DOCTOR-PATIENT COMMUNICATION AND THE CONSULTING ROOM USE OF COMPUTERS IN GENERAL PRACTICE

by

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SUMMARY

This thesis examines the effects of general practitioners' use of a computer, during consultations, on doctor-patient communication and the delivery of care.

The IBM Sheffield Primary Care System was used by GPs during routine consultations for the review and update of patients' records. The system also provided an interactive protocol for the management of patients with chronic hypertension. Video recordings were made of over 800 consultations, with and without use of the computer. These were used to identify a comprehensive and reliable set of measures of doctor-patient communication. With medical collaboration, measures of the standard of delivery of care were also developed. The measures were then used to investigate the effects of computer use.

When used for the review and update of records, the computer had little effect on doctor-patient communication. Doctors showed more solidarity with patients (e.g. by offering supportive comments), but there was no effect on the amount of information and advice offered, or questions asked, by either doctor or patient. However, overall, there was a slight impairment of the doctor's interpersonal manner and delivery of care.

When the computer was used in direct support of clinical decision-making (i.e. through the hypertension management protocol), there was a marked improvement in the doctors' clinical performance in terms of the number of relevant verbal and physical examinations conducted and recorded.

The findings suggest ways in which future systems should be designed and used, to avoid possible adverse consequences for doctor-patient communications. A research framework, including new methodologies, is also offered for the evaluation of future consulting room systems. Similar evaluative studies need to be performed on the more sophisticated systems now available, especially the clinically oriented ones which offer most potential.

PUBLICATIONS ARISING

The following publications have arisen from the research described in this thesis:

Brownbridge, G., Evans, A. and Wall, T. Effect of computer use in the consultation on the delivery of care. Brit. Med. Jnl., 291, 639-642, 1985.

Brownbridge, G., Evans, A., Fitter, M. and Platts, M. An interactive protocol for the management of chronic hypertension: effects on the general practitioner's clinical behaviour. Jnl. Roy. Coll. Gen. Pract., 36, 198- 202, 1986.

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CONTENTS AND LIST OF SUBHEADINGS

CHAPTER ONE: INTRODUCTION AND OVERVIEW

1.1 Aims of the Thesis

This thesis is concerned with primary care computer systems for use during consultations. More particularly, the aim is to examine the effects of doctors' computer use during consultations on the quality of doctor-patient communication. To undertake such an investigation, however, it was first necessary to develop and select suitable techniques for the measurement of doctor-patient communication. Thus a prior goal was to develop, and compare the efficacy of, a number of different techniques for the measurement of doctor-patient communication.

1.2 Primary Care Computer Systems

Small, powerful and reliable computer systems can now be bought at fairly low cost. Having a computer is a realistic proposition for the smallest business. What a computer does best is store, integrate, analyse, and retrieve information. Such characteristics are of clear potential benefit in general practice where accurate and fast processing of information is needed to support the effective delivery of care. It is not suprising, therefore, that software packages are being developed for use in general practice. The interest of the profession is growing, and schemes such as

Micros for GPs, set up by the Department of Trade and Industry and organized by the Department of Health and Social Security, have encouraged general practitioners to explore the potential uses of computers in general practice. This wide ranging scheme sponsored the use and evaluation of microprocessor systems in 140 practices in the United Kingdom (Herzmark et al., 1985).

As in the Micros for GPs scheme most computer systems have so far been used for administration. Typically, they provide facilities for patient registration, repeat prescriptions and some screening and recall. As the initial problems and upheavals in practice routine are overcome, these new systems may open up opportunities - for example, in audit and preventive medicine - thus providing advantages over previous manual procedures. The potential of such systems will be greater, however, when they reach into the consultation itself, enabling the doctor to retrieve from and add to the information system directly during the consultation - for example, by updating the repeat prescripton file or adding to patient notes. This would integrate the administrative and clinical aspects of the doctor's work. Other potential uses include providing information (on prescribing, for example), prompts for opportunistic preventive measures, and providing treatment protocols to use for particular conditions.

Such benefits will accrue only if systems are designed so that doctors can use them as an integral part of the consultation. To date only a handful of GPs have used a computer during actual consulations. Of course this is largely because few of the systems available are intended to support consulting room use. It is also due, however, to the anticipated difficulties of integrating computer use into the complex and sensitive process of the general practice consultation. In a recent report the Royal College of General Practitioners welcomed the potential benefits of consulting room computer use but also expressed concern at the unknown effects that this might have on doctor-patient communication (RCGP Computer Working Party, 1980).

1.3 Doctor-Patient Communication

The process of doctor-patient communication constitutes a large part of most doctor-patient encounters and must therefore be fundamental to medical practice. Its importance to the successful outcome of any doctor-patient encounter has long been recognized. As early as 400 BC Hippocrates wrote:

"The patient, though concious that his condition is perilous, may recover his health simply through his contentment with the goodness of the physician."

(English translation, 1923).

Of course, the importance of doctor-patient communication is to a large extent self evident. Patients must be able to describe circumstances, events, symptoms, and feelings in a manner that the doctor will understand, and doctors must be able to successfully elicit such information from their patients and provide opinions, information, suggestions and instructions, which will be both understandable and memorable. These assertions are supported, however, not only by intuition and common sense but also by a large body of empirical research evidence. Many studies have shown that the quality of doctor-patient communication during the consultation can affect subsequent consultation outcomes. The effects most often demonstrated are on patients' immediate psychological reactions to the consultation (e.g. their satisfaction with the doctor's manner, their satisfaction with the treatment received, their memory for and understanding of the doctor's advice). In a recent review of the research in this area Pendleton concluded:

".. it would seem that satisfaction of the patient is more likely when the doctor discovers and deals with the patient's concerns and expectations; when the doctor's manner communicates warmth, interest and concern about the patient; when the doctor volunteers a lot of information and explains things to the patient in terms that are understood. Similarly, patients are more likely to recall medical information when it is presented simply, specifically, in explicit categories, and when it is repeated."

(Pendleton, 1983, p.39).

Patients' reactions are of course important in their own right, as has been argued by, for example, Locker and Dunt (1978). Perhaps more important is that reserch has also shown that patients' immediate reactions to the consultation will affect their subsequent compliance with the doctors' advice.

1.4 The Need for Research

It should be expected then that doctors will be reluctant to use computers during consultation while the effects of such use on doctor-patient communication are unknown. There has been very little investigation of this issue, and there are no research based guidelines on how to successfully integrate computer use into the consultation. Furthermore, there has been little investigation of the effects of computer use during consultations on the doctor's delivery of care. Although consulting room systems may be intended to improve clinical standards, they could actually impair the delivery of care by distracting the doctor from his or her primary clinical task, which during consultation must involve interaction with the patient.

These issues present a tractable, theoretically informed research area of high social relevance, demanding more attention than it has so far received. In particular, research is needed which is based on strong empirical data. The present research begins to meet this need by examining in detail the effects of the consulting room use of a particular computer system, the IBM Sheffield Primary Care System.

1.5 Plan of this Thesis

The following two chapters provide the background to the research, by expanding on the issues outlined above. Chapter 2 is a review of the empirical research literature on doctor-patient communication, and Chapter 3 describes recent developments in the application of computers in general practice, focusing especially on the potential of consulting room applications. In addition, Chapter 3 provides a description of the IBM Sheffield Primary Care System (SPCS) and of an earlier "human factors" evaluation of the system. During the evaluation a databank of video-recorded consultations, with and without computer use, each with associated questionnaires which assessed patient reactions, was collected for use in the present research.

Previous researchers of the medical consultation have used several different techniques for the measurement of doctor-patient communication, however, little information is available on the relative merits of each. Therefore, before the effects of computer use on doctor-patient communication were investigated, a study was conducted which compared five different techniques for the measurement of doctor-patient communication. This comparative study is described in Chapter 4. The study enabled the identification of a parsimonious, yet comprehensive, set of measures for the subsequent investigation of the effects of computer use. Three of the measurement techniques examined were systems for the classification of verbal behaviours, which had been proposed by previous researchers (Bales, 1950; Byrne and Long, 1976; and Stiles, 1978a), and two new techniques were especially developed (an "Activity Analysis" and an Interaction Rating Scale). The comparison of the systems was in terms of their reliability, their sensitivity to differences between doctors and patients, and their ability to predict patients' subsequent reactions to the consultation.

The selected measures were next used in two seperate studies which investigated the effects of computer use on doctor-patient communication in different types of consultation. Chapter 5 describes a study which examined the use of the computer for the review and update of patients' medical histories and encounter notes in a sample of consultations covering a broad range of different types of presenting problems. Chapter 6 describes a study which examined the use of an interactive computerized protocol, designed to aid doctors in the management of patients with chronic hypertension.

Previous research did not provide any suitable techniques suitable for determining the effects of doctors' computer use on the delivery of care. Two new techniques were therefore especially developed. Chapter 7 describes the development of a "delivery of care rating scale", which may be used for peer review of all types of general practice consultations, and its employment in the present research to determine the effects of doctors' computer use on their delivery of care in "general" consultations. Chapter 8 describes a study of the GPs use of the computerized protocol for the management of hypertension, focusing particularly on the protocol's effects on the doctors' clinical behaviour during consultations for hypertension - the range of verbal and physical examinations conducted and recorded.

In Chapter 9 there is a slight change of focus. The research framework developed, as described in Chapters 3 to 8, was redeployed in a different setting. Thus Chapter 9 describes a study of a computer aid to history-taking, which was used by midwives to take patients' booking histories during their first visit to a hospital ante-natal clinic. The study examined the acceptability of the computer system to midwives and patients and the effects of its use on midwife-patient communications.

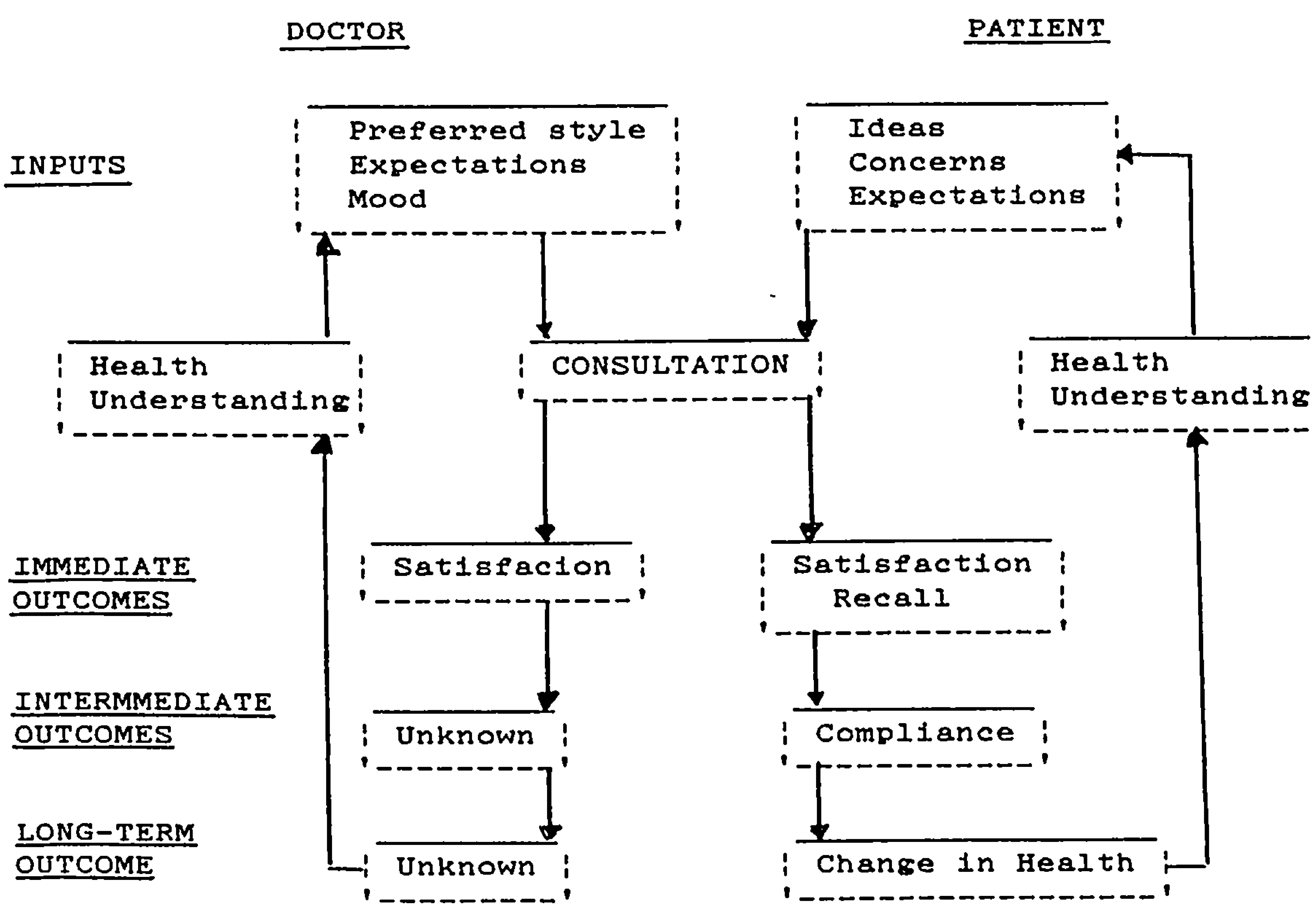
Finally, Chapter 10 draws together the conclusions of the research. These have practical implications for: the conduct of medical consultations with or without computers (and thus for medical training); the future design and implementation of medical consulting room computer systems; and also for future research. A number of tools have been developed which will be of value to future researchers of the medical consultation and a comprehensive psychological research framework is offered for future evaluations of medical consultation computer systems.

CHAPTER TWO: DOCTOR-PATIENT COMMUNICATION

This chapter reviews the body of empirical research which has served to demonstrate the importance of doctor-patient communication. As would be expected, research into this complex phenonenom is characterized by a large number of disparate studies. Of course, in a research area such as this no single study can hope to be exhaustive, and so different researchers have concentrated on different types of doctors and patients and on different communication issues. The studies have also developed and used a variety of methodologies. In reviewing the research in this area, therefore, it is useful to employ a model of the medical consultation as a means by which the studies may be classified.

On the basis of empirical research evidence, Pendleton (1983) proposes an input-process-outcome model of the primary care consultation which places it within a health care cycle (figure 1). Within this model, inputs to the consultation are characterized as attributes of the doctor and of the patient. The doctor's inputs - his or her preferred style of consulting, expectations and mood - will be determined by his or her "health understanding", which will have been affected by training and environment.

Figure 1. A Model of the Primary Health Care Cycle - Based on Pendleton (1983).



The patient's inputs - ideas, concerns and expectations - will depend on his or her symptoms and perceptions of them, and will similarly be determined by health understanding and environment. Pendleton's model shows that differences in input to the consultation will affect doctor-patient communication during the process of the consultation itself, and that the consultation's processes will in turn determine its outcomes.

With regard to the patient, Pendleton distinguishes three different types of consultation outcome: immediate outcomes, intermediate outcomes, and long term outcomes. Immediate consultation outcomes are the patient's psychological reactions to the consultation, e.g. satisfaction, memory and understanding of the doctor's advice. Intermediate outcomes are patients' health related behaviours subsequent to the consultation, e.g. the patient's compliance with the doctor's advice, and the long term outcomes are any changes in the patient's health. Such consultation outcomes, as perceived by the patient, will all affect the patient's future health understanding and thus complete the health care cycle.

Pendleton is less explicit about consultation outcomes on the doctor's side of the model, and suggests that this area in particular has been under-researched. It might be proposed, however, that doctors also learn from the experience of each consultation and so consultation outcomes as perceived by the doctor, via the doctor's health understanding, will also affect inputs to future consultations.

In support of his model, Pendleton cites numerous empirical studies which have demonstrated the effects of differences in consultation input on consultation processes, and of differences in consultation processes on immediate and intermediate consultation outcomes (patients' psychological reactions and compliance). Research has been less successful in demonstrating the place of longer term outcomes (i.e. changes in the patient's health) in the health care cycle as modelled by Pendleton. This is to be expected however, for two main reasons: first longer term outcomes are notoriously difficult (and expensive) to research; and, second, as long term outcomes may be greatly separated in time from the consultation, with many intervening factors, relationships between consultation processes and long term outcomes may be relatively weak.

In the following review Pendleton's model is used to organize a number of different studies in the area of doctor-patient communication. First, a section will deal only with studies which demonstrate the effects which differences in input to the consultation may have on doctor-patient communication. Next, a number of studies are described which demonstrate relationships between doctor-patient communication and patients' subsequent psychological reactions and compliance.

The relevance of this review to the present thesis is threefold:

(1) In view of the evidence that differences in input to the consultation will affect doctor-patient communication, it seems likely that doctor-patient communication will also be affected by the introduction of a third party to the consultation - the computer. Furthermore, the evidence reviewed indicates that any study of the effects of doctors' computer use on doctor-patient communication should control for the effects on communication of other differences in consultation input.

(2) Evidence that aspects of doctor-patient communication affect important consultation outcomes is also reviewed.

(3) The particular aspects of doctor-patient communication, which have so far been shown to be important in terms of outcome, are identified.

The review will also illustrate the diversity of different approaches and techniques which have been used in the measurement of doctor-patient communication. Methodological details are not a major focus in the present chapter. However, because they are relevant to the empirical studies to be described, they are considered in greater depth in Chapter 4.

2.1 Consultation Inputs and Doctor-Patient Communication

This section reviews a number of studies which have demonstrated effects of differences in input to medical consultations, i.e. attributes of doctors or patients, on the consultations' processes.

Bain (1976) studied his own consultations in a Scottish health centre. He audio-taped consultations with 480 randomly selected patients. Patients were categorized on age, social class, presenting problems and their length of registration with the practice. The audio-tapes were used to analyse the verbal-content of the doctor-patient interactions. A verbal interaction coding scheme was devised and applied to the sample consultations. For each consultation the frequency of the doctor's and the patient's utterances in each of the following categories was determined: doctor's utterances - social exchange, encouragement, asking questions, problem resolution, and instruction; patient utterances - presentation of symptoms, answering questions, problem related expressions, questions, social exchange.

Bain reported a number of significant differences in consultation processes dependent on differences in patient inputs to the consultation. The doctor exhibited more "problem resolution" and "instruction" with child patients than with adult patients, and more "questioning" of newly registered patients. There was more "social exchange" between doctor and patient if the patient was from a higher social class, and more verbal exchange in general within consultations dealing with psychiatric or chronic illness. Relatively few questions were asked by the majority of patients, apart from those in social classes 1 and 2. Problem related expressions, where patients were mainly concerned about the effect of their illness on other members of the family and the effect on family income, were more frequently presented by patients from lower social classes.

The conclusions which may be drawn from this study are of course limited by its inclusion of only one doctor. However, Bain (1979) subsequently reported a similar study which included 556 patients visiting 22 different family physicians in Florida. With regard to the effects of differences in patient inputs on consultation processes, the generalizability of Bain's earlier findings was established. The later study also enabled an investigation of the effects of differences between doctors. There were no significant differences in the doctor-patient interaction (assessed as previously) for physicians in terms of age or site of practice. There were however differences between consultations depending on whether or not the physician was a preceptor (trainer), even though there were no trainees or medical students actually present during any of the study consultations. Visits for the preceptor group had increased verbal exchanges for all categories of communication, but notably so with respect to the physicians discussion with, and instruction to, patients on medical matters.

Furthermore, among preceptors, the extent of discussion of social and family issues was double that of non-preceptors. Unfortunately Bain's study was less conclusive than it might have been through the lack of sophistication of the statistical analyses used. It was unclear whether preceptor and non-preceptor groups actually differed in their underlying approaches to the consultation, or whether the communication differences observed were due to the fact that preceptors saw more patients from higher social classes. With the appropriate use of multiple regression or analysis of co-variance techniques, or sub-group analysis, this issue could have been more conclusively unravelled.

Byrne and Long (1976) were particularly interested in underlying differences between doctors in their approach to the consultation. They studied audio-tapes of over 2500 consultations provided by 71 different General Practitioners (GPs), the GPs were mostly British but five from Holland and six from Ireland were also included. Byrne and Long devised a scheme of 63 categories for coding only doctors' verbal behaviours (e.g closed question, broad question, directing, suggesting, indicating understanding). Their method also included the calculation of an overall score for the doctor's style during a particular consultation, based on the verbal behaviours used. Style was measured on a single dimension ranging from doctor-centred to patient-centred. Byrne and Long found that individual doctors were very consistent in style from consultation to consultation. They argued for the greater efficacy of a patient-centred style over a doctor-centred style, and suggested that their method could be used by doctors in self assessment, with a view to developing more patient-centred styles. Again, however, there are methodological weaknesses in Byrne and Longs' study, which undermine their conclusion of an invariance of style by doctor. First, they provide little evidence of the validity of their method for assessing doctors' styles. The method has recently been tested by Bjuis et al. (1984) who found that:

"... when we calculated the style ratings by the formula evolved by Byrne and Long the distribution was very narrow, and only a minimum of discrimination between doctor-centred and patient-centred consultations was obtained."

The implication is that Byrne and Longs' method, as formulated, may be too insensitive to detect variance in style, should such variance exist. Secondly, Byrne and Longs' study is completely one sided, with no investigation of patient attributes, of patients' contributions to the doctor-patient interaction, or of how these may be related, either to each other or to doctors' styles.

Rhee (1977) was also concerned with underlying differences between doctors in their approach to the consultation. However, rather than addressing a concept of "style" he was explicitly concerned with doctors' performances during consultation, and with the relative importance of the doctor's personal versus situational characteristics in determining performance. Rhee studied 454 different physicians (practising in Hawaii in 1968) seeing 2,517 different patients in 22 short-term general hospitals. Physicians were categorized on three personal charateristics (type of medical school attended, time in practice, degree of specialization) and two situational charateristics (type of ambulatory care setting in which physician worked, type of hospital in which physician provided care). Physicians' performances were assessed by retrospective peer review of patients' medical records.

Rhee reported the following findings: (1) The doctor's present work environment had more influence on performance than their formal medical training, i.e. the situation was more influential than what the doctor had internalized; (2) the organizational influence decreased with more doctor training; and, (3) the hospital work settings had distinct attributes which influenced the behaviour of doctors independently of doctors' qualifications. A problem with this study, however, is that it could not account for the fact that doctors have some choice over the situation in which they work, and that personal and situational characteristics are thus somewhat entwined. Furthermore, as was the case in the Byrne an Long study, Rhee did not consider differences in patient attributes. Patients may well be the most important 'situational' charateristic. The studies by Bain (1976,1979), described earlier, showed that differences between patients do affect doctor behaviour during the consultation.

A study which began to unravel the relative importance of physicians' versus patient characteristics in determining doctors' behaviour in consultation was conducted by Raynes (1980). Raynes investigated which of a general practitioner's activities could be classed as routines and which were responsive to differences in the patient's presenting symptoms. She used audio-recordings of a representative sample (size undisclosed) of the consultations of 10 different British GPs. She examined the doctors'use of three "search procedures" (questions, physical examination, use of patients' notes) and four "patient management techniques" (prescribing practices, referall of patient for evaluation or treatment, recall of patient, writing of certificates). Patients' presenting symptoms were classified in nine categories which were then used to differentiate two different types of consultation, namely, predominantly physical versus predominantly psychosocial. Raynes demonstrated that doctors' type of questioning and type of prescribing were determined by the type of consultation (i.e. the patient's presenting symptoms) but that the other five classes of doctor activity were not.

A number of studies of input-process relationships in medical consultations have been specifically concerned with the process of information provision by doctors. Boreham and Gibson (1978) investigated how patients aquire knowledge concerning the diagnosis and treatment of their illness during private medical consultations. They studied a sample of 80 female patients visiting four different doctors in three different private medical practices in Australia. The levels of knowledge which patients possessed prior to the consultation, and the information which was available to them at the close of the consultation, were examined. Also investigated were the means by which information was gained and the influence of both doctor and patient on the communication process, in particular, the extent to which information was provided in response to active requests from patients or whether it generally depended upon the doctor's perception of what the patient wanted to know or should know.

Boreham and Gibson employed four research instruments for data collection: (i) a doctor questionnaire, which sought doctors' views on the information patients should obtain during the consultation and on desirable and undesirable characteristics in patient behaviour; (ii) a pre-consultation patient interview, which examined patients' attitudes to gaining knowledge about illness and treatment, the extent of patients' present knowledge and patients' opinions on desirable and undesirable characteristics in patient behaviour; (iii) details of the illness and treatment provided by the doctor; and (iv) direct observation of the consultation. The observations of the consultation were used to analyse the actual information exchange process. The scheme used for the classification of information provided to the patient was as follows: six categories were used for the classification of information concerning the illness (diagnosis, minimal explanation, detailed explanation, condition, causes, further symptoms) and six categories for information concerning treatment (treatment referred to as "blue pills", name of drug, type of drug, effect of drug, side-effects, instructions for treatment). In addition it was noted whether information in each of the categories was either asked for or not asked for, and either given or not given.

It was found that, prior to the consultation, patients showed a suprising lack of knowledge about their illness, even though they attached considerable importance to gaining such information, and that - largely because of their own passivity - they gained little additional information during the course of the consultation. Initial and follow up consultations proceeded in completely different ways. Information about diagnosis was usually given in the patient's initial consultation although it was rarely asked for by the patient. Few patients questioned the doctor on any of the six issues about the illness, so that what they were told depended largely on what the doctor offered. The doctors answered what they were asked in all but one case. Information about the treatment was rarely asked for by the patient so that, again, what the patient was told depended, largely, on what the doctor offered. In only half of initial consultations and a quarter of follow-up consultations did patients ask questions about treatment other than the name of the drug. Little information was offered by the doctor about the drug side-effects. A likely explanation for this poor information exchange is provided by the finding, from the doctor questionnaires and patient interviews, that the doctors' and patients' views about what constituted a "good" patient were similar, i.e. essentially passive and deferential.

The hypothesis that patient question- asking and doctor information provision during consultations are determined by prior (similar) attitudes and expectations of doctor and patient has been directly tested, and provided with considerable support, by Roter (1977). She studied consultations at a North American family and community health centre. Two hundred and ninety-four patients and three doctors were included. Patients were randomly assigned to experimental and placebo groups. The experimental group received a 10 minute session with a health-educator prior to their consultation, in which they were "activated" to seek the information they required during the consultation, by appropriate questioning. The placebo group also had a 10 minute session with the health educator which mimicked the experimental session structurally but which did not attempt to "activate" the patient. Analysis of tape recordings of the subsequent consultations showed that the experimental group made significantly more bids for information. Interestingly, however, experimental group consultations were also characterized as showing more negative affect and less mutual sympathy between doctor and patient. Roter suggests that the latter finding was because an "activated" patient is counter to the expectations of both doctor and patient.

Doctors' expectations of their patients, and the effect that these may have on the doctors' information provision, was also the subject of a study by Wallen et al. (1979). These authors were particularly interested in the stereotyped views which male doctors may have of their female patients. They studied a stratified random sample of 34 male doctors specializing in internal medicine, consulting 184 male and 130 female patients. Consultations were tape recorded and both doctors and patients completed post-consultation questionnaires. Tape recordings were analysed to determine the amount of time spent in information exchange (either patients requesting information or doctors providing it) and the frequency of "information exchange events" (patient questions or doctor explanations). The level of technicality of patient questions and doctor explanations was also rated and it was noted whether doctors' explanations were spontaneous or answers to patients' questions. Post-consultation questionnaires were used to collect demographic and attitudinal data, especially concerning attitudes towards the transmittal of medical information by doctors to patients. Doctors were also asked to report the nature and certainty of their diagnosis and prognosis for each patient and to give their estimate of the importance of psychological factors in the patient's illness.

Wallen et al. report the following findings: (1) Doctors offered approximately the same number of explanations to both male and female patients, however female patients asked more questions and therefore received more explanations as answers and more explanations in total. Still, the total time spent in information exchange was equal for men and women. (2) Doctors more often mismatched the technicality of their explanations with the technicality of the question when the questions were asked by women (they were most likely to offer an explanation of lower technicality than the question). (3) Doctors were more likely to attribute psychological causes to womens' health problems. These differences were found despite there being no differences between male and female patients on demographic variables, or on desire for information - either as reported by themselves or as perceived by doctors. Wallen et al. suggest that womens' greater participation in the consultation is due to their greater experience of it and their generally greater responsibility for family health. They also suggest that women must be more frustrated by their consultations as the findings indicate that doctors' explanations given to women are more perfunctory tham those given to men.

Wallen et al. suggest a "micro-political" explanation for their finding of a mismatch in the communication between male doctors and their female patients, noting that information is a source of, power: " The reluctance of doctors to educate women fully about their condition may be viewed as one aspect of the white, upper-middle to upper-class male monopoly of medical knowledge that supports the current structure of practice and composition of medical practitioners." (p. 146).

An alternative (but possibly mutually compatible) explanation may be found in the hypothesis which drove a study by Pendleton and Bochner (1980).

