Design a questionnaire

D H Stone

The design of questionnaires is a craft which has been badly neglected by the medical profession. A questionnaire should be appropriate, intelligible, unambiguous, unbiased, capable of coping with all possible responses, satisfactorily coded, piloted, and ethical. The key steps in designing a questionnaire are to: decide what data you need, select items for inclusion, design the individual questions, compose the wording, design the layout and presentation, think about coding, prepare the first draft and pretest, pilot, and evaluate the form, and perform the survey. Despite the apparently complicated nature of the task, theoretical knowledge is no substitute for practical experience.

Questionnaires are not the exclusive preserve of academics. They have many uses, including screening, audit, administration, and public relations, as well as their more familiar role in research. A questionnaire is essentially a vehicle for human communication,[1] an activity that is both highly complex and prone to failure. Most doctors will have taken part in surveys that have used questionnaires, either their own or, more likely, someone else's. The experience was probably an unhappy one, simply because anything to do with questionnaires seems to have an uncanny knack of going wrong. Designing questionnaires is a sophisticated craft which has been badly neglected by the medical profession. The purpose of this article is to try to set out some guidelines for constructing a good questionnaire and to draw attention to the most common obstacles.

Questions should be:

- Appropriate
- Intelligible
- Unambiguous
- Unbiased
- Omnicompetent
- Appropriately coded
- Piloted
- Ethical

A good questionnaire is one that works

When a questionnaire is administered to a potential respondent an elaborate and subtle process is started which is intended to end in the transmission of useful and accurate information from the respondent to the inquirer. Consider what this process involves. A question or series of questions have to be posed in a clear, comprehensible, and appropriate manner so that the respondent can formulate, articulate, and transmit the answers effectively. These answers must be recorded, coded, and analysed without bias, errors, or misrepresentation of the respondents' views. A well designed questionnaire ensures the smooth unfolding of this chain of events from start to finish.

What are the characteristics of a well designed questionnaire? There is no hard and fast answer. A good questionnaire is one that works. In other words, it is self validating. Nevertheless, there are several criteria which should be met in advance of unleashing a questionnaire on an unsuspecting public. Some of these may seem blindingly obvious, but it is surprising how often they appear to have been overlooked in practice (see box).

An *appropriate* questionnaire is one which is capable of providing answers to the questions being asked. There is no point, for example, in asking a pathologist how he establishes a rapport with his patients, or a general practitioner what time he starts his ward round.

An *intelligible* question is one which the respondent can understand. This means using language that the respondent uses. I recently encountered a survey on the sequelae of circumcision which required mothers to choose one of a series of carefully worded statements. The statements were in English and the respondents were mostly first generation Urdu speaking immigrants.

An *unambiguous* question is one which means the same to both the respondent and the inquirer. If you ask a mixed group of psychoanalysts and statisticians to define what they understand by the term "regression analysis" you will receive dramatically divergent answers.

A question may appear *unbiased* until you try to interpret the answers. The objective is to ensure that you are no more likely to trigger one kind of response than another. I used to marvel at the naivety of a certain country's immigration department, who insisted on asking that old music hall joke of a question "Are you or have you ever been a member of the Communist party?" A less obvious source of bias is the dependence on the memory of the respondent who may remember certain events in a highly selective fashion—so called recall bias. An example of this is the attempt to establish the cause of a birth defect by asking mothers whether anything untoward occurred during the pregnancy.

A question should be *omnicompetent*—capable of coping with all possible responses. In reality that is an impossible expectation of any question since the range of potential answers is limited only by the number of people who might answer the questionnaire. We should try, however, to anticipate most of them by including a category "Other" or leaving space for comments. The response most frequently overlooked in designing a multioption question is "don't know," particularly when a "yes/no" answer is being sought. Human uncertainty and indecisiveness may be an irritating inconvenience but it cannot be ignored.

The *coding* system must be carefully checked for ambiguity and overlap. The rule here is that the categories should be exhaustive but mutually exclusive. Thus if ages are being split into 10 year bands it must be clear which bands the ages on the boundaries —20, 30, 40, etc—lie in. Ideally, the answers should be self coding, both to save time and resources when the data have to be computerised and to eliminate a source of errors.

A questionnaire should always be *piloted* before use. This has two purposes: to iron out any design faults which have been missed (and there are always a surprising number) and to enable a formal evaluation to be performed (see below).

Finally, a questionnaire should be *ethical.* Until recently, ethics committees took no real interest in surveys which did not use invasive or potentially hazardous procedures. Nowadays they regard all research as potentially harmful even if it consists of a single question. They will need reassurance about the necessity for the investigation, its scientific rigour, the sensitivity with which it is conducted, and the obtaining of informed consent from the subjects.[2]

So much for theory. Now for the practical task of

Public Health Research Unit, University of Glasgow, 1 Lilybank Gardens, Glasgow G12 8RZ
D H Stone, *senior lecturer in paediatric epidemiology*

BMJ 1993;307:1264-6

sitting down and creating your questionnaire. If you have never done it (and even if you have) the prospect can be intimidating. Here is a list of steps you can take to try to achieve your goal quickly and easily. It is not a receipe for success but it may help you avoid disaster (see box).

