beliefs about Surgery Questionnaire (BSQ).

Methods

Patients with GORD (n = 43) were interviewed to elicit their beliefs about medical and surgical treatments. These contributed to development of BSQ items. The BMQ and BSQ were completed by trial participants at baseline (randomised trial: N=325; preference trial: N=414). Factor analysis and discriminant function analysis were used to assess validity.

Results

Principal components analysis (PCA) largely replicated the 4-factor BMQ structure. PCA of the combined BMQ/BSQ yielded 6 factors explaining 54.5% variance. BSQ items loaded onto distinct factors, demonstrating divergence from BMQ. As predicted, BMQ/BSQ scores enabled correct classification of 78.5% of participants to medication and surgery groups in the preference trial ($\chi^2(6)$=205.9, p<.001) but only 54.5% (no better than chance) in the randomised trial ($\chi^2(6)$=9.4,p=.154).

Conclusions

The BSQ is a valid measure of perceptions about surgical treatments for GORD. With the BMQ, it provides information that may guide patients' choices about treatment. This measure may be applicable to other conditions.

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Current health care policy and practice acknowledge the importance of offering choice to users of

the health-care system about their treatment (Department of Health, 2003). It is plausible that

people's choices about treatment are influenced by their cognitive representations about the risks

and benefits of various treatments (Horne, 1999), which will be shaped, in part, by their past

experience of treatment. Indeed, this link between cognitive representations and action is

represented in Leventhal's Common Sense Self-Regulation Model (CS-SRM; Leventhal, Leventhal

& Contrada, 1998) as follows. In response to a health threat, people form two types of

representations: representations about the illness and emotional representations. They then

implement coping procedures in order to restore their physical or emotional equilibrium and

evaluate their experiences of coping (e.g., taking treatment) in relation to their illness perceptions.

The illness representations framework has been used to investigate illness-related behaviours such

as adherence to treatment (for example, Horne & Weinman, 2002). The dimensions of this

framework include beliefs about what the illness is (its identity: symptoms, severity and label); its

cause, consequences, duration (timeline) and how it may be cured, controlled or managed

(treatment beliefs).

According to the CS-SRM, people's cognitive and emotional representations of their illness will

influence their behaviour, and this could have important consequences for clinical outcomes. For

example, a person with chest pain will not seek medical attention unless the pain is interpreted as a

potential threat to health, associated with worry, and this factor has been demonstrated to influence

delay in seeking help (for example, Horne, James, Petrie, Weinman & Vincent , 2000; Carney,

Fitzsimons & Dempster, 2002). A questionnaire measure about illness representations has been

developed (Weinman, Petrie, Moss-Morris & Horne, 1996; Moss-Morris et al, 2002) and is

frequently used to investigate people's cognitions about illness in the context of the CS-SRM (for example, Pimm & Weinman, 1998; Neame & Hammond, 2005).

Horne and Weinman (2002) have further shown that, while people's perceptions about their illness influence illness-related behaviours such as whether they seek professional help, treatment beliefs are more proximal determinants of treatment-related behaviours such as adherence to medication regimens (Horne & Weinman, 2002). Indeed, beliefs about treatments, such as 'the cure is worse than the disease', can impact on people's treatment behaviours (for example, opting for non-adherence to cope with side-effects; Johnson & Nielands, 2007; Perkins, 2002). In a study of beliefs about non-pharmacological treatments, Yardley, Sharples, Beech and Lewith (2001) developed a dynamic model of treatment perceptions in which experiences of therapy modify perceptions of illness and of symptom change. Thus, within the framework of the CS-SRM it may be informative to investigate and elaborate the domain of treatment beliefs, in order to understand treatment-related behaviours.