These authors note that: "In most interpersonal encounters, as the distance between the cultures or the sub-cultures of the participants increases, mutual understanding tends to decrease with consequences for the smoothness of the interaction." They cite the work of Triandis (1975) in support of this assertion. In a study similar to that reported by Wallen et al.(1979), Pendleton and Bochner investigated the process of information and explanation giving in general practice consultations. Seventy nine naturally occurring general practice consultations were video-taped, and six different doctors were included in the study.

The dependent variables measured were: (1) The length of the consultation; and (2) the amount of information given to the patient (the frequency of occurence of four types of statement was noted - doctor volunteers information, doctor volunteers an explanation, doctor gives information in answer to a question, doctor gives explanation in answer to a question). The indepedent variables were the doctors, the sex of the patient and the socio-economic status of the patients (classified as belonging to low, medium, or high social class). The doctors were all from high SES backgrounds. A positive relationship between patients' social class, consultation duration, and information given to the patient was predicted, specifically that higher SES patients would have longer consultations, and receive and ask for more information and explanations, than lower SES patients, irrespective of differences between doctors and the sex of the patient.

The results were actually more interesting than Pendleton and Bochner had predicted. The social class of the patient was a significant predictor only of how many explanations were volunteered by the doctors. As expected higher SES patients received more voluntary explanations. Differences between doctors determined differences in the length of consultations and women patients were given more information in answer to their (more frequent) questions. It is unclear how closely Pendleton and Bochners' findings mirror those of Wallen et. al., with respect to information given to women. It was true that womens' consultations were not significantly longer than mens', despite the greater occurence of doctors' informative statements. Thus it is possible that individual items of information and explanation given to women were more perfunctory than those given to men. However, in this study qualitative aspects of the information were not assessed.

This section has reviewed a number of empirical studies all of which have demonstrated effects of differences in input to medical consultations on the consultations' processes. Although weaknesses have been noted in the design of most of the studies, the bulk of evidence, provided by the studies taken together, seems incontrovertible. Studies conducted at different times, with different aims and methodologies, and of very different populations of doctors and patients, have all provided very similar or highly compatible findings. In short, it is possible to conclude that consultation processes - the quality and quantity of communication between doctor and patient, the doctor's search procedures and patient management techniques, and the doctor's performance of clinical tasks - are all affected by the nature of the doctor and patient who are the input to the consultation. Particular characteristics of doctors which may be important in this respect are: (1) whether or not the doctor acts as a trainer of other doctors or medical students; (2) personal characteristics such as time in practice, type of training, degree of specialization; (3) characteristics of the doctor's working environment; (4) the doctor's prefered style of consulting; and (5) the doctor's attitude towards patients. Attributes of patients which may similarly affect the consultation's processes are: (1) age; (2) sex; (3) social class; (4) type of presenting symptoms and whether the consultation is a first presentation of symptoms; (5) length of time the patient has been registered with the doctor; and (6) the patient's attitude towards doctors and health care.

These findings are of course important in their own right. The most important consideration however, with respect to the medical consultation, is of the consultation's outcome. Variations in consultation processes, which occur as a result of varations in input, will not be a major concern unless the processes in question are also known to have a significant impact on important consultation outcomes. The next section reviews the empirical research which has examined this issue.

2.2 Doctor-Patient Communication and Consultation Outcomes

Studies of the process-outcome relationships of medical consultations have usually focussed on the outcomes of patients' psychological reactions to the consultation (e.g. satisfaction with the consultation, understanding and recall of the doctors advice) and patients' subsequent compliance with the doctors' recommendations. These outcomes are refered to as immediate outcomes and intermediate outcomes in the consultation model proposed by Pendleton (figure 1), which was outlined in the introduction to this chapter. This section describes several such studies.

Perhaps the best known study of doctor-patient communication is that of Freemon et al. (1971) (also described by Korsch et al., 1971; Korsch and Negrete, 1972). Freemon et al. used Bales' Interaction Process Analysis (Bales, 1950) to categorize verbal exchanges recorded on audio-tapes of over 800 interviews conducted in a Californian paediatric clinic. A researcher also conducted follow up interviews with the patients' mothers to assess their satisfaction with the consultation and the extent to which they had complied with the doctors' advice. Bales' Interaction Process Analysis (IPA) is designed to assess human verbal interaction and focuses especially upon the socio-emotional aspects of interpersonal communication. It comprises 12 categories for coding verbal behaviours (although non verbal behaviours such as smiles and gestures may also be coded) which sub-divide into three socio-emotional areas: positive, e.g.

shows solidarity, agrees; neutral, e.g. gives opinion, asks for orientation; and, negative, e.g. shows tension, shows antagonism. Freemon et al. related the occurrence of doctors' and patients' behaviours during the consultation, in each of these 12 categories, to patients' subsequent satisfaction and compliance. Their findings were as follows: (1) Satisfaction and compliance were positively associated with the proportion of doctor talk during the interview and with the occurence of positive affect in the doctors' speech, and negatively associated with the occurence of negative affect and questions in either the doctors' speech or the patients' speech; (2) satisfaction was positively associated with the occurence of patient agreement; and, (3) compliance was positively associated with the occurence of doctors' information giving.

Bales' IPA has also been used in a more recent study by Stewart (1984). Stewart applied the IPA to audio-tapes of 140 consultations conducted in the offices of 24 Canadian family physicians. Patients' subsequent satisfaction and compliance were also assessed by later interviews and "pill counts". Stewart used the Bales' categories to distinguish "patient-centred" behaviours in the doctors' speech. This was on the grounds that in patient-centred care the important doctor behaviours are those which are supportive and those which allow the patient to express himself or herself. Stewart found that the incidence of patient-centred doctor behaviours was positively associated with patients' satisfaction and compliance.

In the same tradition as the Freemon et al. (1971) and Stewart (1984) studies, is one reported by Stiles et al. (1979a, 1979b). These authors also used a general purpose discourse coding system to assess doctor-patient communication in medical interviews. The system was the Taxonomy of Verbal Response Modes (VRMs) which Stiles had recently developed (Stiles, 1978a, 1978b). This system uses eight VRMs (e.g. Question, Edification, Acknowledgement, Advisement) to classify each distinct utterance in each interactant's speech. Each utterance is coded on both its gramatical form and its interpersonal intent, thereby allowing for "mixed mode" utterances, such as "Will you close the door?", which has Question form but Advisement intent. As each utterance may have any form/intent combination, 64 possible categories of utterance result. In practice, however, the interpretation of VRMs is simplified, in a number of ways, as: (1) usually only 10-15 different VRM categories are used with any significant frequency in a particular type of interaction; (2) different VRM categories may be combined to provide measures of a smaller number of different types of "verbal exchange" (Stiles et. al., 1979a); and (3) different VRM categories may be combined to provide measures on a smaller number of "dimensions of interpersonal roles" (Stiles, 1978b; Stiles et al. 1979b).

Stiles et al. reported applying this system to the audio-taped verbal interactions between patients and physicians in 52 initial interviews in a university hospital screening clinic. Patient satisfaction with the interviews was also assessed, with a questionnaire which provided seperate scores for satisfaction with cognitive and affective aspects of the care received. Different types of verbal exchange and patient and physician role performances during the consultations were related to patients' subsequent satisfaction. The findings were as follows. (1) Affective satisfaction was associated with transmission of information from patient to physician in "exposition" exchanges during the medical history taking segment of interviews, in which patients told their story in their own words. This is to say, the more patients could relate their own symptoms, the more satisfied they were. (2) Cognitive satisfaction was associated with transmission of information from physician to patient in "feedback" exchanges during the concluding segment of interviews, in which physicians gave patients information about illness and treatment.(3) Patient satisfaction was positively correlated with physician "aquiescence" in the concluding segment of the interview, but not with acquiescence during the earlier medical history-taking or during the physical examination.

Other researchers of process-outcome relationships during medical consultations have taken more specific approaches. Some have developed and used discourse coding systems which are specifically for assessments of medical consultations (e.g. Bain, 1977; Heszen-Clemens and Lapinska, 1984), and others have also been specifically concerned with particular aspects of the communication process, e.g. the communication of information from doctor to patient (Bertakis, 1977).

Bain (1977) reported further details of, and findings from, the study which was described in the previous section (Bain, 1976). As outlined above, Bain related differences in patient inputs to the consultation (age, social class, presenting symptoms and period of registration with the practice) to differences in the doctor-patient verbal exchange, as assessed by a specially devised doctor-patient interaction coding scheme. In his later article (Bain, 1977) it is disclosed that the patients included in this study also completed a questionnaire, after their consultations, which assessed their understanding and recall of the doctor's treatment advice. It was found that patients from higher social classes had significantly higher understanding and recall than patients from lower social classes. Bain proposes that these differences in recall are due to the differences in doctor-patient communication for higher and lower social class patients, which had been previously reported. Unfortunately, he does not report any direct investigation of the relationship between his measures of consultation processes (doctor-patient communication) and his measures of consultation outcome (patient understanding and recall). Had he done so, while holding class constant, his conclusions may have had even stronger support. Alternatively, of course, such an analysis may have revealed no relationship between doctor-patient communication and patient understanding and recall. The more favourable outcome of consultations with higher SES patients may have been independent of the quality of doctor-patient communication.

Heszen-Clemens and Lapinska (1984) report a rather unique study of doctor-patient communication in visits by 62 different patients to 11 different doctors practising in specialist out-patient clinics in Warsaw. The study is unusual because of the especially developed technique of doctor-patient interaction analysis employed, but more so because of its aims. These were to explore the relationship between: (1) the process of the doctor-patient interaction and patients' subsequent health behaviour - this included both compliance with doctors instructions and activities patients undertook of their own accord in order to get well; (2) the relationship between both kinds of patients' health behaviour and their subsequent health; and (3) the relationship between the process of the doctor-patient interaction and patients' later health.

The interaction process analysis technique developed by Hezen-Clemens and Lapinska used two main classification principles: who is an object of interaction (speaker or partner) and what is the sphere of intended influence (cognition, emotion or behaviour). In addition it accounted for the fact that the intent of affecting emotional state could be to improve it or to make it worse and that a complex intent is also possible, e.g. to affect emotion and behaviour as well. On the basis of these principles a taxonomy which included 22 different categories of utterance was devised.

Patients' health activities were evaluated through an interview conducted 7 to 10 days after their medical consultation. This provided indices of recollection of, and compliance with, doctors' instructions and of patients' own health activities. Patients' subsequent health status was evaluated by doctors after completion of the first stage of treatment. Subjective evaluations determined whether there were more complaints, no change or fewer complaints. Objective evaluations were also used, based on the results of physical examinations and medical tests.

Hezen-Clemens and Lapinska report that the following associations were found to be statistically significant: (1) The recollection of doctors' instructions was better when their frequency in doctors' utterances was higher, but it was worse when the amount of advice given to the patient was greater (doctor directiveness). It was also found that patients memorized doctors' directions better when the doctor was more friendly (emotional attitude towards the patient), allowed them to act as partners during the interview and when the patients themselves asked more questions and were more talkative. (2) Patients' compliance was worse when the amount of doctors' orders increased and was better when patients asked more questions and were generally more active during the consultation. (3) Patients were more apt to undertake additional activity in order to get well when the doctor showed friendliness in different forms, when he allowed them to act as partners and when patients themselves were more active during the interview.(4) Patients' subsequent health status was not connected to the degree of patients' compliance with doctors' instructions but was positively connected with the amount of patients' spontaneous health activity. (5) The improvement of patients' health, evaluated on the basis of subjective and objective data, was strongly associated with the amount of emotional exchange between doctor and patient.

It is interesting that although this study was reported very shortly after the publication of Pendleton's work (Pendleton, 1983), and presumably conceived without knowledge of his framework, its design accords completely with the model. Indeed, by including both health behaviours directed by the patient's own health understanding and the longer term outcome of patient health status, it begins to fill some of the gaps in the earlier research which were highlighted by Pendleton.

Hezen-Clemens' findings lend strong support, both to Pendleton's model of the medical consultation and for a patient-centred approach by doctors in consultation. In fact the findings, taken together, and especially considering the finding that patients' compliance with doctors' instructions had no effect on their subsequent health, suggest that the doctors who took part in this study might have done well to forget their medical knowledge completely and concentrate instead on their role as counsellor! For the sake of medical science one would hope that the findings listed under (4), above, are not widely generalizable.

Bertakis (1977) was specifically concerned with the quality of doctors' information provision during consultations, and the effect that this has on patients' subsequent satisfaction with the consultation and recall of information. She studied the consultations of physicians at a US university family practice clinic. Two groups of consultations were examined, a control group and an experimental group (n=50 in each case). The same methods of investigation were employed for each group. Consulations were audio-taped and the number of items of information transmitted from doctor to patient in each consultation was calculated. Patients were subsequently interviewed by a researcher and asked to restate the information they had just received from the doctor, the percentage of information retained was thus calculated. Patients also completed questionnaires after their consultations which assessed their satisfacion with it. During consultations in the experimental condition doctors asked their patients to restate the information they had received before the consultation was over, and repeated any information the patient had apparently not assimilated, they also invited the patient to ask questions prior to the end of the consultation. These patient education techniques were not used in the control group of consultations.

Bertakis reports the following significant findings: (1) Patient satisfaction was positively associated with the number of items of information transmitted from doctor to patient during the consultation. (2) Patient satisfaction was positively associated with the proportion of information they retained from the consultation. (3) Patients from the experimental group were more satisfied than patients from the control group. (4) Patients from the experimental group retained more information than patients from the control group.

In addition to verbal communication between doctor and patients, non-verbal communication has also received considerable attention from researchers. Friedman (1979) provides a cogent argument for the importance of non-verbal communication, expanding on the significance of touch, gaze, facial expression, tone of voice, bodily positions and gestures. Touch, he argues, has various significant functions and meanings in medical settings. It may have symbolic value in healing and may create positive expectations in the patient. It may have important physiological effects and, even when used for strictly diagnostic purposes, may affect the interpersonal nature of the doctor-patient interaction. Similarly eye-contact may be significant in communication, it may be comforting or threatening depending on the interactional context at the time of its occurence. Staring at, or refusing to look at, deformities may also upset a patient. Eye-contact may be used to avoid looking at a deformity. Ordinarily lack of eye-contact may signify a de-humanized interaction. Friedman also suggests that during an interaction the most specific and detailed information about emotional states is communicated through facial expressions. Patients, paying special attention to non-verbal cues and especially influenced by the affective nature of the interaction, usually will be heavily influenced by the doctor's facial expressions. Tone of voice also reveals specific emotional and motivational states, as do bodily positions and gestures, e.g. leaning forwards or backwards, hand movements, finger tapping.

Non-verbal communication, because of its enormous range and complexity, is of course extremely difficult to assess quantitatively in its entirety. However, some empirical studies have demonstrated links between aspects of non-verbal communication during the consultation process and the consultations' subsequent outcomes.

Di Matteo (1979) was interested in the importance of non-verbal signals to the socio-emotional dimension of doctor-patient interactions. She conducted a study which showed that doctors' ability to decode non-verbal cues may be an important component of his or her empathy in dealing with patients. Sixty four medical house officers in a North American urban community teaching hospital underwent the PONS test, a film test providing quantitative indices of a respondent's abilities to decode accurately the non-verbal communication of affect in another person's facial expressions, body movements and postures, and voice tone. In addition, an avergage of six of each house officer's patients were interviewed about their satisfaction with the doctor's interpersonal treatment of them. Di Matteo found that patients ratings of their doctors were significantly positively correlated with the doctors' accuracy in decoding emotion expressed through body posture and movement on the PONS test.

Byrne and Heath (1980) studied non-verbal behaviour in video-taped general practice consultations, focusing especially on the relationship between non-verbal behaviour and verbal exchange. They noted that, at the beginning of consultations, doctors' broad questions coupled with leaning back and looking at the patient encouraged patients to talk, but that not looking at, or interrupting the patient, discouraged exposition. During the consultation, leaning forward at the same time as asking questions seemed to indicate concern and made the disclosure of important information more likely. The timing of doctors' postural movements and use of records were also very important. If appropriate they might indicate concern, but otherwise they might disrupt the patient's speech. Byrne and Heaths' evidence, however, consists of seleted case examples which demonstrate links between non-verbal and verbal communication. As is the case for the Di Matteo study, there is no systematic analysis of non-verbal communication during the consultation.

Two studies have undertaken more systematic assessment of non-verbal communication between doctors and patients and related these aspects of communication to patients' subsequent reactions to their consultations. These are the studies by Hall et al. (1981) and by Larsen and Smith

(1981).

The former investigators used audio-tapes of 50 consultations by two women doctors practising in a US family and community health centre out-patient clinic. Extracts from the consultations were rated by 144 student judges under three different conditions: electronically filtered speech (voice only), original speech (voice and words), and transcripts (words only). Patients and doctors were rated for anger, anxiety, sympathy and for the probability of the patient's return (future appointment keeping). In addition patients were rated for satisfaction and assertiveness and doctors for dominance and business-like manner. Patients' actual satisfaction with the consultation was also assessed (through post-consultation questionnaires) as was their actual future appointment keeping. The findings showed that the patients' satisfaction with the visit was related to the ratings of the doctors' communication, but that the relationship for the doctors' verbal communication was opposite that for their non-verbal communication. When the doctor sounded (in filtered speech) more negative the patients were more content. But when the doctors uttered words which were judged (in transcript) to be less anxious and more sympathetic, patients were also more content. Patients who returned for appointments also expressed mixed affects in the different conditions - more satisfied and less anxious in words and original speech, but less satisfied in voice tone. Since affect, in this study, appeared to be reciprocated, the findings suggest that negative doctor affect expressed in voice tone with positive affect communicated through words is interpreted by patients in an overall positive manner, as probably reflecting perceived seriousness and concern on the part of the physician.

Larsen and Smith used video-tapes of 34 consultations at US family medicine centre to score the non-verbal communication of doctors and patients for immediacy and relaxation, using Mehrabian's method (1969). Patients' post-consultation satisfaction and understanding were also assessed by questionnaire. It was found that patients' satisfaction and understanding were positively associated with doctors' apparent immediacy and relaxation.

This section has reviewed several empirical studies which, taken together, provide a very impressive amount of evidence on the importance of doctor-patient communication. Specifically the studies show that many aspects of the communication process may affect the outcome of a medical consultation. The consultation outcomes which have been shown to be dependent on the quality of doctor-patient communication include: patient satisfaction; patient understanding and recall of the doctor's information and advice; patient compliance with the doctor's advice, patient future appointment keeping; patient subsequent health promoting activities; and patient subsequent health. Aspects of doctor-patient communication during the consultation which have been shown to be important in determining these outcomes are: the emotional tone of the interaction; the quality and quantity of the doctors information and advice; the patients role in the consultation; the doctor's use of education techniques; and, both participants' use of and sensitivity to non-verbal signals. The implications of these findings for the present research, together with those of the previous section on the effects of differences in consultation input, are further discussed in this chapter's concluding section, below.

2.3 Summary and Conclusions

In reviewing a number of empirical studies of doctor-patient communication, this chapter used Pendleton's (1983) input-process-outcome model of the primary health care cycle to distinguish two main types of study. First, those studies were reviewed which had shown how doctor-patient communication during the consultation process can be affected by differences in input to the consultation, i.e. by differences in the characteristics of the participating doctors and patients. Second, studies were described which have shown how doctor-patient communication can affect important consultation outcomes - immediate outcomes such as patient satisfaction and retention of information received; intermediate outcomes, such as medication compliance and future appointment keeping; and the longer term outcome of patient health.

The reviewed research suggests a number of substantive issues which must be taken into account in any research of the medical consultation. With respect to the present research, which aims to investigate the effects of doctors' use of a computer during consultations on their communication with patients, two main conclusions may be drawn. These relate to the two different types of study reviewed.

The first group of studies suggest a number of consultation inputs which must be taken into account when studying the effects of doctors' computer use on doctor-patient communication. Doctors' characteristics which have been shown to affect doctor-patient communication include: whether or not the doctor is a trainer; the time the doctor has been in practice; and the doctor's type of training, degree of specialization, preferred style of consulting and general attitude to patients. Patient characteristics which affect doctor-patient communication include: their age, sex, and social class; their presenting symptoms; whether the visit is a first presentation of symptoms or a follow up; and their period of registraton with the doctor.

The second group of studies show clearly that the quality of doctor-patient communication during the consultation can affect immediate consultation outcomes such as patient satisfaction and understanding. Several of the studies have also shown effects of doctor-patient communication on the intermediate consultation outcome of patients' compliance with the doctors' advice. The latter findings may seem to be the most important. However, immediate consultation outcomes are important in their own right, and more so because of their link with patient compliance. A number of studies (not reviewed here as they were not directly concerned with doctor-patient communication) have demonstrated how patients' immediate psychological reactions to their medical consultations affect their subsequent compliance with the doctors' instructions (e.g. Kincey et al., 1975; Hulka et al., 1975; Ley et al., 1976; Ley, 1980). In view of the effects of doctor-patient communication on patient compliance (whether direct or indirect), it would seem that doctor-patient communication during medical consultations will also be an important determinant of patients' longer term health. Unfortunately, the research literature contains only one report of an investigation of the effects of doctor-patient communication on patients' health (Heszen-Clemens and Lapinska, 1984). This study did find that the improvement of patients' health, subsequent to the consultation, was strongly associated with the amount of emotional exchange between doctor and patient, during the consultation.

Clearly the aspects of doctor-patient communication which have been highlighted in the reviewed studies are extremely important factors in the overall quality of health care provision. The aspects of doctor-patient communication which have been shown to be important in terms of consultation outcome include: the quality and the quantity of the information and advice provided by the doctor; the communication of affect between doctor and patient, whether by verbal or non-verbal means; the doctor's consulting style, particularly as it affects the patient's role in the consultation; and the extent to which the patient is able to relate their 'story' in their own words and otherwise take an active role in the consultation.

To return to the concerns of the present research, the second group of studies reviewed above show why the effects of doctors' computer use on doctor-patient communication is an important focus for research. The potential benefits of computers designed for use during medical consultations are discussed in the next chapter. However, if computer computer use interferes with any of the aspects of doctor-patient communication which have been highlighted above, this could be detrimental to the overall quality of the care provided.

Pendleton's model of the primary health care cycle has proven very useful in organizing the studies for review in this chapter. The present review has included several studies which were not considered by Pendleton (e.g. Wallen et al.,1979; Heszen-Clemens and Lapinska, 1984; Stewart, 1984), however, the model is able to incorporate these studies with ease, and indeed, to draw further support from them. Pendleton's model should also be used to guide future research of the medical consultation. It must be stressed that the consultation's processes can only be understood adequately in the context of input and outcome:

" Without these twin anchors, the study of consultation processes will lack any criterion or appropiateness." (Pendleton, 1983, p.6).

In Chapter 4 the theoretical foundations and methodological issues of doctor-patient communication research will be returned to and considered in greater detail. First however it is necesary to provide the background to the other main theme of this thesis, i.e. the consulting room use of computers in general practice. This is the subject of Chapter 3, which follows.

CHAPTER THREE: THE CONSULTING ROOM USE OF COMPUTERS IN GENERAL PRACTICE

This chapter continues to provide the background to the thesis, focusing on its second major theme: the consulting room use of computers in general practice.

Computer use in general practice is still very uncommon. In fact, with respect to use during actual consultations it is almost non-existent. Although a sizeable minority of UK practices are now making routine use of computers in their office areas, e.g. to maintain an age/sex register and to issue repeat prescriptions, most consulting room applications to date have been experimental.

Inorder to reflect this situation the present chapter reviews the extent and effects of the use of "office-based" computer-systems, before describing the few research projects which have studied the use of computers by doctors in the consultation.

3.1 Information in General Practice - The Case for Computerization

" Theoretically, the need for computers is obvious: a four man group practice of 10,000 patients will, in one year, provide 40,000 doctor/patient contacts, make 1600 hospital referrals, do 2000 laboratory tests and 4000 X-rays at a total cost to the National Health Service of well over £1 million. All this is done, however, with nothing that any industrial or commercial organization would recognize as an information system. Indeed, most practices would not be able to give you the figures for their workload in these terms. Meanwhile, the medical records remain unchanged since 1911: surely their is no other science-based technology still dependent on an information system invented in 1911 and not seriously modified since!" (Metcalfe, 1984, p.53)

General Practitioners routinely record important items of information on all their registered patients. Most general practices keep an age/sex register, which lists the name, address and age and sex of all the practices' patients, and a file for each individual patient, containing notes on all the patient's encounters with their GP and correspondence with hospital consultants, results of tests, etc.. Additionally a practice may keep seperate records of repeat prescriptions.

This information has considerable potential for increasing the effectiveness of GPs in preventing, controlling and alleviating illness. It could be used, for example, to identify patients "at risk" to certain illnesses, so they might be called in for preventative purposes, it could be used in audit (i.e. monitoring the practices performance in particular areas, with a view to improving the standard of care provided), in the planning of services, in monitoring the condition of individual patients with chronic complaints, or in avoiding adverse drug interactions and side effects.

Unfortunately this potential has not been realized. Typically the information recorded by GPs is (at best) under used or (at worst) unusable. The failure of GPs to turn the potential of this information into benefits, in terms of the health of the public they serve and in terms of public expenditure, may be attributed, in part, to the prevalent orientation of general practice towards reaction to presented acute needs rather than towards the prevention of illness and the positive promotion of health - or what has been termed "the sick shop inheritance" (Tudor Hart, 1981). Tudor Hart presents a catalogue of damning evidence of the medical professions' failure to apply the knowledge it posseses, using the resources it has available, resulting in serious illness and death which could otherwise have been avoided. For example, recent surveys of the incidence and treatment of chronic illnesses (e.g. hypertension, diabetes, epilepsy) support the postulation of a "rule of halves" - half of the people who need treatment are not known to the medical profession, half of those known are not treated, and half of those treated are not controlled (i.e. the clinical problems associated with the illnesses are not controlled as well as they might be, given the treatments available).

Tudor Hart argues that a change in the way primary health care is organized is necessary to enable reorientation towards prevention to take place, while pointing out that the necessary resources - doctors, community nurses, health visitors, and routinely recorded demographic and clinical information - are already available.

Effective use of information, however, requires a proper information system, which, given the size of the database, would be greatly helped by the use of computer technology. Thus, computers may be an important enabling factor to the urgently needed reorientation of our primary health care service. The use of computers by general practitioners will not, of itself, lead to more effective health care, rather:

"Implementation of a computer system must be seen as an integral part of a practice's strategy of change." (Fitter et al., 1986, p.43).

3.2 The Extent of Computer Use to Date

The actual use of computers in general practice was initiated by a handful of pioneering GPs, developing systems themselves to meet the individual needs of their own practices. Commercial sytems were soon introduced by several small software companies but, until the initiation of the "Micros for GPs scheme" by the Department of Trade and Industry in 1982, there was little attempt at any nationally or regionally coordinated development or implementation. Under the "Micros for GPs scheme" the DTI reimbursed 140 selected practices with half the cost of installing a microcomputer. The initial impact of these systems was evaluated by a team of researchers commissioned by the Department of Health and Social Security (Herzmark et al., 1985). A follow up study, of the longer term use and development of computers in general practice, has also been recently completed (Fitter et al., 1986). At present, still only some 5 to 10% of general practices in the UK have a computer. Since a significant proportion of these originally acquired theirs' through the "Micros for GPs scheme", and since these were selected to be representative of the nation as a whole, the evaluation of the "Micros for GPs scheme", and the later follow up study, serve to reflect the current "state of the art" of GP computing.

3.3 The Evaluation of the Micro's for GP's Scheme

As noted earlier, most computer practices have systems installed in their office areas only, where they are used for the maintenance of the age/sex register, the issue and monitoring of repeat presctiptions, and for simple call and recall. Thus the systems are used mainly by the practice staff rather than by the doctors themselves. Herzmark et al. (1985) found that after one year of use doctors and staff reported prefering the new, computerized, information systems, and wished to continue using them. However, for most practices the achievement of this relatively simple level of computerization, had been far from easy, requiring substantially increased inputs of time and effort by both practice staff and doctors. Furthermore, it could not be said that the benefits of computerizing these parts or the practices' information systems had warranted the costs incurred. It was concluded that initial expectations of the ease of implementation, and of costs and benefits, had been over-optimistic. After one year of use there was insufficient evidence that computers offered a cost effective means of improving health care delivery. The study of longer term use was therefore commissioned by the DHSS.

Fitter et al. (1986) examined 65 practices which had been using computers for more than two years, and compared them with a group of 27 non-computer (control) practices, assessed over the same time period. Comparisons were also made with another group of ten practices which were making particularly "high use" of their computer.

The aims were: first, to assess the impact of the computer on the practices, its ability to support improved health care delivery, and factors that support or impede progress; and, second, to assess the potential and requirements for further developments in general practice and associated primary health care computing.

Most practices were making extensive use of their computer for registration, repeat prescribing, simple call and recall and word processing. However, there was considerable variation in the effectiveness with which the computer was used. For example, most practices continued to "pull notes" in order to check repeat prescription requests, thus reducing the role of the computer to a mere printing technology. The more efficient procedure, of using the computer record to check eligibility, was only common in "high use" practices.

