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Decision Making by Patients : An Application of Naturalistic Decision Making Theory to Cervical Screening and Chronic Renal Failure

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Abstract

Over their lifetime, individuals typically make many decisions about health and health care. Theoretical approaches to decision making have been dominated by a rational, analytic approach which assumes that problems are relatively fixed and well-defined and which have foreseeable and measurable endpoints. Naturalistic decision making (NDM) approaches attempt to mimic “real world” situations where problems vary, may be defined differently by individuals with diverse perspectives and where endpoints are uncertain and complicated.

In-depth interviews were conducted with 40 individuals living in the community: twenty participants had chronic renal failure and twenty were women in the target age range for cervical cancer screening. Decision making processes used by these two groups of health care consumers correspond well with the concepts of NDM. In particular, Image Theory provides a framework within which the process of decision making by health care consumers can be described, including the issues which influence what decisions are made. The findings also demonstrate the usefulness of studying decision making in “real world” situations and in using less analytic techniques than traditional normative approaches in evaluating health care decision making.

The results suggest that NDM is deserving of a wider audience in health care. Health care providers who use NDM models to understand their patients’ decision making processes may improve their capacity to involve patients in decision making.

Keywords

Decision making process, Image Theory, naturalistic decision making

Introduction

Over a normal life-span, individuals make many decisions about their health and health care including whether and when to consult a doctor or other health care professional, what tests or treatments to undergo and whether to comply with recommendations made by the health care provider they consult. However, not all decision making processes and outcomes are the same. For example, the process of decision making in the context of an emergency is likely to be different from “once only” judgements and will be different again from extended or recurring processes. Further, whether the impact of a decision can be expected immediately or in the future and the extent to which the outcome is certain will also affect the decision making process (Broadstock and Mitchie, 2000).

Theoretical approaches to decision making have been dominated by a rational, analytic approach which assumes that problems are relatively fixed and well-defined and which have foreseeable and measurable endpoints (Zsombok and Klein, 1997). Naturalistic decision making (NDM) approaches have been formulated in an attempt to better mimic “real world” situations where problems vary, may be defined differently depending on the perspective of the individual involved and where endpoints are both uncertain and complicated in terms of quantification or assessment (Broadstock and Mitchie, 2000; Montgomery, 1997) .

The complex nature of health care organisation and delivery makes it an ideal field in which to study decision making using the NDM paradigm. The purpose of this study was describe the process of decision making, including the issues which influenced patients in making decisions within the theoretical framework of NDM (as represented by Image Theory (Beach and Mitchell, 1987). After naturalistic decision making, including Image Theory, is described and previous applications to health care explored, the results of an empirical study of patient decision making are presented.

Background

Naturalistic Decision Making

Naturalistic decision making (NDM) has been defined as “the way people use their experience to make decisions in field settings” (Zsombok and Klein, 1997). It evolved from studies of how experienced people make decisions in their natural environments or in simulations where important features of the environment are replicated. Although the first conference on the subject was held in 1989, and conferences, journal articles and books have appeared regularly since then, NDM is still regarded as an emerging paradigm (Broadstock and Mitchie, 2000; Patel, Kaufman and Arocha, 2002).

The NDM paradigm conceives of decision making as consisting of a selection phase and an evaluation phase. In the first, the decision maker makes a preliminary selection of potential alternatives which are then evaluated.

In the evaluation phase, the initial choice is tested against alternatives and if one option is evaluated as being better on at least one attribute and as good on others, it is chosen. When this is not possible, the choice problem is re-framed so that different aspects of the

options are emphasised (either positively or negatively) and any trade-offs between advantages and disadvantages are clarified. The alternatives are assessed using personal experience, professional standards, or socially determined norms or traditions and are compared and matched with values, ethics, morals, goals and/or plans. In addition, the decision maker may consider how justifiable the decision will be in the future.

Table 1 compares NDM and traditional decision making research in respect of four contextual factors: task and setting, research participants, purpose of the research and focus of interest in the decision making event. This clearly demonstrates the more contingent, less structured approach adopted by the proponents of NDM.

Table 1: comparison of naturalistic and traditional decision making research paradigms*

	NDM	Traditional
Task and setting	Ill-structured problems Uncertain, dynamic environment Shifting, ill-defined or competing goals Feedback loop Time stress High stakes Multiple players Environmental goals/norms	Artificial, well-structured problem Static, simulated situations Clear, stable goals One-shot decisions Ample time for tasks Situation lacks true consequences Individual decision making Decision making in vacuum
Research participants	Experienced decision makers	May be naïve subjects
Purpose of research	Actual decision making in real settings	How decisions should be made compared to a rational standard
Focus of interest in event	Awareness of situation in which decisions are made	Selection of options

*adapted from Zsombok and Klein (eds). *Naturalistic Decision Making*. New Jersey. Lawrence, Erlbaum Associates, 1997.