Horne and colleagues (Horne, Weinman & Hankins, 1999) developed the Beliefs about Medicines Questionnaire (BMQ) to assess people's perceptions about medical treatments. For conditions where medication is just one of the treatment options it seems sensible also to assess beliefs about these other potential treatments, especially as they might relate to people's treatment choices. One choice that individuals make about their health care is whether to use complementary and alternative medicines rather than conventional medication approaches. Measures of beliefs about complementary and alternative medicines have been developed (Bishop, Yardley & Lewith, 2005; Finnigan, 1991; Hyland, Lewith & Westoby, 2003), and have been used to inform people's treatment choices, but there appears to be no equivalent measure to assess beliefs about surgical procedures. In the current paper we report the development of a new measure relating to beliefs about surgical treatments (Beliefs about Surgery Questionnaire; BSQ). Together, these

instruments measuring cognitive representations about medical and surgical treatments are validated against patients' treatment choices in the context of a clinical trial.

The BMQ (Horne et al., 1999) was originally validated using a chronic illness sample (n = 524), including people diagnosed with asthma, diabetes, renal disease, psychiatric illness, and cardiac and general medicine inpatients. On the basis of Principal Components Analysis and Confirmatory Factor Analysis, four subscales were identified relating to beliefs about medications specific to the diagnosed condition ('Concerns' about taking the medication and 'Necessity' of taking the medication) and beliefs about medication in general ('Harmfulness' of medication in general and 'Overuse' of medication in general). The psychometric properties of these scales have been reported by Horne et al. (1999) and demonstrate high levels of discriminant validity, criterion-related validity and stability of the factor structure across the different illness groups.

Although beliefs about treatment have been investigated in relation to adherence to medication regimens and treatment preferences (Horne, 1999), little research in this area has explored the issue of patient choice when surgery is one of the treatment options (Duric, Butow, Sharpe, Boyle, Beith, Wilcken, Heritier, Coates, Simes, & Stockler, 2007). The addition of a measure of beliefs about surgery to the existing measure of beliefs about medication would provide the opportunity to explore such decisions. It is possible that people with less negative beliefs about surgery experience less anxiety associated with the surgery. As there is evidence that anxiety is associated with poorer clinical outcomes post-surgery (Johnston & Vogele, 1993), this could be an important issue to explore.

The study was conducted in the context of a clinical trial, the REFLUX trial (Randomised Evaluation oF Laparoscopic sUrgery for refluX trial; Grant, Wileman, Ramsay, Bojke, Epstein, Sculpher, Kilonzo, Vale, Francis, Mowat, Krukowski, Campbell M, et al., 2008), that evaluated these two treatment options in the case of gastro-oesophageal reflux disease (hereafter referred to as

GORD). GORD is a relatively common condition with 10 to 20% of the "western" adult population experiencing symptoms weekly (Dent, El-Serag, Wallander, & Johansson, (2005). The main symptoms are heartburn and acid regurgitation along with difficulty swallowing, chest pain, bloating and belching, all of which can have a significant impact on a person's quality of life. This reduction in quality of life has been reported to be associated with problems with eating and drinking, disturbed sleep, lack of vitality, body pain and poor emotional well being (Talley, Junghard, & Wiklund, 2001). The majority of patients with GORD require long term medication for symptom relief, or surgery. However, it is still unclear which form of treatment is most effective. This REFLUX trial was a large multicentre randomised controlled trial, with parallel non-randomised preference groups, that aimed to compare the clinical and cost-effectiveness of relatively early laparoscopic surgery with continued medical management amongst people with GORD within the UK National Health Service.

Since the REFLUX trial involved non-randomised preference groups, it was felt important to include a measure that would investigate the process of patients' decisions about their treatment choice. This population was of particular interest because GORD is a chronic condition for which there are two viable treatment options. Hence, in this context it was possible to test the proposition that treatment choice would be influenced not only by beliefs about medication but also by beliefs about surgery. However, these trial participants differed in two key ways from the samples in the BMQ validation study reported by Horne et al. (1999). First, they had all been on long-term medication for GORD before being offered the option of surgery. Second, medication was primarily for symptom relief. Hence, it was instructive to investigate whether the BMQ was an appropriate measure for this patient group.

Thus, there were three aims of the study reported here: (1) to test the validity of the BMQ in the context of GORD (using baseline measures); (2) to develop a Beliefs about Surgery Questionnaire (BSQ) based where possible on items that paralleled the BMQ and to test the discriminant validity

of the BSQ (relative to the BMQ); (3) to test the criterion-related validity of the combined BMQ/BSQ. The criterion against which to test the profile of combined scores was the treatment decision (medication or surgery) of participants who had the opportunity to choose their treatment (that is, those in the preference arms of the trial).