Designing a questionnaire

(1) Decide what data you need
(2) Select items for inclusion
(3) Design individual questions
(4) Compose wording
(5) Design layout
(6) Think about coding
(7) Prepare first draft and pretest
(8) Pilot and evaluate
(9) Perform survey
(10) Start again!

Step by step guide to questionnaire design

(1) *Decide what data you need*—This depends, of course, on your objectives. These should be precisely articulated. If you have trouble doing this you are not yet ready to begin your project. Try to visualise what the results will look like. Some people find it helpful to construct dummy tables and to use these to check that the necessary data are being collected. List the variables (such as age, sex, social class) you intend to include in your analysis of the results. Remember that there are many standard health questionnaires in existence which may suit your purpose.[3] There is no point in reinventing the wheel.

(2) *Select items for inclusion*—Draw up a list of specific items of information you are going to record. Again, draw on the experience of others as far as possible, as well as on your own clinical observations or knowledge of the literature. Check that each item can be related to at least one of the study objectives—if there is a mismatch either the objectives or the items are wrong. This stage is an elaboration of the variable list—for example, social class may be assessed in terms of occupation, income, or place of residence. You may decide to include some decoy questions to divert attention from potentially sensitive subjects.

(3) *Design the individual questions*—The format of the questions depends largely on how the survey will be performed—by post, direct interview, or telephone—and whether the data are quantitative or qualitative. For qualitative research open rather than closed questions may be more appropriate. Open questions are also useful for the predesign stage of a project, when you are trying to decide what data you need (step 1 above). Closed questions may prompt dichotomous responses (usually yes/no) or take the form of alternative statements, a checklist, or a rating scale. The choice of a question or scale will also depend on whether the variable being measured can be expressed categorically (for example, religion) or continuously (for example, blood pressure). Avoid the temptation to force responses into a categorical mould since many health variables—including those relating to non-biological factors such as emotions—can be adequately described only along a continuum. A popular means of recording an opinion is the Likert scale, in which the respondent is given a statement and is asked to tick one of the categories: strongly agree, agree, no opinion, disagree, strongly disagree.

(4) *Compose wording*—The golden rule here is brevity: if in doubt leave it out. There is no place for convoluted literary prose, however brilliant the syntax. Avoid medical jargon at all costs. Precision is essential: the respondent must be in no doubt what you want to know. Confine each question to a single idea. Avoid leading or biased questions. For ease of interpreting the responses the more specific the question the better. For example, "Have you visited your family doctor for a health problem in the past month" is preferable to "Have you seen your doctor recently?"

(5) *Design the layout and presentation*—Establish a polite conversational tone from the outset. A brief introduction explaining the purpose of the study and the individuals or organisations involved will pay dividends—even if a preliminary letter has covered the same territory. Avoid using the word "questionnaire" ("form" is more acceptable). The most comfortable sequence of questions is from the general to the particular (funnel design). The initial part of the questionnaire should be neutral (but interesting) with the more sensitive items coming later. Avoid multiple branching questions. Place the boring questions about the patient's demographic characteristics at the end. The visual impact of the form is critical, so pay attention to clear print and colour; an early study by Eastwood found that yellow and pink achieve the highest response rates.[4] Always thank the respondent for devoting the time to complete the form.

(6) *Think about coding*—Advance coding saves time and worry, although it is not always possible if the range of answers is unpredictable. Self coding (whereby the respondent or interviewer codes the responses in the course of completing the questionnaire) is quicker and cheaper than separate coding and also reduces the chances of transcription or other errors. At the very least, coding boxes should be prepared and numbered in advance. Always give the respondents the opportunity to elaborate their answers.

(7) *Prepare a first draft and pretest*—At this point, you may feel the questionnaire is ready for use. But, however carefully you have designed it, there will be flaws and you are the last person likely to spot them (see box). Circulate your draft to a small circle of people you trust—colleagues, friends, family. Ask for comments and criticisms and you will be surprised at the return. Redraft the form and repeat the process, this time asking your advisers to try to answer the questions.

The one that slipped through the net—a question from a tennis club application form

Please delete as appropriate:

I have/have not played tennis previously yes/no

(8) *Pilot and evaluate*—Select a small sample (not necessarily at random) of your target population and evaluate the responses. Evaluation here implies a technical assessment of validity and reliability. Validity means the extent to which a measuring instrument measures what it is supposed to measure. There are various ways of assessing validity, most commonly by comparing the results of the form with an independent source of data or "gold standard." This is concurrent or external validity—and is frequently difficult to measure because a gold standard does not exist (which is why you are doing the research in the first place). Some attempt to cross check data obtained by an interviewer with another source is important, even if only to reassure yourself that the interview actually took place.[5] Reliability means the extent to which the form can be trusted to give consistent results. Test-retest reliability can be assessed by repeating its administration to some of the same subjects after a short interval of, say, a week.