A number of theories have been developed under the NDM umbrella, all of which include the common axioms of selection and evaluation. One such theory which has been well-described in the literature is Image Theory (Zsombok and Klein, 1997). Image Theory is a descriptive theory of decision making which was developed over a 15 year period (Beach and Mitchell, 1987; Beach and Mitchell, 2002). As illustrated in Table 2, the theory assumes that decision makers possess three decision-related images that constrain decisions – values, goals and plans. Decision making involves adopting or rejecting plans and monitoring progress towards implementation of plans using compatibility and profitability tests.

Table 2: Phases of Image Theory*

Selection phase	Each decision maker constructs/possesses three types of images: 1 Value image: principles such as good/bad, right/wrong. These images are absolute and can be based on personal experience, professional standards, socially determined norms or traditions 2 Trajectory image: abstract or specific goals and/or timelines reflecting hopes for the future. 3 Strategic image: sequence of plans and methods for monitoring progress. Tactics can change if new information is acquired.
Evaluation phase	In the evaluation phase, decisions are made and tested. 1 Adoption decision: screening is used to eliminate unacceptable options and a choice is made from those left in the choice set. 2 Progress decisions used if choice is not clear-cut. The choice problem is re-structured so that the advantages and disadvantages of alternatives are more explicitly defined. Decision tests: 1 Compatibility testing involves comparing a choice or plan with one or more of the images. If the choice reaches a pre-determined threshold, it is accepted, otherwise, it is rejected. 2 Profitability testing involves choosing which plan is potentially the most profitable from among a set of two or more choices, all having been deemed acceptable using the compatibility test.

*adapted from Zsombok and Klein (eds). *Naturalistic Decision Making*. New Jersey. Lawrence, Erlbaum Associates, 1997.

The observation and measurement of decision making in NDM research

In contrast to traditional decision making theories which focus on the observation and measurement of the inputs and outcomes of decision making, NDM research concentrates on the process of decision making, that is, how information is sought, selected and combined within the decision making process (see Table 1). Researchers can observe how subjects choose from among information presented and computer-based applications allow for sophisticated choices to be offered to research participants (Maguire et al, 1997).

Although the developers of NDM theories recognise that their approach is pertinent to the study of decision making in health care, published reports of its application are small in number (Broadstock and Mitchie, Patel, Kaufman and Arocha, 2002). Most published examples of NDM research concern clinical or medical decision making by health care professionals (Gaba, Howard and Small, 1994; Bogner, 1997; Currey and Botti, 2003), although it is acknowledged that it could also be useful in studying consumer or patient decision making (Broadstock and Mitchie, 2000; Zsombok and Klein, 1997). Difficulties in adapting the techniques described above to contexts such as health care may be one

reason that NDM research has not been widely used in the study of decision making by patients.

While NDM has been the subject of some criticism, particularly in relation to how the decision making problem is formulated and whether the right questions are asked of the decision maker (Yates, 2001; Meso, Troutt and Rudnicka, 2002), it has the potential to provide additional explanatory power in relation to decision making in the health care setting where interactions between patients and health care providers are examples of complex real-time decision making.

An empirical application of naturalistic decision making

In this section of the paper, the results of a study are reported in which decision making processes employed by health care consumers were assessed. The technique employed to elicit the processes used by consumers was an in-depth interview, a well-recognised qualitative research method (Patton, 1990). To assess whether this method is able to produce data that can be framed within an NDM perspective, the themes which emerged from the interviews were compared with the processes described in Image Theory (Zsombok and Klein, 1997).

Two “conditions”, chronic renal failure and cervical screening, were chosen as the context within which to investigate decision making processes because it was considered that the decision making processes of individuals in these situations were likely to be well-developed, but different. For example, a woman making a decision about having a Pap smear may take into account her personal set of values about screening, previous experience of Pap tests and information about recommendations from experts (e.g. about the interval between Pap tests). Decisions about Pap smears are repeated but not everyday decisions. In contrast, individuals with chronic renal failure may undergo many years of treatment, some of it under their own control (e.g. home dialysis) during which time they may consult many health care providers and make repeated, “one-off” and emergency decisions. The research was approved by the Ethics Review Committee of Central Sydney Area Health Service.