Methods

Interviews to elicit patients' views

During the development of a new GORD-specific measure of symptom severity (The Reflux questionnaire; Macran, Wileman, Barton & Russell, 2007) for use within the trial, a total of 31 people with GORD participated in one-to-one interviews (lasting approximately 30 minutes). Of these, 15 were receiving medical treatment and 16 had had surgery. Two focus group interviews (approximately 90 minutes) were also conducted, each involving 6 people, all of whom had previously undergone surgery. A semi-structured interview schedule was developed (for both the one-to-one and focus group interviews) to elicit views about the advantages and disadvantages of medical and surgical options, experience and impact of the illness, and views about service provision. The interviews were recorded, transcribed verbatim, anonymised and subjected to thematic analysis. The themes categorising patients' views suggested that patients focused on their past experience, that is, their experience of medication treatment of GORD. There was little discussion about the risks and benefits of the surgical treatment option. However, generic views about surgery did emerge in this analysis and these were used to generate items for the BSQ, following the framework of generic beliefs about medicines outlined in the BMQ.

Item development

Item content for the Beliefs about Surgery Questionnaire (BSQ) was informed by three sources: the BMQ; the literature on informed decision making about treatment options (Bekker et al., 1999; HTA review); and thematic analysis of the data elicited from patients in the interviews about GORD symptoms. Table 1 presents 12 items generated from the three sources. Following discussion

among the research team, four of these items were discarded, either because they duplicated the

content of other items or because the wording was potentially problematic. The resulting 8-item

questionnaire (with a response format replicating that of the BMQ: 1 – Strongly disagree – to 5 –

Strongly agree) was included with the 18-item BMQ in the trial measures at baseline.

TABLE 1 ABOUT HERE

Trial context and procedure

Between March 2001 and June 2004, 810 patients who had documented evidence of GORD

(based on endoscopy and/or manometry/24hr pH monitoring) as well as symptoms for more than

12 months requiring maintenance proton pump inhibitors (PPI) therapy for reasonable symptom

control, agreed to participate in the trial. The trial had multi-centre research ethics approval and

was conducted in accordance with the principles of research governance as specified by the EU

Clinical Trial Directive (2001).

A total of 357 were recruited to the randomised arm of the trial and 453 to the preference study.

The participants in the randomised arm of the trial were, on average, 46 years old (SD=11.1) and

66% were men. In the preference arm, the participants tended to be older (mean = 50 years,

SD=11.8) and there were slightly fewer men (61%).

Patients who consented to take part in the trial, both randomised and preference groups, were

asked to complete a baseline postal questionnaire which they returned in a pre-paid envelope to

the trial office for analysis. The questionnaire contained the Reflux questionnaire (Macran et al.,

2007), the EQ-5D (EuroQol Group, 1990) the SF36 (Jenkinson, Layte, Wright & Coulter, 1996), the

BMQ and the BSQ.

Analytic strategy

Three analyses were conducted, each addressing one of the study aims. First, rather than

structural equation modelling, the same analytic procedures were used as reported by Horne et al.

(1999). That is, an exploratory Principal Components Analysis was conducted on the BMQ items

and Confirmatory Factor Analysis was performed by computing Pearson's correlations for factor

loadings against: (a) the theoretical model of predicted factor loadings and (b) the empirical model

of factor loadings reported by Horne et al. As described by Horne et al., the theoretical model was

defined by assigning a factor loading of '1' to all items expected to load on the factor and all other

items were assigned a loading of '0'. This strategy permitted comparisons of two expected patterns

of factor loadings (the theoretical 0-1 loadings and the empirically derived loadings from Horne et

al.) with the pattern derived from the REFLUX sample. This was done to achieve a clear replication

of the original validation study.