There were similar differences between practices in the effectiveness with which they used the computer for preventive procedures. A thorough preventive programme requires good call, recall, follow-up and audit procedures. Only a minority of practices were using their computer to follow-up individual patients comprehensively, and few made any systematic assessment of their performance in providing the programmes. Such assessment and follow-up procedures were more common in the high use practices.

Doctors in the high use practices felt more committed and directly involved with their computer. The doctors in the other computer practices identified lack of commitment and managerial competence as factors impeding effective computer use. The high use practices were more oriented towards systematic planning and an efficient organization.

Despite their largely negative findings, Fitter et al. concluded that the potential of GP computing is now firmly established and that there is little doubt that computer use will become commonplace in general practice. It is apparent, however, that although the need for computers is obvious in principle, real practical benefits, for the majority of users, have still to be demonstrated. Among the factors identified as supporting or impeding effective progress, were: the objectives and motivation of the practice and its principals; the pace and focus of implementation; management, progress reviews and planning; and time input. Fitter et al. suggest a number of initiatives which could guide future developments and enable more of the potential of computer use to be realized. Among these are three important areas of systems development for general practice computing which require particular attention: (i) aids to information management and practice audit; (ii) decision aids in the consultation; and, (iii) communication with other parts of the health service. The following section focuses on the second of these areas.

3.4 Consulting Room Computer Use - The Potential

Computer terminals in the consulting room, enabling direct access to the computer system by doctors during the consultation, could greatly increase the potential of the practice's computer. Consulting room terminals open up several areas of health care delivery to possible computer enhancement. These possibilities are in the areas of: prevention; audit, research and planning; prescribing; chronic disease management; and history-taking and diagnosis. They are outlined below.

(a) Prevention

All preventive programmes require information to identify appropriate patients. Although a start can be made with age/sex data alone, progress depends on the computer holding relevant clinical information. Several practices in the UK are now using computerized clinical information to enable call and recall programmes, most commonly for cervical cytology, rubella and tetanus (Fitter et al.,1986). Most of these practices do not have consulting room terminals, therefore these programmes may require summaries of individual patient's clinical histories, on computer printouts, to be attached to patients' paper-based medical records. Printouts are updated manually by doctors in the consultation to enable updating of the computer records by practice staff.

Obviously, terminals in the consulting room could save time in this respect and reduce the likelihood of transcription errors. Furthermore, consulting room terminals could help in adherence to pre-defined categories for the recording of clinical information, especially if dictionary-based software is used. Computerized clinical data may also be used to support opportunistic prevention (enabling the computer to generate prompts during the consultation) as well as group call and recall. Opportunistic prevention is of course also possible with manual patient records. In fact Fitter et al. (1986) found that opportunistic approaches to prevention were more common in non-computer practices, however they also note that:

"..their comprehensiveness, in the absence of specific prompts and the means of reviewing uptake, may be questionable." (p.18).

(b) Audit, Research and Planning

Audit (e.g. analysis of immunisation and recalls, morbidity, prescribing and workload), epidemiological research, and the planning of services which these activities support, are entirely dependent on adequate clinical information. Again consulting room terminals could provide the most efficient means of inputting and accessing the necessary clinical information.

(c) Prescribing

Consulting room terminals would allow doctors to check and update patients' repeat prescription records during the consultation, and could also enable the computerization of acute prescribing and thus computerized support of total prescribing audit. In addition the computer could provide prescribing information during the consultation and warn the doctor of possible adverse interactions or side effects which could result from particular prescriptions.

(d) Chronic Disease Management

Computers offer an ideal medium for the provision of chronic disease management protocols, e.g. for hypertension or diabetes. Computers could prompt the doctor to conduct necessary verbal and physical examinations and to record the results, and aid in monitoring a patient's condition over time, making recommendations for treatment, recall and referall. Thus helping to ensure the provision of adequate standards of care to the chronically ill. In this sphere, the introduction of computerized management protocols, and also history taking protocols (see below), may prove to be an important factor in the current trend towards more community-based care (and away from hospital-based care). Community-based care may have a number of advantages (e.g. for hospital resources, patient convenience and satisfaction, and the GPs' job satisfaction) but it does place greater responsibility on the GP to ensure adequate standards (Evans, 1985).

(e) History-Taking and Diagnosis

Computers are also an ideal medium for the provision of branching questionnaires, e.g. for history taking. In many areas of health care (e.g. ante-natal care) comprehensive histories are essential to risk appraisal. Most trials of computerized history-taking questionnaires have involved systems designed for patient completion (e.g. Slack et al., 1966; Mayne and Martin, 1970; Lucas, 1977). However, systems designed for use by the health care provider have some advantages (Lilford et. al., 1983; Lilford et al., 1985). In the literature, reports of this type of system are confined to hospital applications. However, as is the case for management protocols, computerized history-taking protocols offer considerable potential for use in general practice as part of a shared care policy.

In the longer term practical computer aids to diagnosis for use by GPs may also become a reality. To date development of such systems is at a very early stage (see for example, Rector, 1985).

A list of the potential benefits of computer use during consultations should make the prospect seem very attractive to any enthusiastic GP. However, consulting room use is still extremely uncommon (almost certainly occuring in less than 0.5% of UK practices). This is not suprising given the difficulties which have been found in the implementation of the far less complex office-based systems. Several other factors also inhibit developments in this direction. The capital cost of installing consulting room terminals is a major hurdle, especially as this must come from the GPs' own pockets and as the potential benefits have yet to be proven. GPs may also, understandably, doubt the practicality of consulting room computer use. Given the tight constraints of the general practice consultation, any computer system would have to be very quick and easy to use. The sytems reliability would also be crucial. Although some GP computer systems, designed for consulting room use, are now commercially available, innovative software and hardware which could make them easier to use is still at the developmental stage. Perhaps the greatest impededement, however, is the unknown effects which doctors' use of a computer might have on the consultation process. As illustrated in the previous chapter, the medical consultation is a complex and sensitive human interaction. The achievement of the consultation's ultimate goal (a healthier patient) is dependent on the quality of doctor-patient communication and on patients' psychological reactions. While the effects of consultation computer use on doctor-patient communication and patient reactions, as well as on the delivery of care, are unknown, most GPs will be reluctant to install terminals in their consulting rooms. The extensive use of computers during general practice consultations must therefore be seen as a projection. Any future realization of the potential outlined above must be preceded by extensive research and development.

3.5 Consulting Room Computer Use - Research to Date

As indicated above, the consulting room use of computers in general practice is still very uncommon. Research in this area is rarer still. However, four seperate studies have been reported, these will be refered to as: the Exeter project; the First Aid study; Pringle et al.s' study; and, the IBM project. The first three of these studies are briefly described below. The IBM study is then described in more detail, as it was this project which gave rise to the present research.

(a) The Exeter Project

This very ambitious project, conceived in the 1960's, was probably the first to introduce computer terminals for routine use by GPs during the consultation. The concept of the project was that the whole of the record system for a health care district, both in and out of hospital, should be held on a mainframe computer. GPs should be able to access the records of their patients in hospital, and information from general practices should be easily accessible to hospital consultants.

Systems were installed in two practices in 1975. No systematic evaluation of the project has been reported. However, the account by Bolden (1985) accords remarkably with the experiences found in the extensive and systematic evaluations of the "Micros for GPs scheme" and of the IBM project (see later in this chapter).

The system did not "go live" until 1976, after much hard work loading data. The doctors were suprised at how little notice patients took of the consulting room terminals. For the doctors, however, consulting room use was extremely onorous. The computer did provide the benefits of organized and legible records, automatic monitoring of workload, a preventive care system, a repeat prescription system, a disease register and a research tool. But it was felt, in one of the practices at least, that these benefits did not make up for the problems arising from consulting room use. Doctors had difficulty in adjusting to typing and also from the system design, which made it difficult to move from one area of information to another. They were also concerned that the extra time and inconvenience of computer manipulation could adversely affect the doctor-patient relationship. Further problems were the stress on practice staff, the work of adding the disorganized records of new patients to the system, and the unreliability of the system.

As time progressed the size of the accumulating computer record for individual patients also became a problem as the system provided no means of summarizing unstructured data. Thus problems of manipulation during the consultation were increased. One practice ceased using the computer during consultations after three years. It is reported that the other still uses consulting room terminals but that the problem of summarizing accumulated data has still to be solved.

(b) The First Aid Study

The "First aid" system was a computer aid to history-taking and diagnosis for dyspepsia patients. It was designed by Barber and Fox (1981) for interactive use by doctors in a hospital out-patient clinic. However, it is one of the few consulting room systems which has been systematically evaluated, and was also used in a trial by GPs, hence the inclusion of the study here. The system used Bayesian statistics to process symptoms entered by the doctor during the consultation, and provided the resulting probabilties that each of five diseases was the cause. The evaluation of the system employed a "before and after" research design, with video recordings of consultations and pre and post consultation patient questionnaires providing the data. Patterns of computer use, the effects of the computer on doctors' information gathering and processing, and patients' psychological reactions to the computer and to their consulations, were examined (Fitter and Cruickshank 1982,1983; Brownbridge et al., 1984; Cruickshank 1984).

Two different patterns of computer use were identified, each with different advantages and disadvantages. Some doctors adopted a "minimal use strategy" making most computer entries in the patient's absence, i.e. between patients or when patients were in an adjacent examination room. Others chose a "conversational strategy" using the computer extensively in the patient's presence and involving the patient in the process. The minimal use strategy avoided the difficulty for doctors of having to share attention between the computer and the patient, but the delay in entry meant that computer entries were fewer and with more distortions than those of conversational users. Computer consultations tended to take longer than pre computer consultations for all users - but also obtained more information. There was, however, a considerable mismatch between the definitions of symptoms used to pre-define the computers' categories and those normally used by the doctors, and also between the hypothetical patient population which the system was designed to serve and the actual population encountered in the clinic. Thus in its trial setting the computer did not improve on the doctors' diagnostic performances.

It was found that patients who had experienced the computer had a stress level after the consultation which had not been reduced as much as the stress of non-computer patients. However, computer patients tended to have more favourable attitudes towards the idea of doctors using computers than non-computer patients. Answering the question "Can patients be happy with a computer-using doctor?", Cruickshank concluded:

" the answer may be dependent on the skill of the doctor in question, particularly the skill with which the doctor puts the patient at ease, inspires confidence, and generally relieves pre consultation stress and minimizes the chance of post consultation stress ... Use of the computer need not result in less satisfied patients." (Cruickshank, 1984, p.46).

Overall the findings were promising for the future development of consulting room computing, in that the main determinant of the system's success was the design of the system itself, rather than its less tangible effects on the consultation process or on patients' reactions.

(c) The Pringle et al. Study

Pringle et al. (1984a,1984b,1985a,1985b) conducted a systematic study of the consulting room use of a computer by GPs during routine surgeries, focusing on both the clinical and psychological, or interpersonal, effects of use. The computer was designed to perform a very specific function and one to which computers are ideally suited, i.e. to present the doctor with prompts to carry out opportunistic preventive procedures during consultations. As in the First Aid study, research data were provided by video recordings of consultations and patient questionnaires.

When a comparison was made between computer and non-computer consultations it was found that there was a sixfold increase in the number of preventive procedures to be discussed, including: a threefold increase in discussion about cervical smears; a 34-fold increase in discussion of tetanus status; and twice as many blood pressures were measured (Pringle et. al., 1985a). It seems likely that the remarkable clinical successes of this system are due to its very focused application (cf. Fitter et al. 1986).

In a questionnaire survey of 350 patients Pringle et al. (1984a) found that while only 17 per cent of patients had negative attitudes towards medical computers, nearly a third expressed anxiety concerning confidentiality. However, as none of these patients had actually experienced computer use, it seems likely that, as was the case with Cruickshank's sample, anxieties would have decreased wih actual experience. Pringle et. al. (1984b,1985a) also used a mood adjective checklist to measure patient stress and arousal before and after consultations, some of which were in normal surgeries, and some of which had two doctors present (trainer and trainee), or a video camera or computer in use. It was found that, while the presence of a second doctor adversely affected stress and arousal, a computer or a video camera did not. Again this finding is encouraging for the development of consulting room computer systems, but also suggests that research may be needed into the effects of trainees on patients' psychological reactions!

A potentially serious problem with computer use was also identified, however. A "topic analysis" of the video recorded consultations showed that, because the computer was being used as a preventive medicine reminder system, there was an increase in doctor-initiated medical topics at the expense of socializing and patient-initiated medical topics. A similar "focusing effect" was also evidenced as a result of the use of the First Aid system (Brownbridge et. al. 1984). It seems that this possibility must be an important consideration in the implementation of any "prompting" computer system.

3.6 The IBM Sheffield Primary Care Computer Project

The IBM Sheffield Primary Care Computer System (SPCS) is described here in some detail, as it is the consulting room use of this system which is the main subject of the present thesis.

(a) The Project and the Computer System

SPCS was the product of a collaborative project between the IBM (UK) Scientific Centre at Winchester and the Department of Community Medicine at Sheffield University Medical School. The system was experimental in nature and comprehensive in concept allowing for both administrative (office-based) and consulting room use. Amongst the project's objectives were:

- (i) to gain an understanding of the requirements for a general practice information system;
- (ii) to evaluate the effect of the computer on administrative work patterns;
- (iii) to evaluate the effects of the computer on the consultation;
- (iv) to determine factors effecting usability and acceptability and attitudes to use of the computer;

(v) to survey the epidemiology of certain chronic diseases;

(vi) to evaluate the effects of minimal acceptable care protocols in the management of those chronic diseases; and

(vii) to evaluate the role of the computer in medical record keeping (Denner and Kaye, 1981).

The project was for a fixed term of three years involving two Sheffield practices. One was in a substantialy middle class area serving a population of 8500 patients and had four partners, two of whom were part-time. The other practice had 6 full-time partners, served a mainly working class population of 20000 patients, and operated from two sites approximately two miles apart. The system itself ran on a mainframe computer situated in the IBM (UK) Scientific Centre at Winchester. Access to the system was made through terminals in the practices, connected to the mainframe by private telephone lines leased from British Telecom. This configuration was particularly suited to the experimental nature of the project, allowing for remote manipulation, ease of installation and the development and installation of modifications. Similar systems could now be run on microcomputers within the practice.

Based upon the apparent functional divisions within the practice SPCS was designed to provide facilities in four main areas:

(i) Management facilities related to the general management of the practice, for example, maintenance of an age/sex register; production of practice statistics such as morbidity; the control of financial claims information.

(ii) Reception facilities associated with the servicing of patient requests, e.g. repeat prescriptions, home visits.

(iii) Doctor facilities which enable the doctor to review appointments in the current surgery; review and update patients records - summary of medical history, encounter notes, medication; and follow a management protocol for hypertension.

(iv) Utilities to enable a wide range of questions to be asked of the data stored in the whole system.

The doctor facilities were available to doctors through terminals on their consulting room desks. The "Details Screen", which summarized the patients significant medical history, and the "Treatment Screen", which allowed the doctor to enter notes on the current encounter, are illustrated in figures 2 and 3. The main screen of the hypertension protocol, which was intended to enhance the standard of care provided for patients with chronic hypertension, is illustrated in figure 4.

The "human factors" evaluation of SPCS was undertaken by a team of researchers from the MRC/ESRC Social and Applied Psychology Unit. The evaluation was concerned both with the administrative use of the system (Fitter et. al., 1984; Garber et. al., 1984; Fitter et. al., 1985) and with the acceptability of use during consultations to doctors and patients (Herzmark et. al., 1984; Brownbridge et. al.,1985; Evans and Brownbridge 1985). The evaluation of the consulting room use of SPCS is reviewed below.

"DETAILS SCREEN"

- PATIENT IDENTIFICATION

- MEDICAL SUMMARY - SIGNIFICANT PAST MEDICAL HISTORY
  - ALLERGIES

  (IN ORDER OF DATE OR PRIORITY)

- REFERRALS, RECALL, TESTS - HIGHLIGHTS PREVIOUS ATTENDANCE PLANS
  - IF REPEAT PRESCRIPTIONS NOT ISSUED REQUIRES UPDATING

- ENCOUNTER NOTES - SUMMARY OF ALL ENCOUNTERS IN REVERSE CHRONOLOGICAL ORDER

Figure 2: Patient information displayed by the "Details Screen"

"TREATMENT SCREEN"

- PATIENT IDENTIFICATION

- SYMPTOM - (MAY BE COMPLETED BY RECEPTIONIST AT TIME OF BOOKING APPOINTMENT)

- ENCOUNTER NOTES - FOR FREE TEXT ENTRY
  - ANY ORDER OR CONFIGURATION ACCORDING TO DOCTOR

- DIAGNOSIS - FREE TEXT FIELD PLUS SIX CHARACTER PORTION FOR RCGP CODE
  - FACILITY FOR INDICATING NEW MORBIDITY
  - FACILITY FOR INDICATING SIGNIFICANT DIAGNOSIS, FOR SUBSEQUENT INCLUSION IN MEDICAL SUMMARY OF DETAILS SCREEN

- CURRENT MEDICATION - FOR INDICATING PRESENT MAINTENANCE MEDICATION
  - AUTHORIZING CONTROL AND ISSUE OF REPEAT PRESCRIPTIONS
  - TWO FREE TEXT "NEW MEDICATION" LINES FOR ACUTE MEDICATION OR ENTERING NEW REPEATABLE ITEMS

- REFERRAL, RECALLS, TESTS - INDICATING MANAGEMENT PLAN HIGHLIGHTED ON PRECEEDING DETAILS SCREEN

- CLAIM - REGISTERING CLAIMS FOR THE FPC
  - TAKES DOCTOR INTO ANOTHER SCREEN

Figure 3: The fields of the "Treatment Screen" and the types of entries accepted by each

NEW EVENTS

What new events have occured since the last appointment?

- Myocardial Infarcation .... (y or n)
- Angina/chest pains .... (y or n)
- Intermittent Claudication .... (y or n)
- Cerebral Ischaemia (specify type) .... (p or t or n)
- Vertigo .... (y or n)
- Gout .... (y or n)
- Other (specify) .... (y or n)

PHYSICAL EXAMINATIONS

Weigh patient .... (Kg)

Examine Urine:
- Is albumin present? .... (y or n)
- Is glucose present? .... (y or n)

Take Blood Pressure:
Systolic ....
Dyastolic ....

Take Pulse .... (per min)
- Is rhythm abnormal? .... (y or n)

Are there any Basal Crepitations present? .... (y or n)

Is the heart clinically enlarged? .... (y or n)

Specify degree of Ankle Oedema .... (c or m or nor)

Examine Peripheral Pulses ....(left).............. (a or r or nor)
.........(right)............. (a or r or nor)

Are Fundi abnormal? .... (y or n)
- If yes are there any Vessel Changes? .... (y or n)
Haemorrhages? .... (y or n)
Papilloedema? .... (y or n)
Microaneurysms? .... (y or n)

y = yes; n = no; p = persistent; t = transient; c = considerable;
m = moderate; a = absent; r = reduced; nor = normal

Figure 4: The Principle Prompts of the SPCS Hypertension Protocol

(b) Evaluation of the Consulting Room Use of SPCS

Methods

Consulting room terminals were installed at the smaller of the two participating practices and at one site only of the larger "split site" practice, the other site thus provided a control. The evaluation investigated the extent to which the doctor facilities were used, the ways in which computer use was incorporated into the consultation, the acceptability of consulting room use to doctors and patients, and the success of the system in providing a more effective patient record. Four different research techniques were used: structured interviews with the participating doctors, video recordings of consultations, patient questionnaires, and a log of computer use kept by the system itself.

The structured interviews were used to elicit doctors' prior expectations of, and subsequent reactions to, consultation computer use. All participating doctors were interviewed on three occasions: before the consulting room terminals were installed; after three months of consulting room use; and at the end of the project.

The video recordings enabled an investigation of how computer use was incorporated and how it affected the consultation process. Video recordings were made (with the informed consent of all the doctors and patients concerned) of consultations with and without computer use. Non-computer consultations were recorded at all sites before installation and at the control site after installation. Over 800 consultations were recorded in all.

Questionnaires were completed by all patients whose consultation had been video recorded, and by a further sample of over 250 patients. These were used to determine the effects of computer use on patients' psychological reactions to their consultations. Indices included in the questionnaire were designed to tap patients' satisfaction with their relationship with the doctor, their satisfaction with the information provided by the doctor, their confidence in the efficacy of the treatment received, their intention to follow the doctor's advice and their level of anxiety after the consultation. An additional questionnaire scale assessed patients' attitudes to the idea of doctors using computers. A range of background data was also recorded, covering the patient's age and sex, the number of years the patient had been registered with the practice, their frequency of attendance, and whether the consultation was with the patient's own doctor.

The main characteristics of the video and questionnaire data base are summarized in table 1. Preliminary analyses of the data showed: (i) no differences across groups in patient background variables - thus confirming no systematic sampling bias; (ii) no differences between "video" and "non-video" conditions on questionnaire response - suggesting this data collection method had no distorting effect on patient reactions (Herzmark 1985); and, (iii) the existence of differences in patients reactions to different doctors, and in relation to the age and sex of patients - showing that the questionnaire measures were sensitive enough to show expected effects.

The log of computer use was used to investigate the extent to which the doctor facilities were used and for what purposes, thus enabling an evaluation of the effectiveness of the computerized patient records.

	Pre-computer installation	Post computer installation	
	No computer use	No computer use	Computer use
Video and questionnaire data	441	220	188
Questionnaire data alone	267	-	-

Table 1: Number of consultations represented in the project data bank

Findings

Computer use seemed to be quite acceptable to patients. Patients' mean responses on all of the questionnaire measures were unaffected by the introduction of computer use, although they were dependent on doctor seen. There was indication of a need for caution, however. When a distinction was made between patients with favourable or unfavourable attitudes to doctors using computers, it was found that those with unfavourable attitudes indicated higher post-consultation stress when the computer was used (Brownbridge et. al., 1985). It was concluded, in line with Cruickshank (1984), that use of a computer during consultations need not result in less satisfied patients. Difficulties may arise with particular patients or with particular styles of use, and the long term effects remain a subject for further enquiry. In the short term, however, it seemed that the acceptability of consulting room computers to doctors would be a more important factor in determining their success.

In contrast to the patients' reports, the doctors said that the computer had been a stress factor in the consultation. This was due mainly to its novelty, the time it took within the already tight time limits imposed on the consultation, and its obtrusiveness. Although it was not regarded as generally worse than other potential stress factors, such as starting late, being interupted, or having to deal with a particularly "difficult" patient, the stress experienced probably accounted for the fact (revealed by the computer log) that none of the doctors used the computer as extensively as they might have. Although during some months certain doctors used it in most of their consultations, no doctors consistently used it in all consultations during the time it was available, and some doctors never used it in more than 50 per cent of their consultations.

Differences between doctors in their uptake of computer use were also reflected in differences in their opinions of the system and in their general approaches to the consultation. One group of doctors described their own consulting styles as "non-directive" or "co-operative", these were the ones who had used the computer the least. They were also the least enthusiastic about computer use, feeling that it could be detrimental to their relationship and communication with patients. The other doctors described their consulting styles as "directive". They used the computer in many more consultations and, although they had also found the experience stressful, they they did not think it was a threat to the doctor-patient relationship. In fact they thought that the computer could be a useful tool in managing the flow of the consultation.

Examination of the video-recordings of consultations confirmed that computer use did impose significant extra time pressure. In computer consultations, on average almost twice as much time was spent using the computer as had previously been spent using manual records. In addition, total record keeping time was further increased in computer consultations as, for a number of reasons, all the doctors continued to maintain their manual patient records. It seems likely that whenever computerized patient records systems are introduced there will be a need for a transitional period when parallel systems are maintained.

The video-recordings revealed two different strategies used by doctors to cope with the increased need for attention to records in computer consultations. Either they tended to increase the overall length of their consultation, or they spent less time attending to the patient. Of course neither of these strategies could be deemed satisfactory and so the doctors' reported stress is to be expected (Herzmark et al. 1984).

Computer use was also unpopular with doctors as they could perceive few benefits from its use, certainly none which were enough to compensate their efforts in adapting to the system. Although all the doctors thought that the hypertension protocol was a "good thing", they could see little benefit deriving from the computerization of medical histories and encounter notes. This was to a large part due to the lack of structure and standardization employed by doctors in their computer entries (evidenced by the computer log). This rendered the computerized patient information of little benefit over that previously recorded in the manual patient records. It could not practically be used in, for example, audit or preventive medicine (Evans and Brownbridge 1985). The difficulties doctors experienced in using the computer in consultation, and also the system's poor reliability, also meant that the computerized clinical information could not be relied on during the consultation itself.

3.7 Summary and Conclusions

The use of computers in general practice offers considerable potential for increasing the effectiveness of primary health care services. To date however the progress of computerization has been slow and the realization of potential benefits limited. Research has suggested a number of initiatives which would guide future developments and enable more of the potential to be realized. Computer systems which may be accessed by doctors in consultation have been identified as an area of systems development deserving particular attention.

This chapter has outlined the potential benefits of computer systems designed for consulting room use, but has also identified a number of obstacles to such development. The major inhibiting factors are both "technical" - i.e. the design of systems which may be practically and effectively used within the constraints of the medical consultation - and "human" - e.g. the effects of computer use on patients' reactions to the consultation and on doctor-patient communication.

The few studies of consulting room computer use which appear in the research literature have been reviewed. These confirm that to date inadequacies of system design have been mainly responsible for holding back such innovations. Only one of the systems reviewed, which was a very focused (and less technically complex) application, has been shown to improve standards of care (Pringle et al., 1985a). However, information technology is rapidly gaining ground. Furthermore, many systems designers now have an increased understanding of general medical practice and many GPs are now more oriented towards information management and prevention and aware of the potential benefits of consulting room computer use. Technological deficiencies will not forever obstruct the development of consulting room computing. A number of systems designed for consulting room use are now commercialy available. As yet they are unproven but certainly they deserve evaluation.

With regard to the "human factors", research to date suggests that patients' reactions to consulting room computers will not be an obstacle to their future development. However, the question of the effects of computer use on doctor-patient communication has still not been adequately addressed. Similarly there has been little investigation of the effects of computer use during consultations on the doctor's delivery of care. Although consulting room systems may be intended to improve clinical standards, they could actually impair the delivery of care by distracting the doctor from his or her primary clinical task, which during the consultation must involve interaction with the patient. These issues need to be addressed if there is to be any widespread acceptance of computer use in general practice consultations.

The video recordings of non-computer and computer consultations with associated patient questionnaires, collected during the IBM project, offer a very useful databank for the exploration of these issues. They were used to this end in the research described in the remainder of this thesis. Chapters 5 to 8 describe studies which aimed to determine the effects of doctors' use of SPCS during consultations on doctor-patient communication and the delivery of care. Before these studies could be undertaken however it was necessary to select, and/or develop, suitable techniques for the measurement of doctor-patient communication. The next chapter (Chapter 4) therefore describes a study which used the "IBM databank" to compare five different techniques for the measurement of doctor-patient communication.

CHAPTER FOUR: DEVELOPMENT OF A SYSTEM FOR THE MEASUREMENT OF DOCTOR-PATIENT COMMUNICATION

In the previous chapter it was concluded that there is a need for research into the effects of doctors' computer use during consultations on doctor-patient commmunication, and that the databank of video recordings of non-computer and computer consultations from the IBM project could be used to this end.

Before such research could be conducted, however, it was necessary to select, and/or develop, suitable techniques for the measurement of doctor-patient communication. Measurement techniques were needed which would cover, as fully as possible, all the wide ranging aspects of doctor-patient communication. The review of the literature on doctor-patient communication, which was provided in Chapter two, showed that many different aspects of doctor-patient communication could affect important consultation outcomes. Thus the measurement techniques used in the present research need to assess: both verbal and non-verbal communication; doctors' consulting styles; patient involvement in the consultation; and, affective as well as task-oriented, and qualitative as well as quantitative, aspects of communication. The measurement techniques also need to be sensitive to differences in input to the consultation.

Previous research has shown that doctor-patient communication is affected by characteristics of the participants (see Chapter 2). If the measurement techniques used in the present research are not sensitive to the characteristics of different doctors and patients, then it is likely that they might also be insensitive to differences in communication brought about by the introduction of computer use. Furthermore the measurement techniques need to be demonstrably reliable and, last but not least, they need to be reasonably quick and easy to apply.

Many different techniques for the measurement of doctor-patient communication have been proposed. However, perhaps unsurprisingly, there is no single measurement system available which meets all of the needs specified above. As none of these criteria could reasonably be dropped, it was felt that considerable time and effort was warranted in developing and validating a suitable measurement system. A study was therefore conducted which aimed to develop a comprehensive system for the measurement of doctor-patient communication, i.e. one which would assess all of the aspects of doctor-patient communication which are of known importance. The study also aimed to demonstrate that the system developed was both sensitive to differences in input to the consultation and able to predict patients' subsequent reactions to it. Furthermore, the system was to be demonstrably reliable (i.e. in terms of inter-rater agreement) and practical (i.e. not too time consuming or difficult to apply.) This study is described in the present chapter.

As will be appreciated as the thesis progresses, the study described here required as much time and effort as any of the studies described in the subsequent chapters. Thus the aim of the present study must be seen as a major, though secondary, goal of the thesis as a whole. It is hoped that the measurement system developed will be of value to future researchers of the medical consultation and that the methods used in its development will also be of interest.