Methods

Twenty participants in each group took part in a semi-structured, tape-recorded, later transcribed, interview. All interviews were undertaken by MH and began with a request that the participant describe one or more decisions they had made in relation to the health issue being investigated (e.g. the decision to have a kidney transplant or a Pap smear). A checklist of the topics the researchers wished to cover in the interviews was developed for each group of participants (available from the first author). While all interviews began with same question, “Tell me about how you make or have made decisions about (your treatment for chronic renal failure) (having a Pap smear)”, the path of each interview was dictated by individual respondents and the checklists were used to ensure that all topics had been covered.

The group with chronic renal failure was drawn from patients attending a Sydney teaching hospital for dialysis or renal transplant follow-up. Ten participants were

interviewed in a hospital setting (including one staying in a hospital-run hostel), nine in their homes and one in a café. Eleven women and nine men were interviewed.

Women in the target age range for cervical screening were recruited utilising a snowball method of sampling. Snowball sampling initially involves identifying a small number of participants and asking them to put the researcher in touch with acquaintances who also fit the criteria for the research, then asking those people to participate and so on (Patton, 1990). The criteria used to choose the sample were that participants should be women aged between 18 and 70 years (the age group recommended for cervical screening in Australia), speak English proficiently and have not been diagnosed with major gynaecological disease (e.g. cervical or uterine cancer) or undergone a hysterectomy. The four initial women were contacted through a women's health nurse. All 20 women were interviewed in their homes.

An iterative thematic analysis of the transcribed interviews was undertaken (Irurita, 1996). Once the themes were elucidated, they were compared with the stages of Image Theory.

Results

The results described below are illustrated using quotes from the interviews.

Selection phase

Individuals in the group with chronic renal failure typically described decisions about their treatment either in terms of day-to-day decisions about dialysis or one-off decisions about kidney transplantation. Three value images (i.e. how things should be or principles) emerged from the interviews. The first was that each individual is an "expert" about his or her own body and therefore has the right to make the final choice on all decisions.

"I believe my body is my body and it should be my decision what happens to it". (*T, aged 42,D*)*

The second was that doctors are experts in their fields and the third was that individuals are capable of making judgements about their doctor's trustworthiness. When commenting about how she could judge a doctor's trustworthiness, one respondent said:

"I suppose over time you get a feeling. Through their advice and what seems to be true and what they say is going to happen generally does, so you come to rely on that and what they are doing" (*V aged 38, D*).

The only trajectory image (i.e. hopes for the future) which emerged was that kidney transplants offer the best chance of good health in the future.

"I thought to live a normal life you need a transplant so that was what I intended to do". (*G, aged 48,T*)

Finally, two strategic images (plans and tactics) were common to the group. First, a baseline amount of information was required for individuals to maintain their treatment regime and thus control their day-to-day well-being. Second, any changes in their treatment plan (e.g. as a result of illness or deterioration in kidney function) or the offer of a potential kidney for transplantation changed individuals' needs regarding information.

"...from the Internet I got down everything about side effects and like cyclosporine (a drug given after a transplant) and all those things, and so I had a lot of information". (*M, aged 39, T*)

* The first letter denotes the ID given to the patient, D = on dialysis; T = transplant recipient.

Women in the Pap test group described their decisions to have a Pap test in terms of one over-riding value image – that having Pap tests was the right choice because experts recommended this course of action.

“I have them (Pap smears) every year now – the gynaecologist said that the risks increased around or after menopause” (*N, aged 55*).

Two trajectory images were described. First, women believed that Pap tests offered the best chance of defeating a condition one participant described as a “hidden enemy”. Second, having a female general practitioner perform Pap tests increased their acceptability to women.

“I was worried initially (about being embarrassed) but I dealt with this by making a decision to only see a female doctor” (*L, aged 47*).

Two strategic images also emerged. The first was that transitions to different life stages triggered a decision to have a Pap test. For example, commencing a sexual relationship, the birth of a child or the onset of menopause reminded women about the need for a test.

“For me, I thought that once I became sexually active I should have a smear test every 2 years or regularly”. (*G, aged 28*)

“After I had the kids, the obstetrician [did a Pap smear] as part of the 6 week check-up” (*F, aged 35*).

Second, information about abnormal results from a Pap test (either her own test or that of a friend or relative) was likely to prompt or reinforce a decision to be tested.