Second, the discriminant validity of the BSQ relative to the BMQ was assessed by a further

exploratory Principal Components Analysis on the combined items from the BMQ and BSQ, using a

non-orthogonal (Direct Oblimin) method of rotation. The factor scree plot and eigenvalues were

used to select the number of factors. An exploratory rather than confirmatory approach was used,

as four of the eight items were different from BMQ items and so there were few grounds on which

to make assumptions or predictions about the underlying factor structure of the BSQ.

Third, Discriminant Function Analysis was used to test the criterion-related validity of the combined

BMQ/BSQ. This form of validity would be demonstrated if the profile of scores enabled correct

classification of cases to the Surgery and Medication groups in the preference groups but not in the

randomised groups.

Results

A total of 794 REFLUX trial participants completed and returned baseline questionnaires. Of these,

both the BMQ and BSQ were completed by 414 (93%) in the preference arm and 325 (93%) in the

randomised arm of the trial. Thus, 739 cases were analysed. These were complete cases and thus

there were no missing data.

Distributions of scores on the 18 BMQ items were generally acceptable: Skewness was greater

than 1 for only one variable: *My health, at present, depends on my medicines* (sk = 1.48). Kurtosis

was greater than 1 for three variables: *My health at present depends on my medicines* (ku = 2.20)

[modal value: 5]; *Natural remedies are safer than medicines* (1.48) [modal value: 3]; *Medicines do

more harm than good* (1.81) [modal value: 2];

Distributions of scores on the eight BSQ items were also generally acceptable: Skewness was

greater than 1 for only one variable: *I would be willing to have an uncomfortable test …* (sk = 1.09).

Kurtosis was greater than 1 for three variables: *I would be willing to have an uncomfortable test*

(1.74) [modal value: 4]; *Surgery does more harm than good* (1.10) [modal value: 2]; *Doctors are too

quick to suggest surgery* (1.40) [modal value: 2].

Exploratory Principal Components Analysis on BMQ items

Based on the structure of the instrument reported by Horne et al. (1999), the BMQ was expected to

comprise 4 factors (corresponding to the two subscales for each of the item pools relating to beliefs

about Medication in General Medicine and Medicines for a specific condition). Using an eigenvalue

cut-off of 1.1 (Jolliffe, 1986), the REFLUX data yielded four factors that together accounted for

53.3% of the variance in the scores. Using a cut-off of 0.3 for item inclusion (Tabachnik & Fidell,

1996), every item in the item pool loaded on to a factor (and 17 of the 18 items loaded at >0.4).

Two of the 18 items had diffuse loading. Factor 1 of the REFLUX data corresponded to the

General Harm scale and part of the General Overuse scale of Horne et al. (1999) and was labelled 'General: uncertain risk/efficacy balance'. Factors 2 and 3 corresponded exactly to Horne's Specific Concerns and Specific Necessity factors so the same labels were retained. Factor 4 corresponded mostly to Horne's General Overuse scale and was labelled 'General: unintended effects'.

Confirmatory factor analysis on BMQ items

To test the consistency between the factor solution derived from the REFLUX sample and that of the chronic illness groups reported by Horne et al. (1999), a Confirmatory Factor Analysis was conducted by computing the correlations between all the factor loadings derived from the REFLUX data set and (a) a theoretical model, defined by assigning factor loadings of '1' to items expected to load on a factor, or else '0'; and (b) Horne et al.'s empirically derived factor loadings. Results of the Confirmatory Factor Analysis are presented in Table 2.

TABLE 2 ABOUT HERE

Exploratory Principal Components Analysis on BMQ/BSQ items

A Principal Components Analysis (with Oblimin rotation) was conducted on all BMQ and BSQ items together. The scree plot and eigenvalues suggested that it was appropriate to extract six factors, which together accounted for 54.5% of the variance in the scores. Using a cut-off of 0.3 for item inclusion, all items in the item pool loaded on to a factor and five of the 26 items had diffuse loading. Table 3 presents the item loadings.

In the solution for the combined BMQ/BSQ, beliefs about surgery appeared to be clearly discriminable from beliefs about medicines, as there was only one diffuse item loading on to a Medication factor and a Surgery factor and all between-factor correlations were less than 0.3 (Table 4).