(9) *Perform the survey*—If you are using interviewers ensure that they are properly selected, briefed, and trained: they will make or break the project. Institute quality control; this means that you must check as

many of the completed forms as you can personally and draw the interviewers' attention to the problems. If you cannot identify any, look again: you have simply missed them. At least one of the questions will turn out to be hopeless despite steps 1 to 8; this is par for the course and not worth losing sleep over. Take pains to achieve a high response rate, especially in postal surveys. If the response rate is poor and you are confident that your questionnaire is not to blame send out a reminder along with a second and even a third copy of the form. Avoid haranguing non-respondents but emphasise to them how important their cooperation is to the success of your extraordinarily important study. Flattery works.

(10) *Start again*—Good research is usually the result of learning from mistakes. If time and resources (as well as personal motivation) permit replicate your study at least once. This will allow you to perform validation, to increase the sample size, and to fine tune your questionnaire to the point where you can be proud of it.

You now know about as much theory as you need to get you started on your survey. For those with the time and inclination, more detailed advice on questionnaire design can be found in good medical libraries.[6,7] Some aspects of the subject may appear highly technical and complicated to the point where you may be deterred from going further. As there is no substitute for experience, however, take a deep breath and jump. The landing will not be as hard as you fear.

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(Accepted 23 August 1993)

Minimally Invasive Surgery

General surgery: biliary surgery

R C G Russell

This is the first in a series of articles on minimally invasive surgery

The management of biliary tract disease has changed completely as a result of minimally invasive treatment. For most patients with gallstones that cause symptoms a laparoscopic cholecystectomy will treat the condition with minimal morbidity and a short recovery period. If complications are encountered, conversion to a mini-cholecystectomy gives results that are nearly as good. Acute cholecystitis can be treated by percutaneous drainage followed either by percutaneous cholecystolithotomy or a laparoscopic cholecystectomy. Gallstones in the bile duct are best treated by endoscopic sphincterotomy with duct clearance. The day of the large cholecystectomy scar with its subsequent incisional hernia has gone.

The concepts of minimally invasive surgery in the biliary tree grew out of the role of the endoscopist in treating gallstones in the bile duct by endoscopic sphincterotomy. From then on the search for a minimally invasive technique to deal with stones in the gallbladder took many turns. Techniques to intubate the gallbladder endoscopically proved difficult, and it is still only rarely possible to negotiate the valves of the cystic duct to gain entry to the gallbladder. A better approach proved to be a percutaneous transhepatic puncture of the liver with the insertion of a catheter, through which solvents could be injected and stones dissolved. This proved time consuming and technically difficult, and the operation has been largely abandoned. For draining an acute empyema of the gallbladder, however, percutaneous drainage can be a dramatic lifesaving and non-invasive technique.

It became apparent that to gain access to the gallbladder and remove the stones it was necessary to pass larger catheters into the gallbladder, and thus the technique of percutaneous nephrolithotomy was adapted to the gallbladder. This technique proved successful in removing the gallstones, but a drain had to be left in the gallbladder to allow the gallbladder to heal round it so that bile did not leak into the peritoneal cavity on its removal. This was done 10 days later, after the biliary tree had been checked radiologically to ensure that there were no residual stones. The major disadvantage of this technique is that up to a third of patients are subject to formation of new stones in the gallbladder, and more than half of these patients have to have their gallbladder removed within three years of the original procedure.

After trials with oral dissolution, contact dissolution, extracorporeal lithotripsy, percutaneous cholecystolithotomy, and rotary lithotripsy attention is now focused almost entirely on cholecystectomy for the management of gallstones either by the laparoscopic technique or by mini-cholecystectomy. Endoscopic retrograde cannulation of the bile duct remains pre-eminent as the method of dealing with a gallstone in the bile duct by minimally invasive technology.

Laparoscopic cholecystectomy

The standard treatment for gallstones in developed countries is laparoscopic cholecystectomy. This treatment was first described in Germany in 1985 but was published in an obscure journal and received little public acclaim. Mouret in Lyons, who is both a general and a gynaecological surgeon, performed the first publicised laparoscopic cholecystectomy in March 1987. Dubois in Paris, who for a long time had been adept at minicholecystectomy, progressively replaced this approach with laparoscopic cholecystectomy from February 1988.[1] In June 1988 McKernan and Saye performed the first laparoscopic cholecystectomy with a laser to dissect the gallbladder.[2] This technique developed rapidly under the stimulus provided by Reddick in Nashville, Tennessee, from October 1988.

The world at large became familiar with the technique when Perrisat from Bordeaux presented a video of it to the Society of American Gastrointestinal Endoscopic Surgeons in April 1989.[3] By the spring of 1990 the operation was performed in numerous centres in the United Kingdom. In 1992 over 60% of cholecystectomies performed in the United Kingdom were done by the laparoscopic method.

Middlesex Hospital, London W1N 8AA
R C G Russell, *consultant surgeon*

BMJ 1993;307:1266-9