4.1 Method

In view of the great number of different techniques which have already been developed and proposed for the measurement of doctor-patient communication, it was deemed unecessary to develop the new measuement system from first principles. The approach taken was to compare a number of existing measurement tecniques, together with some new measures designed to provide broader coverage, and to select a parsimonious but comprehensive subset of measures for the investigation of computer use effects. It was expected therefore that the "new" system would be a "hybrid", consisting of the most useful components of existing measurement systems, supplemented with some new measures which would ensure the breadth of coverage required.

Thus three previously existing measurement techniques and two newly developed ones were originally included in the study. The comparison and validation of the different measures under consideration was acheived by applying all of the measures to a sample of video-recorded consultations from the IBM data bank (the validation sample). This enabled comparisons of ease of application, of reliability (through tests of inter-rater agreement), and of sensitivity and predictive ability. Sensitivity of the measures was assessed by seeing how they were affected by differences between doctors and between patients. Information on patient characteristics was obtained through a prior classification of patients' presenting symptoms by a trained research nurse and from the patient questionnaire associated with each of the video recordings. The patient questionnaire also provided information on consultation outcomes (patient's reactions), which were used to assess the predictive ability of the measures. The methods used for these comparisons will be more fully described in due course. First, however, it is necessary to describe how measures were chosen for inclusion in the study.

In research of doctor-patient communication to date, the most commonly used type of measurement system has been that designed for the classification of verbal behaviours. Systems of this type include: Bales Interaction Process Analysis (Bales, 1950), used for example by Freemon et al. (1971) and by Stewart (1984); Byrne and Long's classification of doctors' verbal behaviours (Byrne and Long, 1976); Stiles' Taxonomy of Verbal Response Modes (e.g. Stiles et al. 1979a, 1979b); and Bain's (1976) system for the classification of doctor-patient communication. Although some of these systems were designed specifically for assessments of doctor-patient communication (e.g. Bain, Byrne and Long) and some are designed for assessments of any kind of interaction (e.g. Bales, Stiles), with respect to general practice applications they may all be regarded as general purpose verbal classification systems. This is because they are largely content free, being concerned with types of utterance rather than subjects of discussion, and are thus equally applicable to all types of general practice consultation (i.e. regardless of presenting symptoms). They also cover the full range of verbal communication, rather than being concerned with particular communication issues. The verbal classification techniques all provide quantitative assessments of communications, i.e. they provide information on the "quantity" of different types of communicative acts. They cannot however provide qualitative information, e.g. they may provide the frequency of a doctor's explanations but they cannot inform on the quality of the explanations.

It was felt that the measurement system used for the assessments of computer use effects in the present project must include a technique of this kind. A general purpose verbal classification system was needed which could provide quantitative information on the full range of verbal communications in all types of general practice consultation. The present study compared three such (previously proposed) measurement systems, inorder to select the best system, according to the criteria applied, or to select the best components of each. These were Bales' Interaction Process Analysis (IPA), Byrne and Long's Classification of doctors' verbal behaviours, and Stiles' Taxonomy of Verbal Response Modes. These three systems, and the reasons for their initial inclusion, will be fully described below.

It was not intended, however, to limit the selected measurement system to one which could inform on quantitative aspects of verbal communication only. Measures were also needed which could inform on non-verbal communication and behaviours, as were evaluative techniques which could assess qualitative aspects of the interaction. The existing research literature includes numerous examples of measurement techniques of this type but none which were felt to be entirely suitable for inclusion in the present study. Previously proposed techniques for the measurement of non-verbal communication were felt to be either too complicated (e.g. Hall et al., 1981) or too specific (e.g. Larsen and Smith, 1981) (the two studies cited were reviewed in Chapter 2). Techniques for the assessment of qualitative aspects of the interaction were similarly felt to be too complicated (e.g. Barsky et al., 1980), too specific (e.g. Boreham and Gibson, 1978; Wallen et al., 1979 - see also Chapter 2), or required considerable time input from medically trained raters, which was not available to the present project (e.g. Maguire et al., 1978; Pendleton et al., 1984). Two new measurement techniques were therefore developed to meet these needs. These were an "Activity Analysis" and an Interaction Rating Scale. These two techniques are also described below.

<u>4.1(a) Description of the Measurement Techniques</u>

<u>(i) Bales Interaction Process Analysis (IPA)</u>

Bales developed his interaction process analysis as a systematic procedure for analyzing social interaction (Bales, 1950). At the time Bales was interested in social interaction in small groups and in the emergence of group leaders. His IPA was first used in a laboratory setting for the analysis of staged group problem solving discussions, by raters observing the interaction through a oneway mirror. Bales proposed, however, that the IPA could be used to analyse any kind of human interaction between any number of participants. In studying a particular interaction the IPA is used to keep a chronological record of the source and addressee of each expressive act and to assign each act to one of 12 categories. The 12 categories also subdivide according to the affective nature of the communication (see figure 5). Three categories cover communications of positive affect (e.g. shows solidarity), six categories cover task oriented, or socio-emotionally neutral, communications (e.g. gives opinion, asks for orientation), and three categories cover communications of negative affect (e.g. shows tension).

Although the IPA is used mainly to code verbal communications, some aspects of non-verbal communication are also accounted for. Gestures, expressions and non-verbal vocalizations may be coded as affective communications, and a tone of voice or facial expression may dictate that a particular utterance is coded as an affective rather than a task oriented communication.

Bales IPA is the technique which has been most widely used in research of doctor-patient communication. Several studies have used the system to demonstrate links between doctor-patient communication and subsequent consultation outcomes (e.g. Freemon et. al., 1971; Stewart, 1984 - see Chapter 2).

The technique was chosen for inclusion in the present study for two main reasons. First, because of its proven success in accounting for the outcomes of medical consultations. Secondly, as, of the various verbal classification systems available, it is the only one which focuses particularly on the socio-emotional aspects of communication and it is the only one which can also be used to code non-verbal behaviours.

Figure 5: Bales' IPA Categories

IPA CATEGORIES		SOCIO-EMOTIONAL AREA
1.	Shows solidarity, raises others' status, gives help, reward	Positive
2.	Shows tension release, jokes, laughs, shows satisfaction	Positive
3.	Agrees, shows passive acceptance, understands, concurs, complies	Positive
4.	Gives suggestion, direction, implying autonomy for other	Neutral
5.	Gives opinion, evaluation, analysis, expresses feeling, wish	Neutral
6.	Gives orientation, information, repetition confirmation	Neutral
7.	Asks for orientation, information, repetition, confirmation	Neutral
8.	Asks for opinion, evaluation, analysis, expression of feeling	Neutral
9.	Asks for suggestion, direction, possible ways of action	Neutral
10.	Disagrees, shows passive rejection, formality, withholds help	Negative
11.	Shows tension, asks for help, withdraws out of field	Negative
12.	Shows antagonism, deflates others' status defends or asserts self	Negative

(ii) Byrne and Long's classification of doctors' verbal behaviours

In their well known book "Doctors Talking to Patients" Byrne and Long (1976) propose a method of analysing doctors' verbal behaviours designed specifically for assessments of general practice consultations. Each "unit of meaning" in the doctor's speech is assigned to one of 50 coding categories, e.g. closed question, broad question, directing, suggesting, indicating understanding (figure 6). The method also includes the calculation of an overall score for the doctor's style during a particular consultation, based on the verbal behaviours used. Style is measured on a single dimension ranging from doctor-centred to patient-centred. Byrne and Long suggest that their system could be used by GPs to assess their own consulting styles with a view to developing more patient centred styles. They also suggest that it will be useful as a research instument.

Byrne and Long provide a cogent rationale for why a patient-centred style is preferable to a doctor-centred one, but their system has never been used to test their argument. In fact, as proposed, the system is under developed for use in research. The category definitions are rather vague and inexplicit, as are the derivations of weightings which are assigned to each of the categories to enable the calculation of style scores. Another obvious weakness of the method is that it ignores patient behaviour completely. However, the concept of a doctor vs. patient centred dimension of consulting style is a very interesting one, with a lot of face validity. Byrne and Long's assertions on this subject have recently received empirical support from the study by Stewart (1984), albeit using Bales IPA! (see Chapter 2). Furthermore this concept is particularly relevant to the concerns of the present thesis in view of the differences between self categorized "directive" and "non-directive" doctors in their views on the consulting room use of SPCS (Herzmark et al., 1984) - see Chapter 3. It was therefore decided to include the Byrne and Long method in the present study and to develop it (e.g. in terms of category definitions) as necessary.

Figure 6: Byrne and Longs categories for classifiying doctors verbal behaviours (continued on next page).

Doctor Centred Behaviour

offering self
relating to some previous experience
direct question
closed question
self answering question (rhetorical)
placing events in time or sequence or place
correlational question
clarifying
doubting
chastising
justifying other agencies
criticising other agencies
challenging
summarizing to close off
repeating what patient said for affirmation
suggesting
apologising
miscallaeneous professional noises
directing
suggesting or accepting collaboration
advising
giving information or opinion
terminating (direct)

Figure 6 (continued)

Patient Centred Behaviours

giving or seeking recognition
offering observation
broad question
concealed question
encouraging
reflecting
exploring
answering patient question
accepting patient ideas
using patient ideas
offering of feeling
accepting feeling
using silence
summarising to open up
seeking patient ideas
reassuring
indicating understanding
pre-directional probing
terminating (indirect)

Negative Behaviours

rejecting patient offers
reinforcing self position (justifying self)
denying patient
refusing patient ideas
evading patient questions
refusing to respond to feeling
not listening
confused noise

(iii) Stiles' (1978a) Taxonomy of Verbal Response Modes

This system is similar to that proposed by Bales in that it is a general purpose system for coding discourse between a speaker and an other. However, the principles used in applying and interpreting codes are quite different. Each utterance by either interactant is coded on both its grammatical form and its interpersonal intent. Eight different coding categories, or Verbal Response Modes (VRMs), are used for coding both form and intent, e.g. Question, Disclosure, Advisement, Reflection (figure 7). The distinction between form and intent avoids coding difficulties which might otherwise arise with "mixed mode" utterances such as "Will you have a look at this doctor?", which has question form but advisement intent. As each utterance may have any form/intent combination, 64 possible coding categories result (8 times 8). In practice, however, the interpretation of VRMs is simplified, in a number of ways, as: (1) Usually only 10-15 different VRM categories are used with any significant frequency in a particular type of interaction. (2) Different VRM categories may be combined to provide measures of a smaller number of different types of "verbal exchange" (Stiles et. al., 1979a). (3) Alternatively, different VRM categories may be combined to provide measures on a smaller number of "dimensions of interpersonal roles" (Stiles, 1978b; Stiles et. al. 1979b).

The Stiles system has been used mostly for the analysis of psychotherapy interviews and medical consultations and has had some success in predicting outcomes (e.g. Stiles et. al., 1979a - see also Chapter 2). It was included in the present study on the basis of this success, because of its versatility (see above), and also because of expectations that it might be more reliable than the other verbal classification systems under investigation. The coding rules of Stiles' Taxonomy are the most explicitly defined and logically based.

Figure 7: Stiles' Taxonomy of Verbal Response Modes

MODE	GRAMMATICAL FORM	INTERPERSONAL INTENT
DISCLOSURE (D)	Declarative, first person singular ("I") or first person plural ("we") where other is not a referent	Reveals thoughts, feelings, perceptions, intentions
EDIFICATION (E)	Declarative, third person (e.g. "he", "she", "it")	States objective information
ADVISEMENT (A)	Imperative, second person "you", verb of permission, prohibition or obligation	Attempts to guide behaviour; suggestions, comments, permission, prohibition
CONFIRMATION (C)	First person plural ("we") where referent includes other	Compares speaker's experience with other's, agreement, disagreement, shared experience or belief
QUESTION (Q)	Interrogative, with inverted subject verb order or interrogative words	Requests information or guidance
ACKNOWLEDGEMENT (K)	Nonlexical or contentless utterances; terms of address or salutation	Conveys receipt of, or receptiveness to, others' communication; simple acceptance, salutations
INTERPRETATION (I)	Second person ("you"); verb implies an attribute or ability of the other; terms of evaluation	Explains or labels other; judgements or evaluations of other's experience or behaviour
REFLECTION (R)	Second person; verb implies internal experience or volitional action	Puts others' experience into words; repetitions, restatements, clarifications

(iv) Conventions used in the application of the above measures

In the application of any verbal classification system to medical consultations two important considerations are the rules employed in the "unitization" of speech and the possible "segmentation" of the consultation. The three systems included here (as described above) originally resolved these issues in different ways. To enable direct comparisons of the systems in the present study it was essential that the same conventions with respect to unitization and segmentation be used in the application of all systems. Thus, Stiles (1978a) definition of the "Utterance" was used, since this was the most cogent of the three definitions available, and Byrne and Longs' (1976) method of dividing consultations into "Diagnostic" and "Prescriptive" phases was chosen as the simplest approach to segmentation.

Appendix A is a transcript of one of the study consultations which has been segemented and unitized according to the methods of the study and coded according to the three different verbal classification systems.

(v) The Activity Analysis

The Activity Analysis was especially developed for use in the present research, as a means of assessing important non-verbal aspects of the doctor-patient interaction. The development of the technique was informed by the earlier work of Brownbridge et al. (1984) and of Herzmark et al. (1984). The Activity analysis measures the duration of the consultation and of its constituent (diagnostic and prescriptive) phases and of a mutually exclusive set of types of activity within each phase. The activity types are defined according to the focus of the doctor's attention, as follows:

(a) Doctor's attention exclusive to the patient;
(b) Doctor's attention shared between paper records and patient;
(c) Doctor's attention shared between computer and patient;
(d) Doctor's attention exclusive to paper records;
(e) Doctor's attention exclusive to computer;
(f) Interruption (e.g. telephone, receptionist).

Thus the analysis will also provide important information on how, and to what extent, the computer is used, and on how computer use effects the dynamics of the consultation at a macro level.

<u>(vi) The Interaction Rating Scale</u>

An evaluative interaction rating scale was designed to enable ratings of the doctor's interpersonal manner and of the quality of the doctor's information provision during the consultation. These aspects of doctor-patient communication are of demonstrated importance. The rating scale differs from the other measures included in the study in that it provides information on the overall climate of the consultation, rather than on the minutiae of the interaction, and also as it provides qualitative rather than quantitative information. Furthermore it may also take account of non-verbal as well as verbal aspects of communication. It was hoped, therefore, that by thus broadening the coverage of the investigations, the scale would usefully supplement the other measures included in the study.

Application of the scale requires 10 dimensions of the consultation to be rated on seven-point semantic differential type scales, see figure 8. It was decided to develop this new rating scale as those previously proposed in the research literature, usually for training purposes, tend to assume knowledge of interviewing skills on the part of the rater. All the systems included in the present study were to be applied by raters especially employed and trained for this purpose - clinical or interviewing skills were not required. Thus the rating scale needed to contain only dimensions which such raters could be expected to rate. In rating the doctors information provision raters were required to "put themselves in the place of the patient" and decide on the comprehensiveness and clarity of the information.

Figure 8: Items of the Interaction Rating Scale

Rate the doctor's Manner:

unsympathetic/sympathetic
unfriendly/friendly
solemn/cheerful
disorganized/organized
unattentive/attentive
authoritative/collaborative

Rate the doctor's information giving:

not enough/enough
unclear/clear

Rate the interaction on:

tension (none/a lot)
empathy (none/a lot)

4.1(b) Application of the Measures

Three raters were employed to apply the five measurement techniques to samples of video recorded consultations from the project databank. Each rater learned to apply three different techniques so all the techniques could be covered and agreement could be checked between at least two raters, independently applying the same measures to the same consultations. The raters learned the techniques by applying them initially to a pilot sample of consultations. Discussions between the author and the raters, and between the raters themselves, involving comparison of coded consultations, helped to resolve areas of ambiguity. These refinements were written into the coding rules.

Codes for the three verbal behaviour classification techniques were originally applied to typed verbatim transcripts of the consultation, while the consultation was being viewed on video. It was found, however, that with practice transcripts were not necessary to the application of any of these measures and their use was later discontinued. Codes were recorded onto paper forms from which they were subsequently transfered to the University of Sheffield's mainframe computer for statistical analysis. Activity analysis variables were measured using push-button electronic timers. Activity Analysis data was recorded onto paper forms, and the interaction ratings onto paper copies of the scale, for subsequent entry into the mainframe. A more efficient procedure in the application of all of the measures would have been to use a microcomputer or remote mainframe terminal for the first recording of the data, enabling direct electronic transfer of data to the mainframe. However, cost prohibited such a procedure in this study. The original use of transcripts in the application of the verbal behaviour classifications also enabled direct comparisons of consultations coded independently by different raters. This was invaluable to initial training and to later assessments of inter-rater agreement.

Prior to the selection of a sample of video-recorded consultations, for the validation and comparison of the different measurement techniques, all the consultations in the project databank were classified on presenting problems from the video-recordings. This enabled a representative sample to be selected. The classification was done by a trained research nurse with supervision from a general practitioner, using the classification system proposed by Raines (1980), see Appendix B. The classifcation was also useful in studies which are to be described later in this thesis.

A sample of 90 video-recorded consultations was then selected (the validation sample). This included consultations by 10 different GPs and approximately equal numbers of consultations with and without computer use. A wide range of different presenting problems was covered, to represent the GPs normal workload.

All five measurement techniques were then applied to the validation sample. The Interaction Rating Scale was applied independently by the three different raters. This enabled a particularly rigorous check of inter-rater agreement on this, the most subjective of the five techniques. The other four techniques were applied to the whole sample by one rater only. However, subsamples were also rated by a second rater, independently, to enable checks of inter-rater agreement.

The analysis of data from the three verbal behaviour classification techniques was simplified by considering only those variables which accounted for 3% or more of either interactants utterances in either consultation phase (together these common types of utterances typically accounted for over 80% of all utterances - see results section, below). Data from all five measurement techniques were subject to three types of investigation, i.e. of reliability, sensitivity and predictive abililty, and of equivalence of measures from the different systems. The results of these analyses were used to inform the selection of a reduced set of measures for the subsequent investigation of the effects of computer use on doctor-patient communication. The statistical techniques employed in each of these areas of investigation, together with the results obtained are described in the following section.

4.2 Analysis and Results

4.2(a) Reliability of the Measurement Techniques

(i) Bales IPA

Only 7 of the 12 Bales categories individually accounted for 3% or more of either interactants utterances in either consultation phase, collectively these categories accounted for over 95% of all utterances. Table 2 shows the mean number of utterances coded under each of these categories, expressed as a percentage of the total number of utterances, by one rater applying the system to the validation sample. The Bales IPA was also applied by a second rater to two sub-samples of the validation sample, sub-sample A (n=45) and sub-sample B (n=20), to enable two tests of inter-rater agreement. Reliability was assessed using Pearson's correlation coefficients, between the number of times each of the common categories were assigned to each consultation by each of the raters. The correlations obtained in the two tests of reliability are also shown in table 2.

It is of course possible (though unlikely) that the Pearson's correlations being considered could be high, even though raters were not agreeing on the classification of many individual utterances. The raters might tend to use a particular category with the same frequency, while tending not to use it for the same utterances. This possibility was guarded against by a second method of reliability assessment. Thirty consultations from sub-sample A, which had been coded on transcripts by both raters, were compared utterance by utterance to enable the calculation of percentage agreements.That is, for each consultation, the percentage of the total number of utterances which were assigned to the same category by both raters.

The correlations obtained in the first check of inter-rater agreement (sub-sample A) were generally satisfactory and the check of percentage agreements, utterance by utterance, gave no further cause for concern. Over 30 consultations percentage agreements ranged from 58% to 90%, mean 82%. This level of agreement had not been particularly easy to obtain, however, as Bales' original category definitions allowed for several differences in interpretation. Some extra "working rules", had had to be agreed between the coders. Even so the first check of inter-rater agreement revealed that there were still some slight differences of interpretation, especially of the "shows solidarity", "shows tension release" and "gives opinion" categories: "shows solidarity" could easily be confused with "asks for orientation", for example with utterances such as "And how's your wife?"; "shows tension release" seemed to vary with the vigilance of the rater to non-verbal displays of tension release (e.g. laughter); and "gives opinion" could easily be confused with "gives orientation". After the first check of inter-rater agreement further attention was given to category definitions and the first rater's codes were corrected where necessary. The second check of inter-rater agreement showed that on the whole this had improved, although the improvement in agreement on "shows solidarity" seemed to be at the expense of agreement on "asks for orientation".

BALES CATEGORIES	MEAN PERCENTAGE OF UTTERANCES validation sample (n=90)				INTER RATER AGREEMENT	
					sub-sample A (n=45)	sub-sample B (n=20)
	Diag.phase		Presc.phase			
	Dr.	Pat.	Dr.	Pat.		
Shows Solid.	7.6	3.3	11.2	15.7	0.58	0.79
Shows Ten.Rel.	3.6	3.5	1.6	2.8	0.26	0.74
Agrees	10.5	10.5	7.0	24.5	0.97	0.85
Gives Suggest.	9.3	0.5	19.7	1.7	0.92	0.81
Gives Opinion	4.7	8.5	4.9	2.9	0.58	0.61
Gives Orient.	34.7	62.8	37.6	39.3	0.91	0.95
Asks for Orie.	26.0	6.7	16.5	8.3	0.89	0.28
Total	96.4	95.8	98.5	95.2		

Table 2: Bales IPA categories which accounted for 3% or more of utterances by either speaker in either consultation phase, mean percentage of utterances assigned to each category by one rater applying the analysis to the validation sample and Pearson's correlation coeficients between the codes of two raters independently applying the analysis to two sub-samples.

(ii) The Byrne and Long classification of doctors' verbal behaviours

Only 7 of Byrne and Longs' 50 categories of doctors' verbal behaviours individually accounted for 3% or more of doctors' utterances in either consultation phase. In addition an extra category "seeking acknowledgement", which had been added through necessity by the present researcher, also accounted for a large proportion of doctors' utterances (see table 3). Collectively these 8 categories accounted for 77% of all doctors' utterances.

The reliability of the Byrne and Long method was assessed in exactly the same way as was Bales (IPA), see above. Table 3 also shows the correlations obtained between the codes assigned by two independent raters in two checks of inter-rater agreement. Again correlations were generally satisfactory on the first check (sub-sample A) and agreement was confirmed by an utterance by utterance comparison of coded transcripts. Across 40 consultations percentage agreement ranged from 62% to 98%, mean 85%. As with the Bales system, however, many extra rules had had to be agreed to enable this level of agreement. Furthermore, agreement on a number of categories had decreased at the second assessment.

BYRNE AND LONG CATEGORIES	MEAN PERCENTAGE OF UTTERANCES validation sample (n=90) Diag. phase	Pres. phase	INTER RATER AGREEMENT sub-sample A (n=45)	sub-sample B (n=20)
Giving or seeking recognition	5.8	0.6	0.67	0.24
Direct question	17.3	6.0	0.89	0.76
Indicating understanding	12.0	5.3	0.81	0.69
Answering patient question	3.0	6.5	0.91	0.86
Giving information or opinion	25.2	31.8	0.84	0.91
Directing	9.4	11.1	0.83	0.87
Seeking acknowledgement	5.4	10.4	0.54	0.78
Termination (direct)	0.0	4.6	0.37	0.23
Total	78.1	76.3		

Table 3: Byrne and Long categories which individually accounted for 3% or more of doctors' utterances in either consulation phase, mean percentage of utterances assigned to each category by one rater applying the classification to the validation sample and Pearson's correlation coefficients between the codes of two raters independently applying the classification to two sub-samples.

(iii) Stiles' Taxonomy of Verbal Response Modes

Eleven of Stiles' 64 categories individually accounted for 3% or more of either interactants speech in either consultation phase (see table 4). Collectively these common categories accounted for 80% of all utterances. The methods of reliability assessment were as described for the Bales IPA, except that in assessing the Stiles Taxonomy sub-sample A (used for the first check of inter-rater agreement) included 33, rather than 45, consultations. Table 4 also shows the correlations obtained in two checks of inter-rater agreement. Most of the correlations were very high and consistent from the first to second check of agreement. High levels of agreement were confirmed by the utterance by utterance comparisons - 58% to 98%, mean 86%, over 32 consultations. Agreement was obtained with the Stiles taxonomy without recourse to any embellishment of the original coding rules. Stiles' original rules are comprehensive, logical and unequivocal - if initially seemingly rather complex, thus although considerable efforts were required by the raters to understand and learn the rules, once learned the system could be applied quickly and reliably.

STILES' VERBAL RESPONSE MODES		MEAN PERCENTAGE OF UTTERANCES validation sample (n=90)				INTER RATER AGREEMENT	
		Diag.phase		Presc.phase		sub-sample A (n=33)	sub-sample B (n=20)
Form	Intent	Dr.	Pat.	Dr.	Pat.		
D	D	5.4	15.3	6.9	16.1	0.97	0.84
D	E	4.0	12.0	3.9	6.9	0.88	0.95
Q	Q	17.3	3.0	12.5	5.3	0.92	0.92
E	E	17.3	15.0	17.6	8.3	0.92	0.78
E	D	0.6	9.6	0.6	2.9	0.90	0.45
K	K	14.0	11.7	7.6	15.1	0.88	0.95
K	D	0.4	4.3	0.4	2.0	0.69	0.56
K	E	1.2	7.0	2.5	6.5	0.34	0.72
K	C	0.9	3.6	0.8	8.3	0.85	0.43
A	A	10.1	0.8	17.8	5.2	0.93	0.82
I	K	5.0	0.8	6.6	5.1	0.28	0.84
Total		76.2	83.1	77.2	81.7		

KEY: D=Disclosure, Q=Question, E=Edification, K=acKnowledgement, A=Advisement, C=Confirmation, I=Interpretation.

Table 4: Stiles' categories which individually accounted for 3% or more of utterances by either speaker in either consultation phase, mean percentage of utterances assigned to each category by one rater applying the taxonomy to the validation sample and Pearson's correlation coefficients between the codes of two raters independently applying the taxonomy to two sub-samples.

(iv) Activity Analysis

Table 5 shows the mean durations of each of the activities measured by the Activity Analysis in the validation sample consultations. Only one check of inter-rater agreement on the Activty Analysis was performed (using Pearson's correlation coefficients), as the first check revealed very high inter-rater correlations (see table 5). This was perhaps to be expected as the interpretations required of the raters, of the activities they observed, were relatively simple.

ACTIVITY ANALYSIS MEASURES (focus of doctors' attention)	DIAGNOSTIC PHASE		PRESCRIPTIVE PHASE	
	mean durn. of activity (seconds, n=90)	agreement (n=30)	mean durn. of activity (seconds, n=90)	agreement (n=30)
exclusive to patient	107.8	0.79	49.4	0.90
exclusive to manual records	7.2	0.77	11.9	0.79
shared - manual records/patient	56.5	0.68	55.2	0.83
exclusive to computer	7.3 (n=35)	0.99	2.7 (n=35)	0.99
shared - computer/ patient	11.9 (n=35)	0.85	8.7 (n=35)	0.89
Interuptions	11.9	0.03	3.2	0.99
Duration of phase	202.6	0.94	131.1	0.89

Table 5: Mean durations of each of the activities measured by the Activity Analysis, according to one raters analyses of the validation sample, and Pearson's correlation coefficients between the durations obtained by two raters independently applying the analysis to a sub-sample.

(v) Interaction Rating Scale

The Interaction Rating Scale was independently applied by three raters to all the consultations in the validation sample. Seperate ratings of the diagnostic and prescriptive phases were obtained. Agreement between the three raters was assessed by calculating Kappa's coefficient of agreement (k), using Fleiss' procedure (Fleiss, 1971), for each scale item in each consultation phase. The coefficients obtained (and the probability that such agreement could have been obtained by chance) are presented in table 6. Table 6 also shows the mean ratings assigned to consultations in the validation sample.

Kappa's coefficient is a measure specifically of agreement between two raters assigning categorical scores. It can take into account any tendency of certain scores to be used more than others (which would otherwise bias reliability assessments in a positive direction). Fleiss' procedure for calculating k enables it to be used to assess agreement between more than two raters. Although perfect agreement between raters would result in a k of 1, relatively low values of k can also indicate good agreement, as the standard error of k must also be taken into account. The calculation of the probability that a given value of k could have been obtained by chance (as shown in table 6) takes into account the value of k and its standard error. To provide further context to the figures in table 6, it may be noted that, with respect to the same data, a k of 0.25 was equivalent to pairwise Pearson's correlations of about 0.7, while a k of 0.1 was equivalent to a pairwise Pearson's correlation of about 0.4.

On all but two items (ratings of tension in the prescriptive phase and of empathy in the diagnostic phase) agreement was significantly higher than that which would be expected by chance. The level of agreement obtained is therefore satisfactory but in view of the relatively low values of k it appears that agreement was not particularly high. It would seem therefore that if the scale were to be applied by one person only, the ratings obtained would not be very reliable, however if ratings by other persons are also obtained then the mean ratings may be reliable indicators of the consultation dimensions under scrutiny.