TABLE 3 ABOUT HERE

TABLE 4 ABOUT HERE

Discriminant function analysis

The next question concerned the capacity of the BMQ/BSQ scores to discriminate between participants who chose to undergo surgery and those who chose to remain on medication. Six composite belief scores were computed (mean scores) for each participant, corresponding to the six factors in the combined BMQ / BSQ factor solution (Table 4). The six variables were entered as independent variables in a discriminant function analysis on data from the preference groups. This profile of scores resulted in correct classification of 78.5% of the cases into Surgery or Medication groups. This was significantly greater than chance, $\chi^2(6) = 205.9$, p < .001. Using Wilks' Lambda to test for equality of group means, and a significance criterion of 0.01 to adjust for multiple tests, three out of the six variables significantly contributed to the solution: Medication - Specific Concerns, Surgery - Overuse/Harm, and Surgery - Concerns (all *p*s < .001). In contrast, discriminant function analysis on data from the randomised groups resulted in correct classification of 54.5% of the cases into Surgery or Medication groups. This was not significantly greater than chance, $\chi^2(6) = 9.4$, p = .154. Table 5 presents classification results for (a) the preference groups and (b) the randomised groups.

TABLE 5 ABOUT HERE

Finally, means, standard deviations and internal consistency co-efficients of the six scales are presented in Table 6.

TABLE 6 ABOUT HERE

Discussion

The CS-SRM (Leventhal, et al. 1998) proposes that cognitive representations about an illness and its treatment will influence illness-related behaviours. Several measures of illness representations have been developed to investigate the propositions of the CS-SRM. More recently, Horne et al. (1999) have developed a measure of beliefs about medication. Scores on the Beliefs about Medicines Questionnaire (BMQ) have been shown to predict treatment-related behaviours such as adherence. In the spirit of these developments, the present study developed a Beliefs about Surgery Questionnaire (BSQ), based where possible on the wording of the BMQ and on evidence from interviews and the literature, and tested its validity in the context of a clinical trial designed to assess the effectiveness of medication versus surgical treatment for people with gastro-oesophageal reflux disease (GORD). Using baseline data from the trial, it was found that (1) the factor structure of the BMQ in the context of GORD is very similar to the structure identified by Horne et al. from people with different chronic illnesses; (2) the BSQ items load on to different factors than the BMQ items, thereby demonstrating discriminant validity of the BSQ; (3) the combined BMQ/BSQ demonstrate criterion-related validity, in that the profile of scores significantly discriminated between people who chose surgical treatment versus medication. The three findings are discussed in more detail below.

First, this study provided support for the validity of the BMQ for individuals suffering from GORD. In particular, the loadings on items measuring Specific Necessity and Specific Concerns about medication mapped almost perfectly across the two studies. The difference in the factor structure across the items measuring beliefs about medication in general may be due, in part, to the nature of GORD and the demographic profile of this sample. In contrast to the illness groups investigated by Horne and colleagues, GORD is not perceived as life threatening, although it has serious implications for quality of life. Furthermore, it is likely that the samples in the Horne study had a larger number of co-morbidities and this may have influenced the pattern of scores for beliefs about

medication in general. In the light of these differences it is even more striking that the Medication

Specific scales corresponded so closely in the two studies.

Second, when participants were asked to answer questions relating to beliefs about surgery, their

answers yielded factors that were discriminable from those relating to beliefs about medications.

This suggests that these participants held distinctive patterns of beliefs about these two kinds of

treatment, rather than about health-care interventions in general. Scores for Concerns about

surgery showed the greatest mean difference between the participants who chose surgery and

those who chose to continue their medication.

Third, data from the BMQ and the BSQ provided evidence of criterion-related validity of the BMQ

and the BSQ, in that the profile of scores on the BMQ and BSQ distinguished between the surgery

group and the medication group in the preference arms of the trial but not in the randomised arms.

In the literature there is some overlap between types of validity and some may prefer to refer to this

as concurrent validity or predictive validity (Streiner & Norman, 2003). The term 'criterion-related'

validity has been used here because it more clearly specifies the method used to test whether the

items measured the intended constructs.