Evaluation phase

Participants with chronic renal failure described using both adoption and progress decisions. For example, if an individual was offered a kidney for transplantation from a deceased person (cadaveric donor), an adoption decision was usually made. Screening was accomplished using advice from doctors about the compatibility of the donated organ. If the possibility of a transplant operation was screened “in”, the final choice about whether to accept the donation was made by the patient, taking into account their current state of health and the views of their family. However, if an offer of a kidney was made by a living person (usually a relative), a progress decision was more common. Here the trajectory image (ideal future) of better health with a transplanted kidney was weighed against a strategic image (forecasted future) where issues such as the potentially negative effects of an operation to remove a kidney from a healthy, loved relative, the risk of the transplant failing and the knowledge that the donor would be able to observe the recipient’s lifestyle and thus judge how worthwhile their donation had been, were taken into account.

“I had to go and see a psychiatrist three times. [The donor] didn’t, he didn’t have a problem with it. I had a problem with taking his kidney. I had a problem with first ‘what if it failed’,...that was my biggest fear...” (*B, aged 34, T*).

Participants in this group who had made decisions about accepting the offer of a kidney for transplantation described the process they used to test their decision. Using information about the likelihood of the operation’s success and their knowledge of the improved health of other transplant recipients, participants judged the compatibility and profitability (i.e. their expectations of the outcome taking into account both risks and

benefits) of the plans with their image of health. Pre-decision consideration of the justifiability of the decision could also be observed, especially in the case of donations from living relatives.

In relation to decisions about Pap tests, women used progress decision making to choose between having a Pap test “now” and delaying the test. The “ideal” trajectory image of having regular Pap tests performed by a female GP was weighed against the “forecast” strategic image in which participants took into account their stage of life and whether they or someone close to them had experienced an abnormal Pap test result. In justifying their choice, some women also described how their decisions were influenced by the amount of anxiety they experienced about delayed Pap tests in the past.

“About 5 years ago I had some abnormal cells detected and that is when they emphasised that it was important for me to have them (Pap smears) annually. Some of them (doctors) will say that 2 years is enough but I think most women I am around tend to feel much more secure in themselves that they have them every year regardless of the doctor’s advice.” (*O, aged 38*).

The use of compatibility and profitability testing was not easily observed amongst women, perhaps because having a Pap test is a repeated decision and such processes may have been used when the initial decision was made but were not readily recalled by participants. However, women described weighing up their choices (having/not having/deferring a Pap test) against the value image “the right thing to do” and the trajectory image of not having cervical cancer. For these women, profitability meant being seen to do the “right thing” and ensuring their future health.

“I knew that I was overdue and I promised my doctor that I would have one very soon. Perhaps I would have left it longer if she hadn’t hassled me about it” (*A, aged 24*).

Discussion

This study indicates that the decision making processes used by two groups of health care consumers, elicited using qualitative research techniques, correspond well with the concepts of NDM. In particular, Image Theory provides a framework within which the process of decision making by health care consumers can be described, including the issues which influence what decisions are made. The findings also demonstrate the usefulness of studying decision making in “real world” situations and in using less analytic techniques than traditional normative approaches in evaluating health care decision making. The results suggest that NDM is deserving of a wider audience in health care.

The robustness of the results reported here can be illustrated by the extent to which the value images reported by the participants match the criteria described by the developers of Image Theory (Zsombok and Klein, 1997). For example, the first two value images expressed by participants with chronic renal failure (each patient is an expert about his or her own body and doctors are experts in their field of work), can be viewed as socially constructed norms. The third value image expressed by this group (experience allows good judgements to be made about the trustworthiness of a doctor) as well as the second trajectory image described by women in the Pap test group (a female GP increases the acceptability of Pap tests) are expressions of personal experience. Others, such as the value image expressed by women (Pap tests are a good idea because experts agree that this is the case) and the first trajectory image expressed by the renal group (kidney transplants offer the best hope of good health in the future) can be seen as combinations of socially determined norms, professional standards and personal experience.

The NDM paradigm has been recommended as being particularly applicable to situations where information and understanding is variable and constrained, where the data available are mainly perceptual and where intangible factors are difficult to estimate (Zsombok and Klein, 1997). Decision making by health care consumers certainly fits this description. In addition, many instances of decision making in health care, including the ones illustrated in this study, involve significant potential for regret, may include the possibility of delay to treatment or outcome and, in some cases, entail fear and hope. The NDM framework is considered particularly suitable in such circumstances.