SCALE ITEM	MEAN RATINGS		RELIABILITY (KAPPA)	
	Diag. phase	pres. phase	Diag. phase	Pres. phase
Sympathetic	5.21	5.36	0.103 *	0.229 ***
Friendly	5.25	5.44	0.192 ***	0.268 ***
Cheerful	4.98	5.23	0.123 **	0.168 ***
Organized	5.62	5.68	0.151 **	0.128 **
Attentive	5.56	5.46	0.231 ***	0.138 **
Collaborative	4.35	3.99	0.038 ns	0.116 **
Info. - enough	4.93	5.47	0.104 **	0.137 ***
Info. - clear	5.03	5.58	0.097 **	0.098 **
Tension	1.63	1.55	0.104 *	0.089 ns
Empathy	4.49	4.87	0.028 ns	0.069 *

*** p<0.001
** p<0.01
* p<0.05
ns not significant

Table 6: Application of the Interaction Rating Scale to the validation sample by three raters independently, mean ratings, Kappa's coefficient of agreement between the three raters (k) and probabilities that agreement obtained could have been obtained by chance.

4.2(b) Sensitivity and Predictive ability

The sensitivity and predictive ability of the measurement techniques were assessed using a series of Stepwise Multiple Regression analyses. These investigated: first, the effects of differences in input to the consultation on the aspects of the consultation measured by each of the five techniques; and, second, the effects of differences on the dimensions measured on patients' subsequent reactions to the consultation. The different "inputs" considered were: doctor consulted; patient's presenting symptoms ; patient age; patient sex; number of years the patient had been registered with the practice; number of visits the patient had made in the past year; and, whether the consultation was with the patient's own doctor. Patients' presenting symptoms had been classified from the video-recordings using Raines (1980) procedure (see section 4.1(b), above). Information on the other input variables was available from the patient questionniare. The patient questionnaire also provided measures of the immediate consultation outcome of patient reaction. These were measures of patient's satisfaction with their relationship with the doctor, their satisfaction with the information provided by the doctor, their confidence in the efficacy of the treatment received, their level of anxiety after the consultation, and their intention to comply with the doctor's advice. Appendix C lists all the questionnaire items used.

In both the investigations of "input-process" and "process-outcome" relationships the effect of the computer's presence on the dependent variables was controlled for by the regression equation - such effects were to be the special subject of seperate studies which are described later in this thesis. In investgations of the verbal behaviour classification systems and of the Activity Analysis, the effect of controlling for the total number of utterances, or the total duration of the consultation (as appropiate), on the relationships revealed, was also examined. In the investigations of "process-outcome" relationships the effects of the "input variables" on the outcome measures were also controlled for by the regression equation.

These analyses showed the five different measurement tecniques were all very sensitive to differences in input to the consultation, and able to significantly explain variance in consultation outcomes over and above that explained by the differences in input. The results of the stepwise regressions used to identify these relationships are fully illustrated in Appendix D. All of the relationships revealed are not fully discussed here, however. Such a discussion would be very repetetive as there was evidence of a great deal of equivalence between the three verbal behaviour classification techniques, in terms of the the effects of differences in input on the aspects of communication measured, and in terms of the variance in consultation outcomes for which they accounted. Input-process-outcome relationships will be returned to and fully discussed, using the relationships revealed by a reduced set of measures. These are the measures selected for subsequent investigation of computer use effects. The selection of a subset of measures was on the basis of reliablity, sensitivity and predictive ability, and of equivalence between some of the different techniques. A factor analysis was used to investigate equivalence between measures, as described below.

4.2(c) Equivalence of measures

On a priori grounds it was expected that some measures, from different original techniques, would in fact be equivalent, i.e. would be measures of the same consultation dimensions. For example, the Bales category "doctor gives orientation", the Byrne and Long category "doctor gives information or opinion", and the Stiles "doctor disclosure" and "doctor edification" categories might all be used in largely the same way. These expectations were supported by the multiple regression analyses described above, and by examinations of zero-order correlations between the measures provided by the different techniques. It was decided however, that the best way of establishing equivalence between the different techniques was through factor analysis. If measures from all of the techniques are entered into a factor analysis together, then the analysis will identify as factors those measures which are tapping the same consultation dimension.

Initially two factor analyses were performed, separate analyses were used to investigate the diagnostic and prescriptive phases of the consultation.

All of the variables under consideration from four of the measurement techniques (i.e. excluding the Activity Analysis) were entered into the appropriate analysis. Varimax rotation was used with all factor analyses. Variables from the Activity Analysis were excluded on a priori grounds, as known to uniquely tap certain consultation dimensions, the regression analyses had also shown that the Actvity Analysis uniquely demonstrated certain consultation process-outcome relationships.

(i) Diagnostic Phase

The first factor analysis of diagnostic phase variables produced one major factor and a number of smaller ones. The major factor contained a broad range of types of utterance from the three verbal behaviour classification techniques. The variables included represented doctor information giving, patient acknowledgement, doctor questions and patient information giving. It was felt that this factor was rather too "all inclusive", and so the factors produced by two separate analyses of diagnostic phase variables were investigated. The first of these analyses considered only those variables which had loaded onto the major factor of the initial analysis. The second analysis contained all other diagnostic phase variables under consideration. These two analyses identified 3 and 7 seperate factors respectively. The variables loading onto each of these 10 factors at 0.6 or above are shown in table 7, which also shows the interpretation of each of these factors, in terms of the consultation dimensions they represent. The interpretation of the factor analysis is discussed below.

Table 7: Factors identified by the factor analysis of diagnostic phase variables (continued on next page).

VARIABLE	FACTOR LOADINGS				
	fac.1	fac.2	fac.3	fac.4	fac.5
Dr. Gives Orientation (Bales)	.80				
Pat. Agrees (Bales)	.72				
Dr. Gives Inf./Opinion (B&L)	.85				
Doctor DD (Stiles)	.69				
Doctor DE (Stiles)	.69				
Doctor EE (Stiles)	.81				
Patient KK (Stiles)	.71				
Dr. Asks for Orientation (Bales)		.73			
Pat. Gives Orientation (Bales)		.56			
Dr. Direct Question (B&L)		.68			
Doctor QQ (Stiles)		.61			
Patient KE (Stiles)		.86			
Patient ED (Stiles)			.82		
Patient KD (Stiles)			.62		
Dr. Agrees (Bales)				.79	
Dr. Indicating understanding (B&L)				.79	
Doctor KK (Stiles)				.80	
Patient DD (Stiles)				.84	
Patient DE (Stiles)				.83	
Patient QQ (Stiles)				.79	
Patient EE (Stiles)				.65	
Patient KC (Stiles)				.81	
Interaction Ratings:					
Sympathy					.84
Friendliness					.91
Cheerfulness					.84
Organized					.61
Attentive					.80
Collaborative					.70
Tension					-.75
Empathy					.84

Table 7 (continued)

VARIABLE	FACTOR LOADINGS				
	fac.6	fac.7	fac.8	fac.9	fac.10
Dr. Gives Suggestion (Bales)	.88				
Dr. Directing (B&L)	.88				
Doctor AA (Stiles)	.82				
Doctor IK (Stiles)	.67				
Dr. Shows Solidarity (Bales)		.80			
Dr. Giving/Seeking Recognition (B&L)		.87			
Enough information (Interaction Rating)			.89		
Clear information (" ")			.85		
Dr. Shows Tension Release (Bales)				.84	
Pat. Shows Tension Release (Bales)				.85	
Pat. Shows Solidarity (Bales)					.67
Pat. Asks for Orientation (Bales)					.63

INTERPRETATION		eigenvalues*	% of var*
Factor 1	Doctor Exposition	8.73	58.2
Factor 2	Doctor Questioning	1.24	8.3
Factor 3	Patient Disclosures	1.05	7.0
Factor 4	Patient Exposition	8.85	28.5
Factor 5	Doctor's Interpersonal Manner	5.05	16.3
Factor 6	Doctor Advising	3.19	10.3
Factor 7	Doctor Shows Solidarity	1.92	6.2
Factor 8	Quality of Doctor's info. Provision	1.54	5.0
Factor 9	Tension Release	1.25	4.0
Factor 10	Patient Shoes Solidarity	1.07	3.5

* Factors 1 to 3 and 4 to 10 represent the solutions of two separate analyses - see text.

Factor 1 contains: (i), from the Bales analysis, "doctor gives interpretation" and "patient agreement"; (ii), from the Byrne and Long classification, "doctor gives information or opinion" and "doctor seeks acknowledgement"; and, (iii), from the Stiles taxonomy "doctor EE", "doctor DD", "doctor DE", and "patient KK" (the first letter refers to the mode of the utterance's grammatical FORM and the second to that of its interpersonal INTENT - see figure 7). It is evident that this factor represents verbal exchanges in which the doctor is giving information and the patient is acknowledging its receipt. Furthermore it is apparent that the variables from the different measurement techniques which all load onto this factor are all measures of the same consultation dimension.

Factor 2 contains: (i), from the Bales analysis, "doctor asks for orientation" and "patient gives orientation", (ii), from the Byrne and Long classification, "doctor direct question"; and, (iii), from the Stiles taxonomy "doctor QQ" and "patient KE". Clearly this factor represents verbal exchanges in which the doctor is asking questions and the patient is answering them. Again equivalence between the variables of the different measurement techniques is evident.

Factor 3 contains just two variables, both from the Stiles taxonomy, "patient ED" and "patient KD". It is not clear however that these two variables are really uniquely able to tap one consultation dimension. It seems likely that if they had been included in the second factor analysis of diagnostic phase variables they would have loaded onto the first factor identified by that. The 7 factors identified by the second analysis are here termed factors 4 to 10.

Factor 4 contains: (i), from the Bales analysis, "doctor agrees; (ii), from the Byrne and Long clssification, "doctor indicates understanding"; and (iii), from the Stiles taxonomy, "patient DD", "patient DE", "patient EE", "patient KC" and "doctor KK". This factor clearly represents verbal exchanges which comprise the patient giving information and the doctor acknowledging its receipt. The Stiles taxonomy obviously best identifies this kind of exchange. The Byrne and Long classification is of course extremely limited in this respect by not coding any patient speech. The Bales analsis appears not to distinguish as well as Stiles between patient information giving which is in response to doctors' direct questions (i.e. in the kind of exchange represented by factor 2), and the kind of patient information giving identified by the present factor, which might be termed patient exposition, i.e. the patient is telling "the story" in his or her own words (cf. Stiles et al., 1979a).

Factor 5 contains eight variables from the Interaction Rating Scale, i.e. the mean of three raters ratings of the doctors manner on apparent sympathy, friendliness, cheerfulness, organization, attentiveness, collaborativeness, tension and empathy. Clearly this factor represents the dimension of the doctor's overall interpersonal manner. The interaction rating scale thus provides a unique measure of this dimension.

Factor 6 contains, (i), from the Bales analysis, "doctor gives suggestion"; (ii), from the Byrne and Long classification, "doctor directing"; and (iii), from the Stiles taxonomy, "doctor AA" and "doctor IK". This factor represents the doctor advising the patient. The equivalence between variables from the three verbal behaviour classification techniques is again apparent.

Factor 7 contains, (i), from the Bales analysis, "doctor shows solidarity"; and (ii), from the Byrne and Long classification, "doctor giving or seeking recognition". This factor represents the doctor showing solidarity, e.g. greetings and farewells, the measures from the Bales and Byrne and Long techniques must be to some extent equivalent. None of the other techniques provide measures of this factor.

Factor 8 contains two variables from the Interaction Rating Scale: ratings of the comprehensiveness and the clarity of the doctors information giving. This factor represents the quality of the doctors information giving, it is only measured by the Interaction Rating Scale.

Factor 9 contains two variables from the Bales analysis: "doctor shows tension release" and "patient shows tension release". Tension release (which is usually in the form of laughter) is uniquely measured by the Bales analysis.

Factor 10 also contains two variables from the Bales analysis: "patient shows solidarity" and "patient asks for orientation". This factor probably represents a patient showing solidarity dimension. That "patient asks for orientation" also loads on to this factor may be due to the coding ambiguity mentioned earlier for utterances such as "and how's your wife?". Clearly, however, the Bales analysis uniquely measures this dimension.

(ii) Prescriptive Phase

Only six clear factors emerged from the factor analysis of prescriptive phase variables. Table 8 shows which variables loaded onto each of these factors at 0.6 or above, and the interpretation of the factors. Four of these factors are equivalent to factors identified by the analysis of diagnostic phase variables: factor 2 here is equivalent to factor 5 of the diagnostic phase - i.e. measuring the doctor's overall interpersonal manner; factor 3 is equivalent to factor 4 of the diagnostic phase - i.e. a measure of patient exposition exchange; factor 4 is equivalent to factor 2 of the diagnostic phase - i.e. a measure of doctor questioning exchange; and, factor 6 is equivalent to factor 8 of the diagnostic phase - i.e. a measure of the quality of doctors' information provision. Factor 1 of the prescriptive phase seems to combine doctor information giving and doctor advising. In the diagnostic phase these types of exchange were indentified by two seperate factors. However, the difference in the factor solutions of the two phases does accord with expectations. In the diagnostic phase doctor advising is likely to be the giving of instructions enabling the physical examination, e.g. "lift up your shirt (AA)...O.K. (IK)...deep breaths (AA)" (codes according to Stiles taxonomy). In the prescriptive phase doctor advising is likely to be the giving of instructions regarding treatment, this may be combined with the provision of information, e.g. "the tablets are antiobiotics to fight the infection (EE) take them four hourly (AA)." Factor 5 of the prescriptive phase, patient questioning, has no parallel in the factor solution of diagnostic phase variables, this would suggest that patient questions are more common in the prescriptive phase (as is indeed the case - see table 4, for example). With regard to equivalence between the different measurement tecniques the implications of the factor solution of prescriptive phase variables accords to a large extent with that of the diagnostic phase. There is a great deal of equivalence between the measures from the three verbal classification tecniques, and the Interaction Rating Scale provides unique measures of the quality of the doctor's interpersonal manner and information provision. However, Bales categories for "shows solidarity" and "shows tension release", which the factor solution of diagnostic phase variables showed to be unique, did not load highly onto any factor in the solution of prescriptive phase variables.

Table 8: Factors identified by the factor analysis of Prescritptive phase variables (continued on next page).

VARIABLES	FACTOR LOADINGS			
	fac. 1	fac.2	fac.3	fac.4
Dr. Gives Suggestion (Bales)	.91			
Dr. Gives Orientation (Bales)	.75			
Pat. Agrees (Bales)	.69			
Dr. Gives Info./Opinion (B&L)	.59			
Dr. Directing (B&L)	.74			
Doctor DE (Stiles)	.69			
Doctor EE (Stiles)	.81			
Doctor AA (Stiles)	.88			
Patient KK (Stiles)	.51			
Interaction Ratings:				
Sympathy		.85		
Friendliness		.93		
Cheerfulness		.90		
Organized		(.37)		
Attentive		.78		
Collaborative		.72		
Tension		-.55		
Empathy		.88		
Doctor KK (Stiles)			.63	
Patient DD (Stiles)			.69	
Patient DE (Stiles)			.81	
Patient EE (Stiles)			.65	
Patient ED (Stiles)			.82	
Dr. Asks for Orientation (Bales)				.78
Pat. Gives Orientation (Bales)				.61
Dr. Direct Question (B&L)				.68
Doctor QQ (Stiles)				.60
Patient KE (Stiles)				.79

Table 8 (continued)

VARIABLE	FACTOR LOADINGS	
	fac.5	fac.6
Pat. Shows Solidarity (Bales)	.72	
Pat. Asks for Orientation (Bales)	.82	
Dr. Answering Pat. Question (B&L)	.74	
Patient QQ (Stiles)	.73	
Interactiob Ratings:		
Enough Information		.83
Clear Information		.82

INTERPRETATION		eigenvalues	% of variance
Factor 1	Doctor information and advice	13.39	29.1
Factor 2	Doctor's interpersonal manner	5.86	12.7
Factor 3	Patient Exposition	3.82	8.3
Factor 4	Doctor Questioning	2.67	5.8
Factor 5	Patient Questioning	2.01	4.4
Factor 6	Quality of doctor's information	1.92	4.2

4.3 Selection of Measures for the Investigation of Computer Use Effects

On the basis of the findings discussed above it is possible to simplify use of the measurement techniques to just three of the different systems, for the investigation of computer use effects. These are : the Activity Analysis; a supplemented version of Stiles' Taxonomy; and, the Interaction Rating Scale.

The Activity analysis provides necessary information on basic consultation parameters and was also uniquely able to demonstrate certain consultation process-outcome relationships (a fuller disscusion of such relationships, as revealed by all of the selected systems, is provided in the following section).

Both the regression analyses and the Factor anaysis showed a great deal of equivalence between the three verbal behaviour classification techniques. As also expected on a priori grounds, many consultation dimensions were measured by all three methods. However, the results have also shown that the Stiles taxonomy has a number of advantages over the Bales and Byrne and Long methods. Although there was nothing to choose between the three methods on the basis of inter-rater agreement achieved, the agreement was achieved more easily with the Stiles system, i.e. without recourse to any refinement of the system's original rules and definitions. Such refinements were essential to the achievement of satisfactory inter-rater agreement in the application of the Bales, and Byrne and Long systems. Use of the Stiles system, therefore, will more readily allow for comparison across different studies. Furthermore, the factor analysis showed that the Stiles system best identified verbal exchanges which might be characterized "patient exposition". However, only the Bales system is able to measure the occurrence of affective utterances (displays of solidarity and tension release) by both doctor and patient. It was decided therefore to supplement the Stiles system with two categories from the Bales system: "shows solidarity" and "shows tension release".

It had been hoped that the Byrne and Long system might be useful in enabling the calculation of overall scores for the doctors' consulting styles, using the category weightings and method of calculation proposed by Byrne and Long (1976). Investigations of this possibility, however, were unproductive and, for reasons of time, are not fully reported here. Suffice to say that the findings of the present research on this issue were in complete accord with those of Buijs et al. (1984). As previously noted the validity of Byrne and Long's method of assessing Doctor's style, on a single doctor/patient centred dimension, may be questioned on a priori grounds.

In practice, when the style ratings were calculated according to Byrne and Long's formula, their distribution was very narrow, only a minimum of discrimination between doctor-centred and patient-centred consultations was obtained.

On the basis of the factor solutions described above and also on pragmatic grounds, it was decided to aggregate the 11 common categories of utterance measured by the Stiles taxonomy to provide composite measures of three types of verbal exchange: Exposition, Questioning, and Advising. Separate measures were used of exchanges dominated either by the doctor (e.g. doctor exposition, doctor questioning), or by the patient (e.g. patient exposition, patient questioning), and occurring in either the diagnostic or prescriptive phase. The measures included in the supplemented Stiles system as thus employed are fully illustrated in figure 9.

An alternative use of the Stiles system, as has been proposed (Stiles, 1978b), for the calculation of scores on three dimensions of interpersonal roles, was also considered. However, resources would not allow the use of both measures of verbal exchange and of interpersonal roles, so the former type of measure was selected as being the most easily interpretable and practically relevant.

The Interaction Rating Scale was selected as, in contrast to the other more analytic systems which provide quantitative descriptions of the doctor-patient interaction, it provides data on the quality of the doctor's interpersonal manner and information giving. The ratings have been shown to uniquely tap these dimensions of the consultation, dimensions which also predict consultation outcome. As this measure is relatively quick and easy to apply it was decided, for the sake of reliabilty, to continue obtaining three independent ratings and to use the mean in the examination of computer use effects.

Figure 9: Measures included in the supplemented Stiles system

Speaker	Composite Measures	Types of utterance included in the measure
Doctor	Shows Solidarity	greetings, farewells, communications of warmth and friendship
	Shows Tension Release	indications of relief, satisfaction, jokes and laughter
	Exposition	doctor edifications and disclosures (giving information), patient acknowledgements
	Questioning	doctor questions and short answers by the patient (i.e. utterances with acknowledgement form but Edification or Disclosure intent)
	Advising	doctor advising
Patient	Shows Solidarity	greetings, farewells, communications of warmth and friendship
	Shows Tension Release	indications of relief, satisfaction, jokes and laughter
	Exposition	patient Edifications and Disclosures (giving information), doctor Acknowledgements
	Questioning	patient questions and short answers by the doctor
	Advising	patient advising

4.4 Consultation Input-Process-Outcome Relationships Demonstrated by the Selected Measures

Now that a reduced set of measures has been selected it is appropriate to return to the issue of the sensitivity and predictive ability of the measures. Tables 9 to 11 show the results of the stepwise regression analyses referred to earlier, for the selected measurement systems only. Thus they show which consultation inputs affected the measure provided by each of the systems, and the measures of patients' reactions to the consultation predicted by them (once the effects of differences in consultation input on consultation outcome had been controlled -i.e. so that any effects revealed are known to be due to differences in the actual consultation processes rather than to pre-existing differences between patients). All the measures had been applied separately to the diagnostic and prescriptive phases of the consultation, and differences between the phases were revealed. The two phases were also differentially affected by differences in input to the consultation and had different effects on consultation outcomes. For ease of presentation, relationships are shown in tables 9 to 11 if they were revealed by measures of either or both consultation phases. Full details may be found in Appendix D and mean scores on each of the measures, from a larger sample, are shown in the next chapter. In some of the consultations in the validation sample the computer had been used, in these analyses, since the aim was to compare the properties of the different measurement systems, any effects of computer use were controlled for by the regression equation.

The variables from the measurement systems entered into the regression equations were absolute frequencies of occurance of the different types of utterance, or absolute durations of activities, or mean ratings (across 3 raters) assigned with the rating scale. The effects of controlling for the total number of utterances, or total consultation duration, on the relationships revealed (the equivalent of entering proportional rather than absolute variables) was investigated but this did not affect the results as presented here.

KEY TO TABLES 9 TO 11

Significant effects:

**	p<0.001
*	p<0.01
+	p<0.05

Consultation inputs:

DOC	doctor consulted
SYMP	patient's presenting sysmptom(s)
AGE	patient's age
SEX	patient's sex
TIMEPRAC	years patient registered with doctor
VISITNO	number of times patient has visted doctor in the past year
OWNDOC	whether consultation is with patient's own doctor

Patient reactions:

RELSAT	satisfaction with their relationship with the doctor
INTCOMP	intention to comply with the doctors advice
TRECONF	confidence in the efficacy of the treatment
INFSAT	satisfaction with the information provided by the doctor
ANX	level of anxiety after the consulation

Table 9: Significant Input-Process-Outcome Relationships revealed by the Activity Analysis.

Activity Analysis Measures (Duration in seconds)	Consultation inputs which affect the process measures							Patient reactions predicted by the process measures				
	DOC	SYMP	AGE	SEX	TIME-PRAC	VISIT NO	OWN-DOC	REL-SAT	INT COMP	TRE-CONF	INF-SAT	ANX
Doctor's attention exclusive to patient	**	**										
Doctor's attention shared between notes and patient	**		**		+							
Doctor's attention shared between computer and patient	**											
Doctor's attention exclusive to notes	**											
Doctor's attention exclusive to computer	*							*	**			
Interruptions	+						+	*			*	
Consultation Duration	**			+								

Table 10: Significant Input-Process-Outcome Relationships revealed by the Supplemented Stiles' Taxonomy.

Speaker	Affective communication or type of verbal exchange	Consultation inputs which affect the process measures							Patient reactions predicted by the process measures				
		DOC	SYMP	AGE	SEX	TIME-PRAC	VISIT NO	OWN-DOC	REL-SAT	INT COMP	TRE-CONF	INF-SAT	ANX
Doctor	Shows Solidarity	**											
	Shows Tension Rel.	*			*			*					
	Exposition	**	+	*					+				
	Questioning	**		**									
	Advising	**	**	**		**					**		
Patient	Shows Solidarity		+										
	Shows Tension Rel	+			*			*					
	Exposition	**		*									
	Questioning												
	Advising						*						

Table 11: Significant Input-Process-Outcome Relationships revealed by the Interaction Rating Scale.

Dimensions Rated	Consultation inputs which affect the process measures							Patient reactions predicted by the process measures				
	DOC	SYMP	AGE	SEX	TIME-PRAC	VISIT NO	OWN-DOC	REL-SAT	INT COMP	TRE-CONF	INF-SAT	ANX
Doctor's manner:												
unsympathetic/sympathetic	**											
unfriendly/friendly	*			*	+							
solemn/cheerful	*			+	+					**		
disorganized/organized	**								*		**	
unattentive/attentive	**	*	*									
authoritative/collaborative	**				+							
Doctor's information giving:												
not enough/enough	**	+	*			*						
unclear/clear	**					*						
The interaction:												
Tension (non/a lot)	+				+						+	
Empathy (non/a lot)	+											

Table 9, displaying relationships revealed by the Activity Analysis, shows that the doctor was the main determinant of consultation duration and of the proportional distribution of the doctor's attention during the consultation. The amount of time the doctor spent attending exclusively to the patient was also determined by the patients presenting sysmptoms, and the duration of the doctor's notes use was significantly affected by the patient's age and the length of time they had been registered with the practice. The duration of interuptions was negatively associated with patient's subsequent ratings of their satisfaction with the information provided by the doctor. Patients' satisfaction was also affected by the duration of doctors' exclusive attention to the computer, this effect is considered in more detail in the next chapter.

Differences between the doctors consulted were a major determinant of the aspects of communication measured by the supplemented Stiles system (see Table 10). A number of these variables were also significantly affected by differences in patients' presenting symptoms and by the patients' age, and two variables also predicted patients' subsequent reactions. The incidence of "doctor advising " exchanges was positively associated with patients' confidence in the efficacy of the treatment and the incidence of "doctor exposition" exchanges was positively associated with patients' satisfaction with their relationship with the doctor.

Again, differences between the doctors consulted were the major determinant of the ratings of the consultation assigned with the Interaction Rating Scale (see table 11). These ratings were also significantly affected by differences in patients' presenting problems, patients' age, the length of time they had been registered with the practice, and their frequency of attendance. These findings confirm an intuitive expectation that patients who have known their doctor longer or who have seen him or her more often, will enjoy a more personal relationship. The interaction ratings were also able to predict patients' intention to comply with the doctors' advice, their confidence in the efficacy of the treatment received, and their satisfaction with the information provided by the doctor.

4.5 Summary and Conclusions

The comparison of five different techniques for the measurement of doctor-patient communication has enabled the identification of a parsimonious, yet comprehensive set of measures, combining techniques which reflect the many different approaches to the measurement of doctor-patient communication which are apparant in the research literature. Thus the measures provide a qualitative evaluation of the process of doctor-patient communication, as well as a quantitative description. They cover both task-oriented and affective communication and both verbal and non-verbal aspects. They also provide information on basic consultation parameters, and thus, in relation to assessments of computer use, they may inform on how this is fitted into the tight time schedule of the consultation and how it effects the sharing of the doctor's attention between different consultation tasks.

The measures have been rigorously validated and shown to be reliable, very sensitive to differences in input to the consultation, and able to account significantly for differences in patients' subsequent reactions to the consultation. They are thus well suited to serve the primary objective of the present research, i.e. to determine the effects of doctors' computer use during consultations on their communication with patients. In addition the results highlight those factors to be controlled when, as in the following chapters, the focus is on the effects of computer use. The measures should also be of value in future research.

The investigation of consultation process-outcome relationships described above could also inform doctors on how they might seek to improve the outcome of the consultation. For example to increase patients' satisfaction or intention to comply. The results show particularly that doctors should avoid interuptions to their consultations, that they should give a lot of advice and information, and that they should seem cheerful and well organized. Of course these are all interpersonal skills and, as assessed in this study, may be unrelated to the doctor's clinical skills, which are - at least - equally important. Ideally skill at communication should be viewed as an integral part of the doctors' clinical skills. Thus, a major shortcoming of the measures developed in this study is that they do not recognize this relationship. The investigation of the effects of computer use would be incomplete if it did not consider effects on the doctors performance during the consultation from a clinical as well as from an interpersonal perspective. Therefore Chapters 7 and 8 describe two studies which assessed the effects of doctors' computer use in the delivery of care, using techniques which were especially developed. First, however, Chapters 5 and 6 (which follow) describe two studies which investigated the effects of computer use on doctor-patient communication using the techniques developed in the study described above.

CHAPTER FIVE: EFFECTS OF COMPUTER USE ON DOCTOR-PATIENT COMMUNICATION IN GENERAL CONSULTATIONS

This chapter presents the first study on the effects of computer use on doctor-patient communications. The study used the "IBM Databank" to investigate the effects of the GPs use of SPCS during general consultations on their communication with patients. "General consultations" include all types of consultation except those in which the patient was attending with hypertension. Since the computer provided a management protocol specifically for use with hypertensive patients, the effects of computer use on doctor-patient communications in consultations for hypertension were investigated in a separate study (see Chapter 6). In general consultations the doctors used the "Details Screen" and the "Treatment Screen" of SPCS to review and update patients' medical histories, encounter notes and repeat prescription details (see Chapter 3).