Limitations to these findings should be noted and there is more work to be done to establish the

generalisability of the BSQ. In particular, we did not assess its validity in samples with other

illnesses or outside a trial context. Nor did we assess test-retest reliability or sensitivity to change.

The low internal consistency of the Surgery Concerns subscale should also be noted. In particular,

the properties of one item, whose wording was different from the others, was problematic. This was

the item *I would be willing to have an uncomfortable test to assess my suitability for surgery*. Both

skewness and kurtosis were greater than 1 and it loaded (negatively) on to both the Surgery

subscales. Despite these drawbacks, we chose to include this item in the final questionnaire, as it

emerged strongly as a theme in the interview study and thus is likely to contribute to the content validity of the measure.

The combined BMQ and BSQ may be useful tools in clinical practice as well as in research. Knowing the scores on these two questionnaires could help clinicians to counsel patients who have high levels of concern, or to help patients make better decisions about their treatment. In particular, the items could be used as stimulus materials for a value elicitation / clarification technique, as a decision aid for patients. It could be helpful to explore these possibilities in future research.

In terms of the Common Sense Self-Regulation Model (CS-SRM) more generally, there is ample evidence that people's illness perceptions influence their emotional and behavioural responses to an illness threat (for example, Edwards, Suresh, Lynch Clarkson & Stanley, 2001; Cameron & Moss-Morris, 2004). This study adds to that body of evidence by demonstrating a link between treatment choice and beliefs about both treatment options (that is, surgery and medication). Thus, at the theoretical level more broadly, this research links with a body of social cognition research that demonstrates better prediction of choices when beliefs about the various options are included, rather than focusing on only the beliefs about one 'target' behaviour.

In conclusion, it appears the beliefs and concerns of people with chronic illness about two potential types of treatment can be measured validly and reliably. Core elements of the factor structure of the BMQ (in particular, the items measuring Necessity of medications taken for a specific condition and Concerns about those medications) were replicated in this study. Furthermore, responses to the BSQ indicate that beliefs about surgery form a distinct pattern of treatment representations and there is no redundancy between these two scales. Used together, the two measures can significantly distinguish between individuals who choose one form of treatment over the other. We have no data about the usefulness of this measure in the context of other clinical conditions, but the

items have been designed for use across a range of conditions and we offer this instrument to the

research community as a tool for exploration of factors affecting patient choice.

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Table 1. The source of each of the eight BSQ items

Potential items, based on BMQ, Interviews and literature	Source	Equivalent BMQ item (from Harm and Overuse scales)	Included in final Beliefs about Surgery questionnaire?
Doctors rely on surgery too much	BMQ (General Harm scale)	Doctors use too many medicines.	Yes
Surgery does more harm than good	BMQ (General Overuse scale)	Medicines do more harm than good	Yes
Surgery cannot make anything worse	Interviews	No equivalent item	No
Doctors place too much trust in surgery	BMQ (General Harm scale)	Doctors place too much trust in medicines	Yes
Doctors are too quick to suggest surgery	BMQ (General Harm scale)	If doctors had more time with patients they would prescribe fewer medicines	Yes
Surgery is the only cure for most diseases	Interviews	No equivalent item	No
I would be willing to have an uncomfortable test to assess my suitability for surgery	Interviews	No equivalent item	Yes
Surgery reduces the need for medicines	Literature	No equivalent item	No
I worry about the risks of surgery	BMQ (Specific concerns scale), literature and interviews	(Influenced by three items focusing on worry)	Yes
Surgery can result in new health problems	Literature and Interviews	No equivalent item	Yes
People are not always told that there are alternatives to surgery	Interviews	No equivalent item	No
Surgery should only be taken as a last resort	Literature and Interviews	No equivalent item	Yes

Table 2. Confirmatory factor analysis for the BMQ scales, testing factor loadings (on three factors) from the REFLUX data set against (a) the theoretical and (b) the empirically-derived model.