This study had a number of limitations. Although the study groups represented two sub-populations for whom the process of decision making was hypothesised as being suitable for analysis using the NDM framework, it nevertheless targeted patients with two specific conditions who were living in and/or receiving treatment in one area of Sydney. Therefore the findings cannot be generalised to all services providing screening or management of chronic conditions. As the respondents were not recruited by random sampling they may differ systematically in their attitudes to the issues raised during the interviews from those who were not invited or who chose not to participate. That said, we feel that the results provide useful insights about the decision making processes employed by the users of health care.

While we recognise that using information from an interview in which individuals recall has its limitations, including the potential for recall bias, fabrication and post-hoc justification of decisions, we also believe that there are few other methods which would be available to us. Among the techniques which have been devised to observe naturalistic decision making are phased narrowing, active information search and think aloud tasks. The first is a technique in which subjects are asked to progressively narrow down their choice from a large set of multi-attribute options (Levin and Jasper, 1995), while in the second, participants receive a basic description of the decision making task from the researcher following which they ask questions which the researcher answers in writing (Huber, Wilder and Huber, 1997). In think aloud tasks, research participants are asked to verbally report all the thoughts that occur to them while undertaking decision-related activities.

Whilst it may have been theoretically possible for us to use think aloud tasks, for example, by videotaping a decision making consultation and then asking patients to verbalise the thoughts that were occurring to them as they made the decisions, this retrospective method would also be subject to the biases noted above.

The results of this study underline the complexity of decision making processes employed by consumers of health services. Health care providers who use NDM models to understand their patients' decision making processes may improve their capacity to involve patients in decision making. For instance, they may be able to adopt communication techniques which assist them to understand and take into account the impact on patients' decisions of socially constructed norms and personal experiences, personal goals and timelines, unacceptable options, and the comparison of the outcomes of a possible treatment choice with a personal image of how life should be.

The findings of this research would be strengthened if similar results were obtained using other research methods (eg observation) to evaluate the extent to which selection and

evaluation actually occurs in health care. Additional research is also needed to investigate issues such as justifiability, the existence of a pre-determined threshold in relation to health care choices and how compatibility and profitability are viewed and assessed by patients.

References

- Beach L, Mitchell T (1987). Image theory: principles, goals and plans in decision making. *Acta Psychologica* **66**, 210-220.
- Beach L, Mitchell. T. Eds (1990). Image theory: a behavioural theory of decision making in organisations. Research in Organisational Behaviour. Greenwich CT, JAI Press.
- Bogner M (1997). Naturalistic decision making in health care in Zsombok, CE, Klein GA. Naturalistic decision making. Mahwah, N.J., L. Erlbaum Associates.
- Broadstock M, Michie S (2000). Processes of patient decision making: Theoretical and methodological issues. *Psychology & Health* **15**, 191-204.
- Currey J, Botti M (2003). Naturalistic decision making: a model to overcome methodological challenges in the study of critical care nurses' decision making about patients' hemodynamic status. *American Journal of Critical Care* **12**, 206-11.
- Gaba D, Howard. S (1994). Small S. Situation awareness in anaesthesiology. *Human Factors*. **37**, 20-31.
- Huber O, Wilder R, Huber O (1997). Active information search and complete information presentation in naturalistic decision tasks. *Acta Psychologica*. **96**, 15-29.
- Irurita VF (1996). Hidden dimensions revealed: progressive grounded theory study of quality care in the hospital. *Qualitative Health Research*. **6**, 331-49.
- Levin I, Jasper J (1995). Phased narrowing: a new process tracing method for decision making. *Organisational Behaviour and Human Decision Processes*. **64**, 1-8.
- Maguire B, Henderson B, Potts J, Wright R (1997). Applying Janis and Mann's theory of decision making to the characterisation of people faced with genetic testing. 16th Biennial Conference of Subjective Probability Utility and Decision Making, Leeds UK.
- Meso P, Troutt M, Rudnicka J (2002). A review of naturalistic decision making research with some implications for knowledge management. *Journal of Knowledge Management*. **6**, 63-73.
- Montgomery H (1997). Naturalistic decision making workshop. 16th Biennial Subjective Probability Utility and Decision Making Conference, Leeds UK.
- Patel V, Kaufman D, Arocha J (2002). Emerging paradigms of cognition in medical decision making. *Journal of Biomedical Informatics*. **35**, 52-75.
- Patton M (1990). Qualitative evaluation and research methods. Newbury Park, Sage.
- Yates JF (2001). Outsider's impressions of naturalistic decision making, in Salas, E, Klein G (eds). Linking expertise and naturalistic decision making. Mahwah, NJ. Lea Publishing.
- Zsombok CE, Klein GA (1997). Naturalistic decision making. Mahwah, N.J., L. Erlbaum Associates.