5.1 Method

It has been concluded in previous chapters that, in investigating the effects of doctors' computer use on doctor-patient communication, account must be taken of other factors which are known to also affect communications. These factors, or inputs to the consultation, are various characteristics of doctors and patients. The study described in Chapter 4 identified the particular consultation inputs which affect doctor-patient communication during the consultations included in this project's databank, as assessed by the doctor-patient communication measurement techniques which are used in the present study. The present study therefore used a matched pairs research design to control for these factors. Thus, for the investigation of computer effects, a sample of non-computer and computer consultations was selected from the project data-bank in which each computer consultation was individually matched with a non-computer consultation. Matching was on the following criteria. (1) Doctor consulted - thus controlling for all possible differences between doctors. (2) The patients' type of presenting problem(s). Presenting problems were classified using the system proposed by Raynes (1980) (see appendix B), this classification also distinguishes between first presentations of symptoms and follow up visits. (3) The patient's age and sex. (4) Whether or not the the consultation was with the patient's own doctor. (5) The period of the patient's registration with the practice. (6) The patient's frequency of attendance in the last year.

The project databank contained video-recordings of 188 consultations in which the doctor had used a computer and of 621 consultations in which no computer was used. With this original databank it was possible to find a "non-computer match" for nearly half of all the computer consultations, while strictly applying all of the matching criteria listed above. The matched pairs sample of consultations, which was thus selected for use in the present study, contained 91 computer consultations and 91 non-computer consultations.

The sample comprised equal numbers of consultations by each of six doctors and represented a typical and broad range of presenting problems. Thus, 57 pairs of matched consultations were follow-up visits, with reasons for attendance including, for example, nappy rash, bed wetting, viral infections, ulcers, haemorrhoids, diabetes, depression, and post-operative care. Twenty three consultation pairs were first presentations of symptoms, such as coughs and colds, aches and pains, urinary problems, rashes, lumps and lesions. And 11 consultation pairs were for multiple problems, with equivalent combinations of symptom types in each consultation. The research design thus enabled a comparison of computer use and non-use conditions in a carefully matched sample of typical general practice consultations, holding constant background "input variables" known to influence doctor-patient communication.

All of the consultations in the sample were assessed using the doctor-patient communication measurement systems which had been especially developed and selected, as described in the previous chapter. The Activity Analysis and the Supplemented Stiles Analysis, were each applied by one of the trained raters. The Interaction Rating Scale was applied by three raters independently, allowing for the comparison of mean ratings in the investigation of computer use effects. A weakness of the research design was that the raters were fully aware, both of the aims of the study, and of the condition (computer or non-computer) of each of the consultations they rated. Ideally "blind" raters would have been used. However, the case for "blind" raters was deemed to be outweighed by the impracticalities of achieving such a design.

Repeated Measures Analysis of Variance was used to determine the effects of doctors' computer use on the measures provided by each of the systems. In these analyses the dependent variables were the measures of doctor-patient communication, and the independent variables were the doctor consulted and whether or not the computer was used. Differences between doctors on the doctor-patient communication measures were not of interest in the present study, and, in any case, in investigating computer use effects the effects of doctor differences were controlled for by the matched-pairs design. However, the inclusion of doctor, as an independent variable, enabled the investigation of doctor by computer interaction effects. A significant doctor by computer interaction effect would indicate that computer effects were different for different doctors. For example, some doctors' consultations might take longer with the computer while others' might not. The Analysis of Variance examined computer effects, and computer by doctor interaction effects, on the communication measures, over the whole of the consultations, as well as for the consultations' constituent (diagnostic and prescriptive) phases.

5.2 Results

a) Activity Analysis

Table 12 shows the mean durations of each of the activities measured by the Activity Analysis, over the whole of consultations, in computer use and non-use conditions, and the mean durations of the consultations. It also shows that no significant computer effects or doctor by computer interaction effects were revealed, by the analysis of variance, on any of these activity analysis variables. However, computer use did lead to a significant increase in total consultation duration. The Analysis of Variance similarly showed no significant effects on activity analysis variables in the seperate diagnostic and prescriptive phases of consultations. Means on these measures are therefore omitted from the table. The mean durations of the diagnostic and prescriptive phases of consultations were 174 seconds and 120 seconds, respectively in non-computer consultations, and 220 seconds and 152 seconds in computer consultations.

From the figures shown in Table 12 it is apparent that the introduction of computer use did not lead to any reduction in the amount of time doctors spent using manual records. This explains why, although doctors spent little time during the consultation using the computer (on average only 34 seconds), computer use did lead to a significant increase in consultation duration. The mean consultation duration increased from just under 5 minutes to just over 6 minutes.

It seems that by increasing the total duration of the consultation, doctors could incorporate the extra record keeping time which was required by computer use without decreasing the amount of time they spent attending exclusively to the patient. In fact doctors also tended to spend more time attending exclusively to the patient in computer consultations. The mean values on this measure in non-computer and computer consultations were 2 minutes 56 seconds, and 3 minutes 38 seconds, respectively, but this difference did not reach statistical significance.

ACTIVITY ANALYSIS MEASURES (focus of doctors' attention)	MEAN DURATION OF ACTIVITY (secs)		COMPUTER EFFECTS		COMPUTER*DOCTOR INTERACTION EFFECTS	
	non computer (n=91)	computer (n=91)	F	p	F	P
solely with manual records	21	15	ns		ns	
shared - manual records/patient	89	97	ns		ns	
solely with computer	N/A	12	N/A		N/A	
shared - computer/ patient	N/A	22	N/A		N/A	
interuptions	9	18	ns		ns	
exclusive to patient	176	208	ns		ns	
Duration of consultation	294	372	5.36	<0.05	ns	

Table 12: Focus of the doctors' attention in general consultations in non-computer and computer conditions.

The data provided by the Activity Analysis, on the duration of doctors' computer use during consultations, also enabled another research issue to be addressed. This issue is somewhat tangential to the main aim of the present study. However, an investigation revealed very interesting results which have not been previously reported, and so they are briefly reported here.

The issue concerns the effects of doctors' computer use during consultations on patients' subsequent reactions to the consultation. Brownbridge et al. (1985) have previously reported a study which compared large samples of non-computer and computer consultations on patients' reactions (e.g. satisfaction, intention to comply) and found no difference, therefore concluding that computer use did not affect patients' reactions to their consultations (see also Chapter 3 of this thesis). In that study, however, their was no investigation of the possibility that effects might be dependent on the way in which, or the extent to which, the computer was used. Using the Activity Analysis measures of: (1) the duration of the doctor's exclusive attention to the computer; and (2) the duration of the doctor's attention shared between computer and patient; such an investigation is possible. A Multiple Regression Analysis was used to this end during the present study. In this analysis only computer consultations (n=91) of the matched-pairs sample were used. The dependent variables were patients' reactions to the consultation as measured by the patient questionnaire (Appendix C, see

Chapters 3 and 4), the independent variables were the measures of the duration of the two different types of computer use provided by the Activity Analysis. Statistically significant findings were as follows. In the prescriptive phase of consultations only, the amount of time doctors spent attending exclusivley to the computer was negatively associated with patients' subsequently reported satisfaction with their relationship with the doctor ($F=8.04$, $p<0.001$), and, in both consultation phases, the amount of time doctors spent attending exclusively to the computer was negatively associated with patients' subsequently reported intention to comply with the doctors' advice (diagnostic phase - $F=14.59$, $p<0.001$; prescriptive phase - $F=7.38$, $p<0.01$). The amount of time doctors spent with their attention shared between the computer and the patient did not show these effects.

b) Supplemented Stiles Analysis

Table 13 shows the means on each of the measures provided by the Supplemented Stiles' Analysis in the diagnostic and prescriptive phases of non-computer and computer consultations. Significant computer effects, and doctor by computer interaction effects, as revealed by the Analysis of Variance, are also shown. Most of the Stiles' measures were unaffected by doctors' use of the computer. Thus the mean numbers of doctors and patients statements which constituted exposition, questioning, and advising exchanges, in either consultation phase, were very similar in computer and non-computer consultations. However, use of the computer did significantly increase the number of affective statements used (shows solidarity) and the amount of tension release (which is most usually laughter). For all doctors there were more instances of "doctor shows solidarity" in the diagnostic phase of computer consultations than in the same phase of non-computer consultations (mean number of occurrences were 2.61 and 2.01 respectively, $F=4.31$, $p<0.05$), suggesting that doctors tried to compensate for the computer by being more friendly in the opening phases of the consultation. There was also a doctor by computer interaction effect for occurrences (in the prescriptive phase only) of doctor shows tension release ($F=3.72$, $p<0.01$) and patient shows tension release ($F=3.69$. $p<0.01$), as some doctors were also more likely to inject humour in the prescriptive phase of computer consultations.

Table 13: Mean number of affective utterances, and of utterances constituting the different types of verbal exchange, as revealed by the Supplemented Stiles' Analysis of general consultations in non-computer and computer conditions.

	Type of utterance or verbal exchange	MEAN NUMBER OF UTTERANCES non computer (n=91)	computer (n=91)	COMPUTER EFFECTS F	p	COMPUTER*DOCTOR INTERACTION F	p
D	DOCTOR						
I							
A	shows solidarity	2.01	2.61	4.31	0.041	ns	
G	shows tension						
N	release	0.99	1.13	ns		ns	
O	exposition	14.1	16.9	ns		ns	
S	questioning	9.0	9.1	ns		ns	
T	advising	4.7	5.4	ns		ns	
I							
C	PATIENT						
P	shows solidarity	0.93	0.92	ns		ns	
H	shows tension						
A	release	1.07	1.23	ns		ns	
S	exposition	24.0	28.6	ns		ns	
E	questioning	1.5	1.4	ns		ns	
	advising	0.3	0.3	ns		ns	
P	DOCTOR						
R							
E	shows solidarity	2.57	3.00	ns		ns	
S	shows tension						
C	release	0.66	0.97	ns		3.72	0.004
R	exposition	18.0	18.4	ns		ns	
I	questioning	5.5	5.1	ns		ns	
P	advising	7.7	7.5	ns		ns	
T							
I	PATIENT						
V							
E	shows solidarity	2.24	2.71	ns		ns	
	shows tension						
P	release	0.71	0.91	ns		3.69	0.005
H	exposition	15.0	13.9	ns		ns	
A	questioning	2.0	2.6	ns		ns	
S	advising	1.7	2.0	ns		ns	
E							

c) Interaction Rating Scale

Table 14 shows mean ratings, over the whole of consultations, assigned to non-computer and computer consultations with the Interaction Rating Scale. Computer effects, and doctor by computer interaction effects, revealed by the Analysis of Variance, are also shown. Seperate figures for the diagnostic and prescriptive phases of the consultations were very similar to those in the table, and have therefore been omitted. It may be seen that doctors' computer use did have a significant effect on their interpersonal manner. Ratings of how organized and how attentive the doctors seemed were significantly lower when the computer was used. Differences on the other scale items did not individually reach statistical significance. However, for 8 of the 10 scale items mean ratings were slightly lower in the computer condition, a finding which is statistically significant in itself (Sign Test, $p<0.05$). This suggests the interpersonal manner of the doctors was very slightly impaired overall, when the computer was used. The absence of any significant doctor by computer interaction effects shows that these computer use effects were equivalent across all six doctors.

Scale Item (possible range 1-7 on all items)	MEAN RATINGS[1] non computer (n=91)	computer (n=91)	COMPUTER EFFECTS F	p	COMPUTER*DOCTOR INTERACTION EFFECTS F	P
unsympathtic-sympathetic	5.40	5.34	ns		ns	
unfriendly-friendly	5.43	5.41	ns		ns	
solemn-cheerful	5.17	5.18	ns		ns	
disorganized-organized	5.80	5.23	13.13	<0.001	ns	
unattentive-attentive	5.52	5.33	4.95	<0.05	ns	
authoritative-collaborative	4.20	4.13	ns		ns	
information:not enough-enough	4.84	4.67	ns		ns	
information: unclear-clear	4.90	4.68	ns		ns	
tension: a lot-none	3.43	3.36	ns		ns	
empathy: none-a lot	4.73	4.72	ns		ns	

1 Higher scores indicate ratings towards second pole (e.g. more organized)

Table 14: Mean ratings assigned to general consultations in non-computer and computer conditions by three raters independently applying the interaction rating scale.

5.3 Discussion and Summary

Overall the findings reported here are encouraging for the future development of computer systems for use during medical consultations. The techniques used for the measurement of doctor patient communication, when applied seperately to the diagnostic and prescriptive phase of the consultation, provide measures of 54 different aspects of doctor-patient communication. The measures used have all been rigorously validated, and each has been shown to uniquely tap important consultation dimensions (see chapter 4). Of these 54 measures, only 6 were significantly affected by doctors' computer use. While effects on three of these measures will be seen as negative consequences of computer use (consultation durations increased and doctors were rated as being less organized and attentive), three of the measures actually indicated possible improvement in doctor-patient communication as a result of computer use, i.e. if doctors show more solidarity with patients and both doctors and patients show more tension release. (The latter finding must be interpreted with caution-increased tension release may reflect greater tension in computer consultations).

Computer use during consultations had no significant effects on the actual amount of time doctors spent attending exclusively to their patients (in fact this tended to increase), or on the quantity of information given, the number of questions asked or the amount of advice offered by either doctor or patient. On individual ratings of the doctors' apparent sympathy, friendliness, cheefulness and collaborativeness, of the quality

and quantity of the doctors' information provision, and of the apparent empathy and tension in the interaction, there were similarly no significant effects of computer use. However, across all these ratings there was evidence of a very slight impairment of the doctor's manner.
It seems doctors contrived to reduce the impact of the computer on the interaction by minimizing its use in the patient's presence. The Activity Analysis reported here revealed an average of only 34 seconds computer use per consultation. However, an earlier study of the same consultations, which also examined doctors' activities during surgeries, in between their actual encounters with patients, showed that doctors spent on average an additional 64 seconds per patient using the computer, either before the patient entered the consulting room or after they had left (Herzmark et. al., 1984).

The present study has shown that extensive attention to the computer by doctors during the consultation, if this is to the exclusion of attention to the patient, has negative consequences for patients' subsequent reactions to the consultation. There is evidence that the more time doctors spend attending exclusively to the computer, the less satisfied the patient will be with their relationship with the doctor, and the lower will be their intention to follow the doctors' advice. This is the most worrying of all the effects of computer use.

The negative effects of computer use should of course be viewed in context, that is in the context of the much greater number of findings which were neutral and the experimental nature of the computer system under investigation. The computer system was a very early and experimental one, and the doctors using it had no previous experience of computers. Computer use was also made more problematic for doctors in view of the continued need to maintain manual records (see chapter 2). If the system had become established for routine use then the negative effects on doctor-patient communication and on patients' reactions may have disappeared. The system design could have been improved to make it quicker and easier to use, with practice the doctors could have become more adept in its use, and, with the discontinuation of manual records, the extra time pressures imposed by computer use would also have been reduced.

These issues will be elaborated in the concluding chapter of this thesis. First however, four more empirical studies of the effects of computer use during consultations are to be described. The following chapter describes a second study of the effects of doctors' computer use on doctor-patient communication. The study is more focused than the one described above, being concerned specifically with the use of a computerized interactive protocol for the management of chronic hypertension.

CHAPTER SIX: EFFECTS OF COMPUTER USE ON DOCTOR-PATIENT COMMUNICATION IN CONSULTATIONS FOR HYPERTENSION.

This chapter describes a study of the effects of doctors' computer use on doctor-patient communications during consultations for chronic hypertension. It was important to examine these consultations seperately as SPCS provided a computerized interactive protocol as an aid to doctors in the management of patients with chronic hypertension (see Chapter 3). The protocol prompted doctors to conduct a number of verbal and physical examinations of the patient (see figure 4, page 76) and to record the results. The computer could thus also aid the doctor in monitoring the patient's condition over time.

It might be expected that doctors' use of the computerized protocol would have more pronounced effects on their communication with patients, than their use of the computer in general consultations for the review and update of patients' records. This is for a number of reasons: (1) the computer is used more extensively when the protocol is in operation; (2) the protocol is expected, to some extent, to directly influence the doctors' patient management techniques; and (3) patients with chronic conditions see their doctor on a very regular basis, thus the doctor-patient relationship in consultations for chronic conditions may be of greater significance than that in consultations for acute conditions.

Computerized protocols may hold greater potential benefit, for doctors in consultation, than computer systems for the upkeep of general records. However, there is a distinct possibility that their use will also be more disruptive. This possibility presents an important issue for research.

Prior to the introduction of computers at the study practices, a paper-based version of the hypertension protocol was used. This enabled a test of its design and a comparison of the efficacy of the alternate forms. The investigation of protocol use effects reported here compared consultations for hypertension conducted under three different conditions, i.e. when no protocol was used, when the paper protocol was used and when the computer protocol was used.

6.1 Method

The size of the sample of video-recorded consultations which could be used in the present study was limited for a number of reasons. Only three different doctors used the computerized hypertension protocol in routine consultations during the study's data collection period. And, at that time, it was only possible to video record five or six of each of these doctors' computer consultations with hypertensive patients. Therefore the size of the sample used in the study was limited to 48 video recorded consultations, representing 16 consultations from each of the three conditions. The three different doctors represented in the study were all from the larger, split site, practice. All the consultations in the sample had taken place at one of the sites only. The consultations had occurred during three different time periods: first, when no protocols were in use; second when the paper protocol was in use; and, third, when the computer protocol was in use. The three participating doctors were equally represented by consultations conducted at each time period.

The three measurement systems, which had been selected for the examination of the effects of computer use on doctor-patient communication, were applied to all of the consultations in the sample. Analysis of Variance, with a priori contrast tests, was used to compare the mean values obtained on each measure in each of the different conditions. Three contrast tests were performed: the first compared the measures of doctor-patient communication in the non-protocol condition with the measures of communication in the paper protocol condition, to determine whether use of the paper protocol affected communications; the second compared communications in the non-protocol condition with communications in the computer protocol condition, to determine whether use of the computer protocol affected communications; and the third compared the two different protocol conditions to determine whether the paper and computer protocols had different effects on communications.

6.2 Results

Tables 15 to 17 show the mean values obtained with each of the measurement systems, combined for all doctors and both phases of the consultation, in each of the study conditions, and the differences between conditions revealed by the Analysis of Variance. The findings are discussed below. The Analysis of Variance also examined (and controlled for) possible doctor by condition interaction effects, but, as none were revealed, these are not further discussed. Differences between the consultations' diagnostic and prescriptive phases, in the condition effects revealed, are discussed below.

a) Activity Analysis

From Table 15, which shows findings from the Activity Analysis, it may be seen that doctors spent more time attending to manual records in the paper protocol condition than in the non-protocol and computer protocol conditions (this is not suprising as attention to the paper protocol was included under attention to manual records). Doctors also spent less time attending to manual records in the computer protocol condition than in the non-protocol condition. The latter finding suggests that the computer protocol did replace some of the doctors' need to consult manual records.

In both paper and computer protocol conditions, consultations took longer than in the non-protocol condition (although for the computer protocol condition the difference did not reach statistical significance), mean consultation durations increased from just over 5 minutes to just over 7 minutes.

Over the whole consultation, use of the protocols had no significant effect on the amount of time doctors spent attending exclusively to the patient, although this did tend to increase. However separate investigations of the diagnostic and prescriptive phases of the consultation showed that, in the diagnostic phase of the consultation only, doctors did spend significantly more time attending exclusively to the patient in the paper and computer protocol conditions, about one minute in each case. This suggests that the doctors did conduct more examinations of the patient, physical and/or verbal, when the protocols were used. The remainder of the increase in consultation duration in the protocol conditions is accounted for by increases in attention to manual or computer records, i.e. attention to the protocols themselves.

ACTIVITY (focus of doctor's attention)	MEAN DURATION OF ACTIVITY (Seconds) Condition 1 no protocol (n=16)	Condition 2 paper protocol (n=16)	Condition 3 computer protocol (n=16)	SIGNIFICANT DIFFERENCES Between 1 and 2	Between 1 and 3	Between 2 and 3
exclusive to manual records	43	87	24	***	***	***
shared: manual recs/ patient	65	100	72	*	ns	ns
exclusive to computer	N/A	N/A	54	N/A	N/A	N/A
shared: computer/ patient	N/A	N/A	54	N/A	N/A	N/A
interrup-tions	0	2	0	ns	ns	ns
exclusive to patient	210	254	235	ns	ns	ns
duration of consultation	318	443	439	*	ns	ns

KEY: N/A not applicable; ns not significant; * p<0.05; *** p<0.001

Table 15: Focus of the doctor's attention in hypertension consultations in non-protocol, paper protocol and computer protocol conditions, and significant differences between conditions as revealed by an analysis of Variance with a priori contrast tests

b) Supplemented Stiles Analysis

The Supplemented Stiles Analysis showed no significant effect of protocol use on the amount of solidarity or tension release shown by either doctor or patient, or on the occurence of doctor exposition, patient exposition or patient advising exchanges. There were significant effects on the occurence of doctor questioning, doctor advising and patient questioning exchanges (table 16).

In paper and computer protocol conditions more utterances formed doctor questioning exchanges than in the non-protocol condition. The difference was statistically significant for the paper protocol condition. Doctor questioning exchanges consist of questions by the doctor which require and receive only short (e.g. "yes" or "no") answers from the patient. This finding suggests that in protocol conditions doctors were asking more of the questions prompted by the protocol.

Doctor advising exchanges perform one of two possible functions: doctors could be giving instructions to be followed immediately during the consultation (e.g "Jump on those scales" or "Roll up your sleeve" - these exchanges are usually associated with the physical examination, or instructions to be followed in the longer term, e.g. "Take the tablets twice daily", or "You must loose weight". Unfortunately, the Stiles Analysis cannot distinguish the two. However, the separate analysis of diagnostic and prescriptive phases showed that the increase in doctor advising exchanges occurred in the diagnostic phase of consultations only, and there was no increase in doctor exposition (information giving) exchanges. These findings show that the increase in doctor advice was as a result of more physical examinations being conducted by doctors when the protocols were used, and therefore more immediate instructions being given.

The increase in the number of utterances forming patient questioning exchanges in the protocol conditions shows that patients made more bids for information when the protocols were used. This finding is open to interpretation. It could be that doctors volunteered less information and advice when the protocols were used, but this seems unlikely as the occurences of doctor exposition and advising exchanges did not decrease. It could be that patients asked about the protocol, or it could be that the patients had more opportunity to ask questions in general, during the extra periods of silence when the doctors were attending to the protocol or conducting physical examinations.

Type of utterance or verbal exchange	MEAN NUMBER OF UTTERANCES Condition(1) no protocol (n=16)	Condition(2) paper protocol (n=16)	Condition(3) computer protocol (n=16)	SIGNIFICANT DIFFERENCES Between (1) and (2)	Between (1) and (3)	Between (2) and (3)
Doctor shows Solidarity	4.1	4.2	4.4	ns	ns	ns
Dr. shows Tension Release	2.0	1.9	2.0	ns	ns	ns
Doctor Exposition	33.7	41.5	37.1	ns	ns	ns
Doctor Questioning	11.5	18.7	15.5	*	ns	ns
Doctor Advising	10.7	17.7	21.3	***	***	ns
Patient shows Solidarity	3.1	3.8	3.5	ns	ns	ns
Pat. shows Tension Release	1.8	2.1	2.0	ns	ns	ns
Patient Exposition	42.5	34.0	31.4	ns	ns	ns
Patient Questioning	2.3	6.1	7.8	*	*	ns
Patient Advising	1.7	1.3	2.1	ns	ns	ns

KEY: ns not significant; * $p<0.05$; *** $p<0.001$

Table 16: Mean number of affective utterances, and of utterances constituting the different types of verbal exchange, as revealed by the Supplemented Stiles' Analysis of consultations for hypertension in non-protocol, paper protocol, and computer protocol conditions.

c) Interaction Rating Scale

The ratings of the doctors' interpersonal manner assigned with the Interaction Rating Scale (table 17) show that, as in general consultations, this was slightly impaired by doctors' computer use in consultations for hypertension. The doctors' manner was rated as less sympathetic and more authoratative in the computer protocol condition than in the non-protocol and paper protocol conditions. The doctors' information giving was also rated as less comprehensive and less clear in the computer protocol condition. There were no significant differences between the non-protocol and paper protocol conditions on any of the scale items. This shows that the impairment of the doctors' manner is as a result of computer use rather than of protocol use.

Scale Item (possible range 1-7 on all items)	MEAN RATINGS Condition(1) no protocol (n=16)	Condition(2) paper protocol (n=16)	Condition(3) computer protocol (n=16)	SIGNIFICANT DIFFERENCES Between (1) and (2)	Between (1) and (3)	Between (2) and (3)
unsympathetic/ sympathetic	5.33	5.36	5.00	ns	*	*
unfriendly/ friendly	5.38	5.40	5.34	ns	ns	ns
solemn/ cheerful	5.18	5.18	5.17	ns	ns	ns
disorganized/ organized	5.95	5.89	5.71	ns	ns	ns
unattentive/ attentive	5.60	5.33	5.34	ns	ns	ns
authoratative/ collaborative	3.82	4.13	3.45	ns	*	*
info. prov. not enough/ enough	4.72	4.93	4.31	ns	*	*
info. prov. unclear/clear	4.75	4.93	4.31	ns	*	*
tension a lot/none	5.81	5.93	5.86	ns	ns	ns
empathy none/a lot	5.13	4.86	4.89	ns	ns	ns

N.B. Higher scores indicate ratings towards the second pole (e.g. more sympathetic).

KEY: ns not significant; * $p<0.05$.

Table 17: Mean ratings assigned to consultations for hypertension in non-protocol, paper protocol, and computer protocol conditions by three raters independently applying the Interaction Rating Scale.

6.3 Discussion

Use of the protocols (either paper or computer) by doctors for the management of patients with chronic hypertension had no major effects on doctor-patient communication, other than those which would be expected as a result of doctors conducting more verbal and physical examinations. These might make the consultations seem more formalized, and the doctors more directive (as there are more closed questions and more instructions by the doctors) but patient questioning exchanges were also more frequent, suggesting greater patient involvement when the protocols were used. Otherwise the verbal exchange was unaffected. There was no difference in the number of affective statements or the amount of tension release by either doctor or patient and no difference in the amount of exposition.

In consultations for hypertension, as in general consultations, it seems that computer use did impair the doctor's manner. However, again the effect is not great. It may be due to the unfamiliarity of the computer and might be expected to dissappear if computer use became routine.

The study has highlighted a possible shortcoming of the Stiles system for the measurement of doctor-patient communication (the shortcoming would be common to all similar types of verbal classification system): this is that it is largely context free, we cannot be exactly sure of the nature of the "extra" advice given by doctors, or questions asked by patients, when the protocols were used.

This problem confirms that measurement systems of this type need to be used in parallel with other approaches in order to address certain research issues. In the examination of computer use effects on doctor-patient communcation a supplemented version of the Stiles system was used and two totally different aspproaches were also employed. In the chapters 7 and 8 (which follow) two studies are described, which again examined the effects of doctors' computer use in general practice consultations, but in these studies the doctor-patient interaction is placed firmly in its clinical context and the effects of computer use on the delivery of care are directly examined.

CHAPTER SEVEN: EFFECT OF COMPUTER USE ON THE DELIVERY OF CARE IN GENERAL CONSULTATIONS

It has been shown that the consulting room use of SPCS had no discernable adverse effects on patients' reactions or on doctor-patient communications which would have been great enough to preclude such use (see chapters 3, 5 and 6). Nevertheless, research has shown that computer use was a stressful experience for the doctors (Herzmark et. al.,1984, see also chapter 3). This finding raises perhaps the most important issue of all: whether or not the use of a computer system as an integral part of the consultation directly affects the standard of medical care provided. If such a system is demanding or stressful it may distract the doctor from his or her primary clinical task. The study reported in this chapter addressed this issue by investigating the effects of doctors' use of the computer in general consultations on their delivery of care.

In previous research there have been two main types of assessment of the standard of clinical care provided by doctors. The first requires identifying a few specific illnesses or problem categories and creating a model or algorithm of the ideal clinical decision making procedure for dealing with them. The doctor is then assessed by comparing his or her performance against the pre-specified criteria. The second approach, developed in the United States against the background of litigation minded consumers and defensive medicine, is often referred to as "quality control in medical care". This entails retrospective analysis of medical records only. Both types of medical care evaluation have been reviewed (Donbedian, 1978; Brook, 1973; McAuliffe, 1978; Rhee et. al., 1981).

For present purposes, however, neither of these approaches is suitable. In the first case it is impracticable to develop a sufficient number of algorithms to cover the range of problems covered by the general practitioner (this approach may of course be used when, as in the study reported in the next chapter, the focus is on the management of a particular illness). The second approach, based on written records only, limits the inquiry to only a small part of the clinical process. Although in the USA, in case of litigation, the medical records must be a complete and comprehensive record of the delivery of clinical care, this is not the case in Britain. The general practitioner records only information which he or she considers to be relevant to clinical decision making and management or for future reference.

What is required is a method that assesses the total encounter between the doctor and patient and covers the breadth of the presenting symptoms of a typical surgery. Such a method has been developed by Pendleton et al. (1984). They provide a framework within which general practitioners and their trainees may consider the effectiveness of their consultations, proposing a method for evaluating a consultation by applying a consultation rating scale. This general approach was put into practice for this study.