Factor label	Pearson correlation of items with predicted factor loadings	
	(a) Theoretical model	(b) Empirically derived model
General: uncertain risk/ efficacy balance	0.73	0.91
Specific: necessity	0.96	0.97
Specific: concerns	0.93	0.93
General: unintended effects	0.77	0.90

Table 3. Item loadings for the BMQ/BSQ (6-factor solution) derived from the REFLUX baseline data (N = 739; cut-off for inclusion: 0.3)

Items [square brackets = original BMQ wording]	**Loadings**					
	F1	F2	F3	F4	F5	F6
	Medication General - uncertain risk/ efficacy	Medication - Specific necessity	Surgery - overuse / harm	Medication - Specific concerns	Surgery - concerns	Medication General - unintended effects
Having to take medicines [this medicine] worries me				0.82		
I sometimes worry about becoming too dependent on my medicines				0.74		
II sometimes worry about the long term effects of my medicines				0.83		
My medicines disrupt my life				0.57		
My life would be impossible without my medicines		0.85				
My health, at present, depends on my medicines		0.81				
Without my medicines I would be very ill		0.80				
My health, in the future, will depend on my medicines		0.77				
My medicines protect me from becoming worse		0.59				
If doctors had more time they would prescribe fewer medicines	0.76					
Doctors place too much trust in medicines	0.80					
Doctors use too many medicines	0.74					
Natural remedies are safer than medicines	0.38					
Most medicines are addictive	0.30					0.75
Medicines do more harm than good	0.54					0.37
All medicines are poisons	0.42		0.42			
My medicines are a mystery to me						0.68
People who take medicines should stop their treatment every now and again	0.31					0.45
Doctors rely on surgery too much			0.81			
Surgery does more harm than good			0.70			
Doctors place too much trust in surgery			0.75			
Doctors are too quick to suggest surgery			0.74			
I would be willing to have an uncomfortable test …			-0.30		-0.32	
I worry about the risks of surgery					0.73	
Surgery can result in new health problems					0.62	
Surgery should only be taken as a last resort					0.70	
Eigenvalue	4.42	3.59	2.20	1.52	1.29	1.15
Percentage variance explained	17.0	13.8	8.6	5.8	4.9	4.4

Table 4. Component correlation matrix for the 6-factor solution.

Factor	1	2	3	4	5	6
1 Medication in general: Uncertain risk/efficacy	1.000					
2 Specific medication: Necessity	-.018	1.000				
3 Surgery in general: Overuse/harm	.224	-.094	1.000			
4 Specific medication: Concerns	.254	.153	.002	1.000		
5 Surgery in general: Concerns	.039	-.077	.214	-.065	1.000	
6 Medication in general: unintended effects	.227	.017	.203	.163	.036	1.000

Table 5. Discriminant function analysis: Classification results as frequencies (percentages) for participants in (a) the preference groups and (b) the randomized groups, based on scores for the BMQ / BSQ.

(a) PREFERENCE

		Predicted Group Membership		
		Surgical	Medical	Total
Actual group membership	Surgical	180 (77.9)	51 (22.1)	231 (100)
	Medical	34 (20.6)	131 (79.4)	165 (100)

78.5% of original grouped cases correctly classified.

(b) RANDOMISED

		Predicted Group Membership		
		Surgical	Medical	Total
Actual group membership	Surgical	86 (53.8)	74 (46.3)	160 (100)
	Medical	69 (44.8)	85 (55.2)	154 (100)

54.5% of original grouped cases correctly classified

Table 6. Means (standard deviations) and internal consistency coefficients (α) of the 6 scales of the BMQ/BSQ.

Factor	mean	sd	Cronbach alpha
1 Medication in general: Uncertain risk/efficacy	2.7	0.37	0.74
2 Specific medication: Necessity	3.9	0.25	0.83
3 Surgery in general: Overuse/harm[a]	2.2	0.15	0.73
4 Specific medication: Concerns	3.3	0.65	0.75
5 Surgery in general: Concerns[a]	3.3	0.16	0.59
6 Medication in general: unintended effects	3.3	0.16	0.75

[a] The diffuse loading item "I would be willing to have an uncomfortable test…" was excluded from the factor summary data