7.1 Method

a) Research Design

A matched pairs sample of video recorded consultations from the project databank was used to determine the effects of doctors' computer use during general consultations on their delivery of care. The sample included 30 non-computer consultations matched with 30 computer consultations on doctor seen and patient characteristics and presenting symptoms. Ideally a larger sample would have been used. The consultations were, however, to be rated by volunteer GPs (see below) and a larger workload could not have been imposed upon them. This was a sub-sample of that used in the study of computer use effects on doctor-patient communication in general consultations, as described in chapter 5. It was selected so that different types of presenting problems were represented in the same proportions as in the larger sample. The six different doctors who used the computer were equally represented. The research design thus called for a comparison between computer use and non-use conditions in a carefully matched sample of typical general practice consultations. The standard of care attained by the doctor was rated blind, using the procedure described below.

b) Measuring the Delivery of Care

To measure the standard of the delivery of care an independent panel of six principals in general practice, all of whom were also concerned in a well established vocational training scheme (four of them were GP trainers), was convened. This group, together with Dr Alan Evans (a principal at one of the study practices) and the author, designed a delivery of care rating scale. This was by means of a series of four discussion meetings, each lasting two to three hours. The panel chose to design their own instrument rather than use the one described by Pendleton et al., as the emphasis of that instrument did not accord completely with the panel's views of what was good clinical performance during a consultation. Their brief during the discussions was: to identify the relevant dimensions on which consultations should be assessed; to decide on appropriate items and response format for the rating scale; and to agree a final form when it had been applied to a pilot sample of video recorded consultations. One of the first decisions made was to draw a distinction betwen the appropriateness and adequacy of a doctor's clinical behaviour. These two aspects were then related to the doctors performance in seven areas:

(i) identifying the relevant complaints;

(ii) identifying relevant background factors;

(iii)conducting a physical examination;

(iv) interpreting the findings from the verbal and physical examination;

(v) reaching a decision on the outcome of the consultation (including prescriptions, plans for further investigation, recall, and referal);

(vi) communicating with the patient; and,

(vii)making a record of the encounter.

A final item concerned the doctor's efficiency in the use of time.

To each of the above variables was attached a seven point scale, running from inappropiate/inadequate (scored -3) to appropiate/adequate (scored +3) (mid point 0). The resulting 15 item instrument, with instructions for use which were also agreed, is shown in appendix E.

Having thus designed and piloted the instrument, the panel then applied it to the matched consultations. Each rater was required to assess 15 pairs of consultations. Thus each was provided with the notes available to the doctor at the time of the consultation, a complete verbatim transcription of the consultation, a full description of the physical examination conducted, and the notes made as a result of the consultation. The transcript was of all the utterances of doctor and patient. If the doctor mentioned the computer or the notes this was changed to read "records".

During silences the doctor's activities and their duration were described. Use of the computer or paper records were both referred to as "use of records". This procedure was necessary to preserve patient anonymity and to ensure that the rating was carried out blind (i.e in ignorance of whether it was from the computer use or non-use condition). Consultations were presented to raters in random order and in such a way that each case was rated independently by three seperate raters.

In rating procedures such as that used in this study it is desirable not only to have a demonstrably expert panel but also to show that individual experts agree in their assessments. If the delivery of care is a measurable aspect of a doctor's behaviour then it is necessary to show that it can be consistently quantified. Thus the panels' ratings were examined for inter rater reliability across consultations.

Over all consultations, and on each item, the distribution of each rater's scores were highly skewed (towards the positive end of the scale), making the use of parametric correlation statistics inappropiate for the assessment of inter rater agreement. Non-parametric tests of correlation were also inappropiate as too large a proportion of ratings was tied. For all scale items individual raters often assigned the same score to several of the consultations they rated. Therefore percentage agreements were used. The criterion set for agreement between any two raters was that there should be no more than a single scale point difference between them when rating the same consultation on the same item. Using this criterion it was found that across all pairs of raters over the 15 items agreement was typically 60% to 70%; mean percent agreement scores ranged from 45.6% to 80% (see table 18). With the seven point scale used and agreement defined as plus or minus one, agreement due to chance alone would be expected in 19 of 49 instances (38.8%).

Delivery of Care Item		Inter-rater Agreement (%)
Identified complaints	Appropriately	75.5
	Adequately	63.9
Identified background factors	Appropriately	68.9
	Adequately	62.7
Conducted physical examination	Appropriately	79.5
	Adequately	70.6
Interpreted evidence	Appropriately	78.9
	Adequetely	64.5
Medical decision reached	Appropriate	80.0
	Adequate	68.9
Communication with patient	Appropriate	65.5
	Adequate	45.6
Records made	Appropriate	68.3
	Adequate	57.2
Use of time	Efficient	56.6

Table 18: Mean % agreement between two raters independently applying the Delivery of Care Rating Scale

Using this level of agreement that would occur by chance as the base line, the Chi-square statistic shows that agreement above 60% is significant beyond the $p<0.001$ level (and 56% agreement is significant beyond the $p<0.002$ level). Clearly the raters in this study showed considerable convergence in their assessments of the standard of the delivery of care across consultations. Interestingly, the worst areas of agreement concerned the adequacy of communications with patients and records made. Perhaps doctors are not the best judges of the adequacy of communication, whereas it seems reasonable to assume that the latter oucome - records made - reflects controversy in the profession concerning how selective or inclusive doctors should be in making patient notes. The overall point, however, is that this procedure produced an appropriate, valid, and reliable measure of important aspects of the delivery of care for use for research.

7.2 Results

The objective of this study was to determine whether the use of the computer during the consultation had any discernable effects on the delivery of care. The relevant results are shown in table 19, where expert ratings of the standard of care attained in 30 conventional consultations are compared with those for 30 matched consultations during which the computer was used by the doctor. Correlated sample t tests showed that item by item there were no significant differences between the two conditions. With or with out the use of the computer doctors seemed to attain satisfactory standards of clinical care. In identifying complaints and background factors, conducting the physical examinations, interpreting the evidence, and reaching decisions, the use of a computer seems to have had no major effect. The results for the adequacy of communication with the patient, the adequacy of records made, and efficiency in the use of time are less clear because, as the lower levels of inter rater agreement show, these aspects of the consultation were less reliably measured.

Furthermore, in looking at the pattern across all 15 measured aspects of the delivery of care, there is a trend towards the computer condition attaining the lower scores. In 11 of the 13 instances where there is a difference, the consultations in which the computer was used are rated lower. This proportion is significantly lower than that expected by chance, at $p<0.05$ level of probability (Sign test). Thus, although there is no computer effect strong enough to emerge on the item by item analysis, there is evidence of a weak overall effect of computer use which

Delivery of Care Item (possible range of ratings -3 to +3, each item)		Mean Rating across three raters: No Computer Use	Computer Use
Identified complaints	Appropriately	1.8	1.6
	Adequately	1.4	1.3
Identified background factors	Appropriately	1.2	1.3
	Adequately	0.9	1.0
Conducted physical examination	Appropriately	1.4	1.2
	Adequately	1.0	1.0
Interpreted evidence	Appropriately	1.6	1.5
	Adequately	1.5	1.2
Medical decision reached	Appropriate	1.9	1.7
	Adequate	1.5	1.5
Communication with patient	Appropriate	1.6	1.3
	Adequate	0.9	0.7
Records made	Appropriate	1.5	1.3
	Adequate	1.0	0.6
Use of time	Efficient	1.4	1.1

Table 19: Effects of computer use on the Delivery of Care

is generally detrimental to the delivery of care. This does not appear to be a major concern for two reasons. First, the effect is small and standards of delivery of care remain positive. Secondly, the computer system was being investigated in a trial and the doctors were relatively inexpert in its use. If such a system were used routinely such a small negative impact would probably disappear.

A criticism that might be levelled at the results is that the measures of the delivery of care were too insensitive to show the effects of computer use. This seems unlikely, however, as other analyses showed that the measures discriminated effectively between the standards of care attained by the different doctors and the standards obtained in first consultations as opposed to follow up consultations. A two way analysis of variance of the mean ratings of the delivery of care by consulting doctor and consultation type (first presentation of symptoms or follow up visit) showed a significant doctor effect on the appropriateness of the physical examination ($F=3.15$, $p<0.05$) and near significant effects on the appropriateness of the identification of background factors ($F=2.45$, $p=0.058$) and the adequacy of records made ($F=2.34$, $p=0.068$). Significant effects for consultation type were shown on the appropriateness of the physical examination ($F=6.14, p<0.05$), and the adequacy of records made ($F=5.24$, $p<0.05$). The physical examinations were rated more highly in first consultations, and the adequacy of records was rated more highly for follow up consultations. These findings suggest that the measures of the delivery of care developed for this study were capable of showing effects of computer use during the consultation.

7.3 Discussion

The results show clearly that even when doctors are fairly inexperienced in computer use, using the computer for the review and update of patients' medical histories and encounter notes has no appreciable impact on the standard of the delivery of care. When coupled with the findings of previous research, showing no major negative effects on patient reactions (Cruickshank, 1984; Brownbridge et. al., 1985) and with other findings from this project showing no major impact on doctor-patient communication (Chapter 5), the results are encouraging for the development of computer systems for the consulting room. It was possible of course that the more intensive computer use, required by the management protocol used in consultations for hypertension, would be less innocuous. This possibility was the subject of a separate study, described in Chapter 8, which follows.

CHAPTER EIGHT: EFFECTS OF COMPUTER USE ON THE DELIVERY OF CARE IN CONSULTATIONS FOR HYPERTENSION

Currently many patients with chronic illnesses are being transferred from hospital to community based care. General practitioners are able to provide a more personal service for chronically ill patients than hospital doctors and, as they know their patients well, they may also be better able to identify and respond to individual patient needs. As general practitioners become responsible for larger numbers of routine consultations for chronic conditions, the establishment and use of management protocols could enhance their delivery of care. A major component of such protocols is a checklist of examinations and investigations, helping to ensure that all the necessary screening and monitoring procedures are carried out each time a patient attends surgery.

Computer terminals in the consulting room could provide interactive protocols which are less cumbersome to use, and therefore more practical, than paper-based forms. Computerized protocols can also be selective in the prompts they present, tailoring them to specific requirements in individual consultations. They can provide a profile of a patient's relevant history and information for monitoring the condition of individual patients over time and for evaluating treatment regimens on groups of patients.

This chapter reports a study of doctors' use of the interactive protocol for the management of hypertension provided by SPCS. It focuses particularly on the effects of protocol use on doctors' clinical behaviour during consultations - the range of verbal and physical examinations conducted, and the information recorded by the doctor.

8.1 Method

a) The protocol

The hypertension protocol provided by SPCS was briefly described in Chapter 3. Further detail of its development and structure is provided by Evans et al., 1985. A brief description is provided here, however, as the model for the delivery of care to hypertensive patients which was incorporated into the protocol provided the template against which the delivery of care in consultations for hypertension was judged.

The protocol consisted of a series of prompts for specific investigations to be carried out, or for decisions to be made, by the doctor during consultations for chronic hypertension. It was designed by a general practitioner involved in the project and a hospital consultant specializing in hypertension, with advice from the other general practitioners in the project. The management of hypertension was discussed, and a set of rules which were thought to reflect the optimum care for a typical hypertensive patient were drawn up. The protocol was then constructed from these rules. The protocol was used in paper form for a period of three months in routine consultations for hypertension, in order to test its design and compare it with the computerized version. The computer protocol was later used for a period of six months, again in routine consultations. Necessary information from the patients' records cards was entered into the computer. With the computer not all the prompts had to be presented every time the protocol was used - only examinations required at the particular consultation were prompted. Time-dependent examinations were omitted (for example examination of fundi was required only at six monthly intervals), as were those proscribed by answers already given.

The computer protocol presented four consecutive screens to the doctor during the course of the consultation. The first screen gave details of when the patient was recalled to attend the surgery, how early or late the attendance actually was, and if their was any special reason for attendance, for example if at the last consultation the blood pressure was outside target range or the protocol had recommended tests. The doctor was also prompted to ask the patient whether any of six new events had occurred since the last appointment (see figure 4, Chapter 3 page 76). The second screen displayed all the physical examinations which should be performed (a maximum of nine - figure 4), and the third screen displayed the last six recorded blood pressures in graphic form so that trends could be seen. The doctor was also asked to indicate whether the blood pressure was considered to be outside target. Finally, the fourth screen provided recommendations for tests, therapy review, referrals and recall.

b) Research design

Trials of the protocol took place at the larger of the two project practices only (see Chapter 3). Both manual and computer versions of the protocol were used in routine hypertension consultations by three doctors at one site of this practice. In the present study the other site provided a control - consulting room terminals were not introduced there and the same doctors worked at both sites. The consultations by each doctor at each site were studied during three time periods: T1, before the protocol had been introduced; T2, when the paper protocol was being used at the experimental site; and T3, when the computer protocol was being used at the experimental site. The design thus resulted in six distinct experimental conditions: four control conditions where no protocol was used and two conditions where protocols were used. The sample comprised 89 consultations; the number of consultations in each condition is shown in table 20.

c) Measures

Selection of the sample was opportunistic. All consultations for chronic hypertension which occurred during each data collection period were recorded on videotape until a suitable sample size with equal representation of each of the three participating doctors was achieved. From the video recordings of each of the consultations the occurrence of the following events was noted:

1. If the doctor asked a general question relating to the patient's health, for example "How are you?" or "Has anything new happened since I saw you last?"

2. If the doctor conducted any of the physical examinations included in the protocol (figure 4).

3. If the doctor asked specificaly for information on any of the events included in the protocol which require only verbal examination (fig. 4).

4. If the doctor asked any other specific, health related questions, not covered by the protocol.

5. If the patient provided any information on events included in the protocol - this may have been in response to 1 or 3 above, or volunteered.

6. If the patient provided any information on events not included in the protocol - this may have been in response to 1 or 4 above, or volunteered.

In addition it was noted if any information on events or examinations related to the protocol was recorded during each consultation. This was achieved by an examination of the patient's records, the paper protocol or the log of the computer's use, as appropriate.

d) Analysis

The percentage of consultations in which the doctor asked a general question relating to the patient's health was calculated for each of the six experimental conditions. For the other measures the mean number of occurrences per consultation in each of the six conditions was calculated. Two-way analysis of variance was used to test for differences in the mean value of each measure across the different experimental conditions, the independent factors being the experimental conditions and the doctor consulted. The analysis was designed so that any doctor effects and doctor by condition interaction effects were controlled for when experimental condition effects were being tested. Thus any effects of protocol use revealed (condition effects) could not be due to underlying differences between doctors and would be known to be common to all doctors. A set of four a priori contrast tests were also used on each of the study measures. These compared: a) mean at the control site during T2 with mean there during T3, to determine whether control sessions were affected by changing from paper to computer protocol at the experimental site; b) mean at the control site during T1 with the mean there at T2 and T3 combined, to determine whether introduction of the protocols affected the control sessions; c) mean at the experimental site during T2 with mean there during T3, to determine whether the computer protocol produced different results from the paper protocol; d) mean at the experimental site at T1 with mean there during T2 and T3 combined, to determine whether the introduction of protocols lead to changes at the experimental site. Again doctor effects and doctor by condition interaction effects were controlled for when these contrasts were tested.

8.2 Results

Table 20 presents means for all doctors on each of the study measures in each of the six experimental conditions. The results of the analysis of variance for the condition effect and each of the contrast tests are also shown. The analysis revealed significant doctor effects on some of the study measures but no interaction effects. Since these are incidental to the current concern with computer protocol effects, they will not be discussed here.

a) Physical examinations conducted and recorded

The use of the protocol had a considerable impact on the range of physical examinations conducted by doctors. The mean number of physical examinations included in the protocol which were conducted by the doctors ranged from 1.42 to 3.31 per consultation in the non-protocol conditions; when the paper and computer protocols were used the means were 5.78 and 6.93 respectively. The condition effect was statistically significant and contrast (d) showed that it was the introduction of the protocols which led to significant increases in the number of examinations conducted at the experimental site. Contrast (b) showed a significant carry-over effect to the control site, that is, doctors also increased the number of examinations they conducted at the control site after protocols had been introduced at the experimental site. However, the effect was notnearly as great at the control site as at the experimental site.

A similar pattern of results may be observed for the measure of information recorded on protocol-related examinations, although in this case there was no significant carry over effect to the control site.

In parentheses, it is interesting to note that in the sub-sample of consultations in which protocols were used, nine examinations were always prompted. The examinations which still tended to be omitted were urine, peripheral pulses and fundi. Peripheral pulses and fundi were not examined during consultations where the paper protocol was used; with the computer protocol peripheral pulses were examined in 33% of consultations and fundi in 53%.

	Control site			Experimental site			Condition effect	*A priori* contrast tests[a]			
	T1 no protocol	T2 no protocol	T3 no protocol	T1 no protocol	T2 paper protocol	T3 computer protocol	*F*	(a) *F*	(b) *F*	(c) *F*	(d) *F*
Number of consultations	12	13	14	17	18	15	—	—	—	—	—
General questions (% of consultations)	*83*	*69*	*100*	*82*	*94*	*80*	NS	NS	NS	NS	NS
Physical examinations included in the protocol	1.42	3.31	2.57	1.94	5.78	6.93	45.33•••	NS	13.54•••	NS	135.65•••
Specific questions on events included in the protocol	0.42	0.38	0.43	0.35	1.10	1.50	4.35••	NS	NS	NS	12.21•••
Other specific questions not covered by the protocol	0.33	1.00	0.21	0.70	0.33	0.13	2.40•	4.01•	NS	NS	6.24•
Information given by patient on events included in the protocol	0.42	0.38	0.57	0.41	1.22	1.60	5.48•••	NS	NS	NS	14.64•••
Information given by patient on events not included in the protocol	1.00	1.31	1.28	1.16	0.72	0.60	NS	NS	NS	NS	NS
Information recorded on protocol-related events	0	0.08	0.07	0	2.70	6.00	555.9•••	NS	NS	259.3•••	1435•••
Information recorded on protocol-related examinations	0.80	1.46	1.43	1.41	5.28	6.80	53.93•••	NS	NS	NS	139.3•••

• *P*<0.05. •• *P*<0.01. ••• *P*<0.001. NS = not significant. T1 = time period before the protocol had been introduced; T2 = when the paper protocol was being used at the experimental site; T3 = when the computer protocol was being used at the experimental site.

[a](a) Mean at the control site during T2 compared with the mean there during T3; (b) mean at the control site during T1 compared with the mean there during T2 and T3 combined; (c) mean at the experimental site during T2 compared with the mean there during T3; (d) mean at the experimental site during T1 compared with the mean there during T2 and T3 combined.

Table 20: Number of consultations, percentage of consultations in which the doctor asked a general question relating to the patient's health and mean number of occurences per consultation for each study measure in each condition. Condition effects and effects shown by four a priori contrast tests.

b) Verbal examinations conducted and recorded

Using the protocol also had an effect on the doctors' verbal examinations. The protocol always prompted the doctor to examine the patient verbally about the occurrence of six possible events (figure 4). The mean number of specific questions on events included in the protocol clearly increased with protocol use. The overall condition effect was statistically significant, and contrast (d) showed that protocol use increased the number of questions doctors asked at the experimental site. However, the mean values for the conditions where the protocol was used remained low. As expected, a similar pattern of results was observed for the measure of information given by the patient on events included in the protocol: this information was directly elicited by the doctors' specific questions. However, these two sets of figures contrasted interestingly with the mean number of protocol related events on which information was recorded during the consultation - the effect of the protocol was much more pronounced on this measure. It would appear that when using the paper protocol and, to an even greater extent, the computer protocol, doctors entered information which they had not explicitly elicited from the patient. Such entries almost always indicated that an event had not occurred.

c) Other questions

The percenage of consultations in which the doctors asked a general health question was apparently not affected by use of the protocol. Most consulations in all conditions included such an inquiry.

Analyses did reveal a significant condition effect on the number of specific questions not covered by the protocol which were asked by the doctor, that is, questions about other problems related to the patient's hypertension or about unrelated problems. Contrast (d) showed that significantly fewer questions not covered by the protocol were asked at the experimental site when the protocol was used. Contrast (a) also showed a significant change between periods T2 and T3 at the control site, a finding which is difficult to interpret, however, in view of the similarity there during periods T1 and T3. A similar trend is apparent for the measure of information provided by the patient on events not included in the protocol, although here the condition effect did not reach statistical significance. These measures do provide some evidence of a focusing effect of using a protocol.

d) Comparison of paper and computer protocols

For all the measures which are affected by protocol use the effect of the computer protocol appeared to be greater than that of the paper protocol. For the measure of information recorded on protocol-related events contrast (c) showed that the difference in means between the two protocol conditions reached statistical significance.

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8.3 Discussion

A well designed protocol for the management of patients with a chronic illness should represent a high standard of care for such patients. If the hypertension protocol used in this study was indeed well conceived then the study showed a significant improvement in the standard of care for hypertensive patients resulting from the doctors' use of the protocol. This is due particularly to the range of physical examinations conducted by the doctors during consultations for hypertension, which was considerably enlarged with protocol use. The number of possible new events specifically covered by the doctors' verbal examinations was also significantly increased by protocol use, although not to the same extent.

For both physical and verbal examinations there was also considerable improvement in the recording of findings, although in the case of verbal examinations it appeared that the non-occurraece of events was being recorded even though substantiating information had not been explicitly elicited. Brownbridge et. al. (1984) reported a similar finding in the "First Aid" study (see also Chapter 3). When the protocol was used the doctors usually asked one or two more specific protocol-related questions, but did not conduct the full verbal examination as suggested by the protocol.

It seems likely that the verbal examination with the protocol was too detailed and therefore inappropiate to the realities of a general practice consultation. A consultation in which the doctor asked such questions as, "Have you had a heart attack since I saw you last?" or "Have you had a stroke?" would undoubtedly have seemed unnatural to both participants and may well have worried the patient. Drury (1981) draws attention to the tendency of some doctors to set unrealistic and inappropiate standards for general practice. Designers of protocols for use in general practice consultations should be wary of this tendency. Protocols which are unrealistic in certain respects, even though generally well conceived, will not easily find acceptance among potential users. The protocol used in this study seems to have been over ambitious in parts and may have been improved if doctors had been able to respond "not applicable" to some of its prompts. It was possible for doctors to make such entries but in the case of prompts on specific new events it was much easier for them to answer yes or no. This aspect of the protocol's design was intended to encourage adherence. However, it appears that doctors preferred to use their own judgement and usually they deemed it unnecessary to ask specifically about all the events prompted while still feeling able to enter "no" in response to the prompts. With a simple "not applicable" response option the protocol would still present all the prompts, and thus offer the same potential for improving clinical performance, but at the same time its design would recognise the protocol's status as an aide-memoire. Such protocols are not intended to override the doctors owm judgement.

Comparison of computer and paper protocols

Providing the protocol's effects are of benefit then these findings suggest that a computer protocol would be advantageous over a paper one. In this study examinations of peripheral pulses and of fundi, which are required only at relatively long intervals, were more likely to be conducted when requested by the computer protocol than by the paper protocol. However, when using the computer protocol doctors were less likely to ask questions which were not required by the protocol than when using the paper protocol, and they recorded information on the absence of events which had not been explicitly elicited.

Both paper and computer protocols were time consuming to use. Extra time was taken in completing the protocols, as well as in conducting more thorough examinations (see Chapter 6). Doctors commented that the computer's guidelines for progressing through the protocol's screens could be confusing. With an improved user interface and an extended period of use, doctors may have been able to use the computer protocol more quickly. Computer protocols do offer some advantages over paper protocols; a computer can monitor a patient's condition over a series of visits and can be selective in its prompts, and the information recorded in it can be more easily retrieved for review.

Comparison of control and experimental sites

For most of the study measures there was no evidence of changes at the control site concurrent with the introduction of the protocols at the experimental site. For two measures however, namely the number of physical examinations included in the protocol that were conducted and the number of specific questions not included in the protocol that were asked, there was evidence of a carry over effect of protocol use from the experimental site to the control site. However, the size of the effects at the control site was not as great as at the experimental site. These findings suggest that changes at the experimental site were due to the introduction of the protocol and that actual use of the protocols was necessary to bring about the maximum change in the doctors' clinical behaviour.

Focusing effect of protocol use

This study also provided some evidence of a focusing effect of protocol use. When protocols were used doctors tended to ask fewer questions about problems which were not covered by the protocol, or which were not related to the patient's hypertension. This finding reflects the perennial problem faced by general practitioners dealing with people with chronic conditions - the patient may be attending with a problem which is not strictly related to the chronic illness being studied (Evans, 1985). One solution is to conduct special clinics for people with particular chronic problems only. Doctors might also find the use of special management protocols more amenable in such clinics than in a general surgery. When doctors are presented with this problem in a general surgery they can only use their own judgement to decide whether the other problem should take precedence over the chronic one already being managed. If a management protocol is being used then (assuming the doctors own judgement is good) this should not make the chronic problem more likely to take precedence. From the results presented here it is not possible to judge whether the protocol's focusing effect detracted from or improved the overall delivery of care. Peer review of video recordings would be necessary for such an assessment. However, in order to guard against this possible adverse effect the protocol's design might be improved by making the "other" category, under new events (fig. 4), more prominent.

The practical implications of the findings presented in this chapter are returned to and further discussed in Chapter 10, the concluding chapter of this thesis. First, Chapter 9 describes an empirical study which represents a slight change of focus. The research framework which has guided the studies described in this and the preceding chapters, was redeployed in a different setting. Thus Chapter 9 describes a study of a computer aid to history-taking, which was used by midwives in a hospital ante-natal clinic.

CHAPTER NINE: MIDWIVES' USE OF A COMPUTER TO TAKE BOOKING HISTORIES IN A HOSPITAL ANTE-NATAL CLINIC: ACCEPTABILITY TO MIDWIVES AND PATIENTS AND EFFECTS ON THE MIDWIFE-PATIENT INTERACTION.

In Chapter 3 of this thesis it was noted that computer systems designed for use during medical consultations have wide ranging potential. It is hoped that the investigations of the consulting room use of the IBM Sheffield Primary Care System, which have been reported in the preceding chapters, will provide useful guidance to the implementation of any medical consultation based computer system. The findings reported so far will naturally be most relevant to systems used by GPs, either for patient record keeping or for the provision of management protocols. However, they may also be generalizable to, for example, consulting room systems used by hospital doctors or nurses, for the same or for different purposes. In addition, the investigation techniques which have been developed and employed in the studies described so far, may also be useful in evaluations of sytems used in different settings and for different purposes.

While the studies reported in Chapters 5 to 8 were being conducted, an opportunity arose to test the generalizability of their research techniques and findings. The author was approached by Professor Richard Lilford, Head of the Department of Obstetrics and Gynaecology at St. James's University Hospital, Leeds, for collaboration in evaluating a computer system which was being implemented at St. James's. The present chapter describes a study which resulted from that collaboration. The study examined midwives' use of a microcomputer to take booking histories in a hospital ante-natal clinic, focusing on: (1) the effects of computer use on the midwife-patient interaction; (2) patients' views of the system and the effects of its use on their subsequent reactions to the interview; and (3) the user midwives views of the systems.

9.1 The Computer System

The obstetric record is particularly well suited to computerization as it consists of a limited amount of information which fits into a well defined structure. Most hospital ante-natal clinics presently use a paper-based questionnaire to take the booking history. The strength of computer-based questionnaires is that they may include more questions without being more onorous to use. An automatic branching program in the computer will ensure that unecessary questions are omitted but also that all the relevant ones are asked. Computer based systems thus offer the potential of increasing both the scope and the accuracy of history-taking.

The computer system investigated in this study is fully described elsewhere (Lilford et al.,1983; Lilford et al., 1985). It was designed to elicit a more comprehensive history than is usually obtained with a manual history questionnaire, and thus to improve the identification of fetal and maternal risk factors. The program contains 342 questions which the midwife may be prompted to ask the patient. In practice, however, only 88 questions are asked during the average interview. The questionnaire is divided into five sections (figure 10), following the pattern set out in most manual questionnaires.

1. General history - contraceptive history and menstrual history
2. Medical history - personal details, family history, gynaecological history
3. Obstetric history
4. Examination (weight, urine, blood pressure)
5. Present pregnancy experience and complaints

Figure 10: The main sections of the computer questionnaire

In the present study the system's hardware consisted of a Commodore microcomputer with visual display unit, keyboard and printer. These were placed on a desk in one of the clinic's consulting rooms. During the history-taking the midwife and the patient sit together in front of the desk. Questions are presented to the midwife on the VDU, she then questions the patient and enters the answer on the keyboard. At the end of the interview the printer provides a "hard copy" of the patient's history. This is then attached to the first page of the obstetric folder, where it takes the place of the traditional booking history.

The system has been previously used in successful trials at St. Bartholomew's Hospital and Queen Charlotte's Hospital, London. Previous evaluations of the system have concentrated mainly on its clinical efficacy. A cross-over study showed, for example, that the computer provided a much more complete history with an average of 16 additional items. Much of this information was of such importance as to warrant specific action on the part of the physician (Lilford et al., 1983).

In previous evaluations a very favourable consumer response was also noted. However, the consumer questionnaire used was very simple and directive. Furthermore, previous evaluations did not consider midwives views of the system or investigate the effects of its use on the midwife-patient interaction. A detailed examination of the psychological effects of computer use is obviously required, as, although computer use may result in a more complete history, it could detract from the interview in other ways. For example: if extra time is taken in obtaining the history the midwife may have less time for giving information and advice; computer use may detract the midwives' attention from the patient and may thus have a depersonalizing effect; both midwives and patients may therefore be less satisfied with the interview if a computer is used. The present study investigated these possibilities.

9.2 Method

Research Design

A sample of 95 ante-natal history-taking interviews was used. The sample contained (approximately) equal numbers of interviews conducted by each of three different midwives. Each midwife conducted 10 or 11 interviews using the manual history-taking questionnaire, which was standard to the clinic, and 21 interviews using the computerized history taking questionnaire. A greater number of computer histories were included to enable a comparison of early and late computer use. Patients were randomly allocated to non-computer and computer conditions as they presented, until the target sample was obtained. Comparison of mean values obtained on each of the study measures (see below) in non-computer and computer conditions was by analysis of variance, controlling for any effects of differences between conditions in patients' ages and whether patients had had a previous pregnancy. Examination of background data from the patient questionnaire (see below), showed the manual and computer groups to be largely homogenous with respect to ethnicity and social class.

Data Collection

Video recordings were made of all the interviews in the sample, with the informed consent of the participating patients and midwives. These were used for subsequent assessment of the midwife-patient interaction. Questionnaires were completed by the patients immediately after the interview. These elicited patients' ratings of the interview. Midwives' views of the system were elicited through a lengthy structured discussion session between the midwives and the author (who had no association with the clinic prior to the research), at the end of the study.

Assessment of the midwife-patient interaction

Two of the coders, who had applied the doctor-patient communication measures in the studies described in Chapters 4 to 6, applied some of the same methods of analysis to the video-recorded interviews. Ideally, all of the measurement techniques which had been selected in the study described in Chapter 4, and employed in the studies described in Chapters 5 and 6, would also have been used in the present study. Unfortunately resources could not support this, and only the Activity Analysis and Stiles' Taxonomy of Verbal Response Modes were used. Time would not allow use of the Interaction Rating Scale or of the

"Supplemented version" of Stiles' taxonomy

As previously, the Activity Analysis measured the duration of the interview and of a mutually exclusive set of types of activity during the interview. However, it was refined and adapted to be more relevant to the different type of interview. Thus, two main categories of activity were defined, "primary activities" and "secondary activities", secondary activities being sub-categories of primary activities. The "secondary" activities were the same as the activities distinguished by the Activity Analysis in the previously reported studies. The distinction between "primary" activities is also equivalent to the distiction between diagnostic and prescriptive phases previously used, but reflects the greater length and consistency of the present interviews.

Six primary activities were defined according to the focus of the interview, as follows:

(1) general history (includes contraceptive history and menstrual history);

(2) medical history (personal details, family details, gynaecological history);

(3) obstetric history (excluded if patient has had no previous pregnancy);

(4) physical examinations (e.g. weight, urine, blood pressure);

(5) present pregnancy experience and complaints; and

(6) feedback and advice.

The primary activities closely parallel the sectioning of the interview contained in the computerized and manual history-taking questionnaires. Within each primary activity six secondary activities were defined according to the focus of the midwife's attention, as follows:

(i) midwife's attention exclusive to the patient;

(ii) midwife's attention shared between paper records and patient (i.e. the midwife is writing in, or reading from, the paper records and talking to or listening to the patient at the same time);

(iii) midwife's attention shared between the computer and the patient;

(iv) midwife's attention exclusive to the paper records;

(v) midwife's attention exclusive to the computer; and

(vi) interruption, e.g. by another member of staff, i.e. the midwife's attention is elsewhere.

Stiles' Taxonomy of Verbal Response Modes, which was used according to the manual (Stiles, 1978), has been described in Chapter 4. A summary is provided below.

The speech of each interactant is split into distinct utterances. Each utterance is coded both on its grammatical form and its interpersonal intent, using one of eight mutually exclusive "Verbal Response Modes": Disclosure (D), Edification (E), Advisement (A), Confirmation (C), Question (Q), Acknowledgement (K), Interpretation (I) and Reflection (R). Thus 64 possible categories result.

The Stiles' taxonomy may seem very complicated but after familiarization and practice it may be applied quickly and reliably. The very logical coding rules and the allowance for mixed mode utterances avoids coding ambiguities which may arise with other verbal classification systems. In practice only a few of the 64 possible categories are used with any significant frequency, thereby simplifying the analysis. In this study only 12 different cotegories individually accounted for 3% or more of either interactants' utterances and collectively they accounted for 85% of all utterances. These were: DD, DE, QQ, EQ, EE, ED, KK, KD, KE, AA, IE and RQ (the first letter refers to the grammatical FORM of the utterance and the second to the interpersonal INTENT). Figure 11 shows a hypothetical exchange between midwife and patient and provides examples of each of these categories of utterance.

Figure 11: Hypothetical verbal exchange between midwife and patient illustrating the use of common verbal response modes

Midwife:	Do you get headaches? (QQ)
Patient:	Yes (KD) I feel pain here now and again (DD), it's worse in the evenings (ED).
M:	This is your first pregnancy? (EQ)
P:	Yes (KE)
M:	Have you ever had german measles? (QQ)
P:	No (KE)
M:	You've never had jaudice? (RQ)
P:	No (KE)
M:	Do you smoke cigarettes? (QQ)
P:	Yes (KE)
M:	How many? (QQ)
P:	I smoke about 20 a day (DE)
M:	You should cut down (AA), do you know why? (QQ)
P:	No (KD)
M:	Well, (KK) you can stunt the baby's growth by smoking (IE). The nicotine constricts the blood vessels in the placenta cutting off some of the oxygen to the baby (EE)
P:	Mmm (KK)

Assessment of patients' reactions to the interview

Patient perceptions of, and reactions to, the interview were examined by asking them to complete a questionnaire immediately after their interview. The questionnaire was an adaptation of that used in the previously reported studies (Chapters 3 and 4 and also Brownbridge et al., 1985). Patient views of and reactions to the interview were measured using indices of:

(1) Patient's affective satisfaction (8 items, alpha=0.85, e.g. "The midwife was very interested in me as a person", "The midwife was kind and understanding");
(2) Patient's cognitive satisfaction (3 items, alpha=0.81, e.g. "I have considerable confidence in the history taken during the interview");
(3) Patient's anxiety (4 items, alpha=0.74, e.g "Are you feeling nervous?");
(4) The main focus of the interview as perceived by the patient (1 item, multiple choice response format, e.g. "The interview focused mainly on my condition", "The interview focused mainly on my condition but also on me as a person");
(5) Patient's perception of the amount of information or advice given by the midwife (1 item);
(6) Patient's understanding of the midwife's information and advice (1 item);

(7) Patient's intention to follow the advice (1 item);

(8) patient views of the video recordings (1 item); and,

(9) patient views of the computer (if used) (3 items, e.g. "If you were to have your history taken again in this clinic, would you like the midwife to use a computer?".

In addition an 8-item scale (alpha=0.68) was included which assessed the patient's attitude to the idea of computers being used in medical interviews (example items, "I'd feel uncomfortable in a medical interview if a computer was used", "Computers will improve the standard of treatment"). The questionnaire was completed by all the patients in the sample. Appendix F is a copy of the questionnaire.

9.3 Results and Discussion

Effects of computer use on the midwives' primary activities during the interview and on the interview duration

Table 21 presents the mean durations of interviews conducted under either manual or computer questionnaire conditions and the mean durations of the midwives' primary activities in each condition. It is clear that interviews took significantly longer when the computer questionnaire was used. The mean duration increased from 23 minutes 40 seconds to 31 minutes 30 seconds. Midwives took significantly longer over the general history, the obstetric history (if there had been a previous pregnancy) and the present pregnancy experience, in the computer condition. The time spent on the medical history also tended to be longer when the computer questionnaire was used, but this effect did not reach statistical significance. There was no difference between the two conditions in the time spent by the midwives on physical examination of the patient (urine testing, blood pressure and weight). The time midwives spent giving information and or advice was significantly lower when the computer was used.

Table 21: Mean durations of the interviews and of the midwives' primary activities in manual and computer conditions. and significant differences between the means.

Primary activity (focus of interview)	Mean duration (seconds)		Significant differences	
	Manual questionnaire (n=32)	Computer questionnaire (n=63)	F	P
General history	270	487	76.2	***
Medical history	408	472	3.8	ns
Obstetric history (if present)	343	630	18.8	***
Physical exam.	105	118	0.2	ns
Present pregnancy	122	246	33.3	***
Feedback/advice	330	228	13.5	***
Duration of interview	1420	1890	40.3	***

ns = not significant; *** = p<0.001

It would seem that, although a more comprehensive history may be obtained by use of the computerized questionnaire, midwives take longer to obtain it. It seems also that, in order to compensate for the extra time taken in obtaining the history, midwives spent less time giving information and advice to the patient. It should be noted, however, that midwives were aware of the problem of fitting in information giving and advising, in view of the extra time which was required for history taking (see report of the discussion with the midwives below). They compensated for this by giving more information and advice during the physical examinations. Not all of the physical examinations were considered as part of the "interview" for the purpose of this study, as some were conducted in a seperate examination room and were not recorded.

Effects of computer use on the midwives' secondary activities

Table 22 shows the mean durations of the midwives secondary activities during interviews conducted under manual and computer conditions. As would be expected this reveals that midwives spent less time attending to manual records during interviews in the computer questionnaire condition. However, as midwives were also using the computer, in the computer condition the total attention to records (manual and computer) increased significantly. It seems that the computer questionnaire was used in the same way as the manual one had been, i.e. about two thirds of the midwives' attention to the computer was simultaneous with attention to the patient.

Table 22: Mean durations of midwives' secondary activities during interviews conducted under manual and computer conditions, and significant differences between the means

Secondary activity (focus of midwife's attention)	Mean duration (seconds)		Significant differences	
	Manual questionnaire (n=32)	Computer questionnaire (n=63)	F	P
Exclusive to patient	649	746	2.3	ns
Shared between manual records and patient	486	247	70.5	***
Shared between computer records and patient	N/A	451	N/A	
Exclusive to manual records	284	143	62.8	***
Exclusive to computer records	N/A	283	N/A	
Elsewhere (interruption)	0.3	17	4.5	*
Total attention to manual and computer records	770	1125	51.5	***

N/A = not applicable; ns = not significant; * = p<0.05; *** = p<0.001

Table 22 shows that the amount of time midwives spent attending exclusively to the patient also tended to increase with the introduction of computer use, but this difference did not reach statistical significance. In fact, when considered as a proportion of the total duration of the interview, exclusive attention to the patient decreased from 46% when the manual questionnaire was used, to 40% when the computer questionnaire was used. This decrease was statistically significant ($F=9.6$, $p<0.01$).

<u>Effects of computer use on the verbal exchange between midwife and patient</u>

Table 23 shows the mean number of utterances made by midwives and patients in interviews conducted under manual and computer questionnaire conditions. Both midwives and patients said more when the computer questionnaire was used. Of the 64 possible categories included in Stiles VRM taxonomy only 8 different categories were used with any significant frequency by midwives and 7 by patients (12 different categories in total). These were categories which individually accounted for 3% or more of all utterances by either interactant. Together the 12 categories accounted for over 85% of all the utterances by both speakers. Table 23 also shows the mean number of each speaker's utterances which fell into each of the common categories in manual and computer conditions, and the mean percentage of the speakers' total number of utterances for which each of these categories accounted. These figures show that not only did midwives and patients say more when the computer was used but also that the make-up of their verbal exchange was different.

Table 23: Mean frequency of occurence of each VRM category and proportion of utterances accounted for by each in non-computer and computer conditions

Type of Utterance	Mean number of occurrences		Significant differences		Mean percentage of utterances		Significant differences	
	Manual questionnaire	Computer questionnaire	F	P	Manual questionnaire	Computer questionnaire	F	P
Midwife								
DD	12.6	14.0	0.6	ns	4.3	4.2	0.6	ns
CQ	66.6	72.3	3.2	ns	23.8	22.5	0.9	ns
EE	57.4	55.2	0.3	ns	18.8	16.4	5.7	*
EQ	42.6	58.0	31.7	***	15.1	18.3	10.6	**
KK	22.6	20.3	0.2	ns	8.0	6.0	6.3	*
AA	10.4	7.6	7.6	**	3.4	2.2	22.6	***
IE	11.4	8.3	7.8	**	3.5	2.4	17.1	***
RQ	18.0	26.8	10.6	**	6.1	7.7	3.9	ns
Total No. of Utterances	289.3	332.8	7.9	**				
Patient								
DD	17.9	17.5	0.0	ns	8.2	6.7	2.8	ns
DE	20.8	23.5	1.0	ns	9.7	9.2	0.3	ns
EE	51.9	60.0	3.9	ns	25.3	24.0	0.8	ns
ED	5.7	7.7	4.2	*	2.7	3.1	1.4	ns
KK	23.8	17.2	3.8	*	10.8	7.0	16.5	***
KD	4.8	7.9	18.6	***	2.4	3.8	6.6	*
KE	64.0	85.5	51.0	***	32.4	37.5	4.9	*
Total No. of Utterances	207.2	241.9	6.1	*				

ns = not significant; * = p<0.05; ** = p<0.01; *** = p<0.001

As would be expected midwives asked significantly more questions when the computer was used; the frequency of both pure mode questions (QQ) (e.g "Is this your first pregnancy?") and mixed mode questions (EQ and RQ), i.e. utterances which are Questions in intent but Edification in form (e.g. "This is your first pregnancy?") or Reflection in form (e.g. "You've not been pregnant before?") tended to increase, but the increase was significant only in the case of mixed mode questions. As a proportion of all the midwives' utterances there was no increase in pure mode questions (QQ) when the computer was used, but the proportion of midwives' utterances which were mixed mode questions (EQ or RQ) did tend to increase, and in the case of EQs the increase was statisticaly significant. It seems that use of the computer questionnaire makes it more likely that questions will be formed in this way. This is probably because the patient can easily read the question from the questionnaire when the computer version is used, but not when the manual version is used. Knowing that the patient has read the the question it may seem more natural to the midwife to form the question as an Edification or a Reflection. What also happens occasionally is that the patient answers the question before the midwife has asked it, e.g.: The patient reads, "Is this your first pregnancy?" and says, "Yes". The midwife reflects the statement back as "This is your first pregnancy?" or "You've not been pregnant before?".

Midwives made less pure mode Advisements (AA) when using the computer questionnaire, both in absolute terms and as a proportion of all their utterances. Similarly, they made less mixed mode Edifications (IE), e.g. "You can stunt the baby's growth by smoking". There was no significant decrease in the number of midwives' pure mode Edifications (EE), e.g. "The nicotine constricts the blood vessels in the placenta" but as a proportion of the total number of midwives' utterances pure mode Edifications also decreased significantly when the computer questionnaire was used. This finding corroborates that of the Activity Analysis which showed that less of the interview focussed on feedback and advice when the computer was used.

The constitution of the patients' speech was also significantly affected by the introduction of the computer questionnaire. The changes are as would be expected given the changes in the midwives' speech. There are increases in the number of utterances of the type which convey information, i.e. those with Disclosure intent (revealing thoughts and feelings) and those with Edification intent (stating objective information). The number of patients' utterances which have Acknowledgement form and Disclosure or Edification intent (KD or KE) increase significantly both in absolute terms and as a proportion of all patients' utterances. The increase in these types of utterance obviously results as midwives are asking more questions. The findings also show that most of the extra questions asked by midwives as a result of using the computer questionnaire, are of a "closed queston" type, i.e. ones which require only "yes" or "no" answers, rather than more open questions which require a full sentence or sentences in reply.

There was also a significant decrease in the number and proportion of patients' utterances which are pure mode Acknowledgements (KK). This is also to be expected in view of the finding that midwives offered less information (EE's and IE's) and advice (AA's).

Comparison of early and late computer use

In order to investigate the effects of midwives' increasing experience of computer use, the measures from the Activity Analysis and from the Stiles' VRM analysis were examined in more detail. Comparisons were made of mean values on the measures of interviews conducted under 3 different conditions: (1) when the manual questionnaire was used (as previously); (2) the first 10 of each midwives "computer interviews"; and (3) the second 10 of each midwives computer interviews. The comparisons showed changes from condition (2) to condition (3) on some measures.

The Activity Analysis showed that the proportion of the interview in which the midwives' attention was exclusively with the patient increased from 37% in condition (2) to 44% in condition (3) ($F=18.1$, $p<0.001$). On this measure there was no significant difference between condition (3) and condition (1) (46%). Thus this aspect of the interview was only impaired when midwives were inexperienced in computer use. The total duration of midwives' attention to manual and computer records also decreased from condition (2) to condition (3) (means 1201 seconds and 1041 seconds, respectively) but this difference did not reach statistical significance ($F=3.44$) and midwives still spent significantly more time attending to records in condition (3) than in condition (1) (mean 770 seconds). Still, the findings suggest that with experience midwives became more adept at using the computer. There was a slight and insignificant decrease in the total duration of the interview from condition (2) to condition (3) (means 1940 seconds and 1836 seconds, respectively).

Differences were revealed between the three midwives when these comparisons were made. For one midwife there were no differences between conditions (1) and (3) in the proportion of exclusive attention to the patient, in total attention to records or in total interview duration. Thus, after using the computer for 10 interviews she could take a history as quickly with the computer as she had previously with the paper questionnaire, with no loss of attention to the patient.

Some of the adverse consequences of computer use revealed by the Stiles' VRM analysis also tended to be reduced in condition (3) as compared to condition (2). The investigation of computer use effects over all computer interviews has shown that the frequency and proportion of midwives' information giving utterances and advising utterances were reduced. The more detailed investigations showed that the decrease from non-computer interviews was statistically significant only in condition (2). In condition (3) midwives also gave less information and advice than in condition (1) but this difference did not reach statistical significance. Other computer use effects revealed by the Stiles' VRM analysis, the increase in midwife EQ's and RQ's and patient KE's and KD's were consistent from condition (2) to condition (3).

Effects of computer use on patients' reactions to the interview

Table 24 shows patients' mean responses on each of the questionnaire measures after interviews conducted with either the manual or the computer questionnaire. The results show that patients' ratings of interviews in either condition were very favourable. Furthermore, patients affective and cognitive satisfaction, their level of anxiety, their perceptions of the interview's main focus, perceptions of the amount of information and advice given by the midwife, their understanding of the midwife's information and advice, and their intention to comply, were all unaffected by the introduction of the computerized questionnaire. It would seem that the midwives' use of the computer was quite acceptable to patients. Patients' attitudes to the idea of computer use in medical interviews were in fact more positive if they had experienced the computer being used, suggesting that any fears patients might have had about computers were to an extent alleviated by actual experience of this form of interview.

Table 24: Patients' mean responses to the questionnaire measures after interviews conducted in manual and computer conditions

Questionnaire measure	Possible response range	Mean Response		Significant differences	
		Manual questionnaire n=32	Computer questionnaire n=65	F	P
Patients' affective satisfaction	1 (very satisfied) to 5 (very dissatisfied)	1.25	1.20	ns	
Patients' cognitive satisfaction	1 (very satisfied) to 5 (very dissatisfied)	1.45	1.46	ns	
Patients' anxiety	1 (not anxious) to 4 (very anxious)	1.79	1.61	ns	
Patients' perception of interview's main focus	1 ("me as a person") to 5 ("my condition")	2.96	2.96	ns	
Patients' perception of amount of info. or advice given by midwife	1 (none) to 4 (a great deal)	3.07	3.02	ns	
Patients' understanding of info./advice	1 (none of it) to 5 (all of it)	4.82	4.76	ns	
Patients' intention to follow advice	1 (none of it) to 5 (all of it)	4.43	4.51	ns	
Patients' attitude to the idea of computers in medical interviews	1 (very unfavourable) to 5 (very favourable)	3.51	3.79	5.76	*

ns = not significant; * = $p<0.05$

Other questionnaire items sought patients' views of the computer system more directly, and one item similarly sought their views of the video recording (see Table 25). Eighty one percent of patients thought the video recording had no effect on the interview and 17% thought only that it had "possibly a little" effect. Only two respondents thought the interview was influenced a "fair amount" by the video recording and none thought it was influenced "a great deal". Patients were also asked to say in their own words how (if at all) the interview had been affected. Only three respondents did so, e.g.

"Although the midwife explained everything I wanted to know, I may have asked more questions if the interview had not been filmed".

For a minority of patients, video recording may have adverse consequences and great care should therefore be taken with this technique. As was the case in the present study, patients should be fully informed of the video recording and should have have every opportunity to decline being recorded. The confidentiality of the recordings should be stressed and conscientiously maintained. For the majority of patients, however, video recording for research purposes will be quite acceptable. These findings parallel those reported by Herzmark (1985).

Table 25: Questionnaire items which directly assessed patients' views of the video recording and of the computer. and patients' responses

ALL PATIENTS (n=95):

Do you feel the interview was in anyway influenced because it was filmed?

	n of responses	% of responses
No, not at all	77	81
Possibly a little	16	17
Yes, a fair amount	2	2
Yes, a great deal	0	0

IF THE COMPUTER WAS USED (n=63):

Do you feel the interview was in any way affected by the midwife using the computer?

	n of responses	% of responses
No, not at all	42	67
Possible a little	18	29
Yes, a fair amount	2	3
Yes, a great deal	1	2

What do you think using the computer was like for the midwife?

	n of responses	% of responses
Don't know	4	6
It caused a lot of problem	2	3
It was probably a little difficult to use	14	22
She managed it easily	34	54
She found it easy and enjoyable to use	9	14

If you were to have your history taken again in this clinic, would you like the midwife to use a computer?

	n of responses	% of responses
No, I'd rather she didn't	1	2
I wouldn't mind either way	58	94
Yes, I'd rather she did	4	6

Patients' responses to the questionnaire's direct enquiries about the computer confirmed that to the majority of patients midwives' use of the computer was quite acceptable. Sixty seven percent of patients, who had experienced the computer being used, thought it had no effect on the interview and 29% thought it affected the interview "possibly a little". Only two patients (3% of those who had experienced computer use) thought it affected the interview "a fair amount", and one thought it affected it "a great deal". Five of the patients who had perceived some effect also offered explanations, both positive and negative effects were noted, e.g.:

"The interview seemed to be based around the computer. However it seemed to make it more fun";

"The midwife seemed to be new to using the keyboard - broke the ice because it mde her seem a person not just a nurse".

Patients were also asked if they would like the midwife to use a computer if they were to have their history taken again. Ninety four percent of "computer patients" said they "wouldn't mind either way" and four patients (6%) said "yes, I'd rather she did". Only 1 patient said "No, I'd rather she didn't". However, five patients also gave additional comments in response to this question and four of them were negative to the computer e.g.:

"It is perhaps a little more personal to write the information down - instead of both having to concentrate on keying the information in".

The findings from the patient questionnaire are similar to those from earlier surveys of patients views of consultation computer use (Cruickshank, 1984; Brownbridge et al., 1985). Overall, patients' reactions to their interviews are unaffected by the introduction of computer use, and if patients experience computer use in their own medical consultations they tend to be more favourably disposed to the idea of such an innovation. There is very little evidence of patients perceiving any actual benefits from computer use. It seems rather that, to a large majority, computer use is perceived as innocuous. To a small minority, however, computer use may be unpopular.

Midwives' views of the computer

On the whole midwives were very positive about their experience. Their enthusiasm was demonstrated most strongly by the wish expressed by all to continue using the computer after the study was complete. One midwife thought computer use had been a direct benefit to her. She had learnt from it the reasons for the detail of the history. The other midwives were not so sure that the computer had benefited them personally. However, all midwives agreed that the computerized questionnaire made sure things weren't missed out and so in the longer term could benefit patients. All the midwives also agreed that their use of the computer would be of benefit to the doctors. It made sure the doctors received the information they wanted. On this point the nurses showed some resentment at the way the computer system had been designed and implemented. Although the system was for their use they thought it had been designed completely by doctors and that it was the doctors who most directly benefited from its use. They thought the system could be improved if the whole ante-natal care team was involved in its design and in planning its implementation. During the course of the project the midwives had compiled a list of extra questions and prompts which they thought should be considered for inclusion in the program.

Another perceived problem with the computer was that it could depersonalize the interview and detract attention from the patient. The three midwives differed in the extent to which they were concerned about this issue. One midwife was very concerned, one was only slightly concerned and the third didn't think it was a problem.

A problem all the midwives agreed on was one of time pressure. They thought (correctly) that interviews took longer with the computer, this was partly due to the systems' slow response times but could also sometimes be due to the extra details required by the computerized questionnaire. The extra time taken by the computerized interview could be a problem for the whole clinic, rather than just for the midwife in question, as it reduced the availability of the midwife for other clinic duties. The problems of depersonalization and time pressure were thought to decrease as the midwives became more experienced in using the computer.

A consequence of the extra time pressure has also been identified by the analysis of the video recorded interviews, i.e. that nurses spent less time giving information and/or advice. When the computer was used the flow of the interview was largely directed by the computer. The midwives reported that they didn't know how best to fit in the things which they wanted to do but which weren't directed by the computer, e.g. giving advice about parent-craft classes or about breast feeding. The midwives maintained that they did give the same amount of information in "computer interviews", although it may not all have been recorded on video (information and advice was often given during the physical examination, all of which was not always recorded on video), but that the computer did cause problems in this regard.

Some more specific problems with the system's design were also noted during the course of the trial. Mistakes could only be corrected by proceeding to the end of a question sequence and then repeating that block of questions, and there was a lack of standardization in the key depressions required by the different questions, e.g. some required the return key but others did not.

9.3 Summary and Conclusions

Summarized below are the main findings of this study and the implications which derive from each.

Time pressure

Analyses of the video recordings and discussions with the midwives showed that histories took longer to obtain by computer and that this was responsible, at least in part, for a decrease in the amount of information and advice offered by midwives, especially in the early stages of computer use. The system's response times need to be improved with more modern equipment in order to speed up the interview. Midwives will probably become quicker at using the computer with experience and may be able to develop a completely satisfactory new routine. However the transition to the new routine could be eased from the outset in a number of ways, listed below.

(1) Train the midwives in a routine which will include adequate provision of information and advice.

(2) If necessary reorganize the clinic slightly so midwives may learn the new routine without feeling pressures of time.

(3) Include prompts in the computer program, for the provision of advice

and information.

(4) These arrangements should be chosen through discussion with the midwives who will use the system.

Depersonalization

Computer use had no effects on patients' overall reactions to the consultation, and their attitudes to the idea of computers in medical interviews tended to be more favourable if the computer had been used in their interview. However, two of the midwives were concerned about a possible depersonalization of the interview resulting from computer use. The attention which is required of the midwife by the computer may reduce the time which is available for the personal approach to the patient and for the development of rapport. The Activity Analysis showed that midwives' attention was distracted from the patient when the computer was used but that this effect was reduced or eliminated as they became more experienced with the computer. It was also found that a greater proportion of the midwives' questions were of a "closed" type when the computer was used, i.e. requiring only Yes or No answers from the patient. This could inhibit the patients from expressing their feelings or worries. The following guidelines may help to reduce these problems.

(5) The midwives in this study adopted a collaborative approach to

computer use, through a seating arrangement which enabled both the midwife and the patient to see the computer screen. This approach should be encouraged as common practice for future use (the same point would apply to the completion of manual questionnaires).

(6) Midwives could be encouraged to precede, and/or intersperse computer use with conversation with the patient. They might use these conversation periods to explore any worries or information requirements the patient might have, and to offer information, advice or reassurance, i.e. nurses can take positive steps to maintain the personal approach and rapport.

(7) Attention should also be paid to system design. The hardware and software should be designed with patient involvement in mind. The use of colour and graphics could make computer use easier for the midwife and more interesting for the patient. A summary of each section of the history on the VDU might further enhance the patient's feeling of involvement and trust in the computer history.

(8) Above all, perhaps, the computer must be easy to use, so that the midwife is not distracted by the computer. A simple "go back" button, enabling the midwife to reverse up the branching program would simplify the correction of errors. The key depressions required for answering different questions should be as simple and standardized as possible.

Leading questions

The Stiles' analysis of the video recorded consultations has shown another possible problem resulting from computer use. This is the increased tendency of midwives to form questions as edifications (e.g. "This is your first pregnancy?") or reflections (e.g. "You've not been pregnant before?"). It might be suggested that questions formed in this way are more "leading" than "pure mode" questions (e.g. "Is this your first pregnancy?"), and could thus result in less accurate information being obtained. To our knowledge this hypothesis has never been the subject of experimental investigation. An experimental test of the hypothesis is possible and would be worthwhile. It is of course a natural tendency of people in interaction to make assumptions about the other and therefore to use mixed mode questions. However, in the context of the medical history-taking interview, health care providers should guard against this tendency.

User Involvement

The midwives who particiated in this study were enthusiastic about the system and keen to continue its use. A degree of pride was also evident at their involvement in this innovative venture. It would be a mistake not to capitalize on this enthusiasm and make use of the midwives' ideas. The success of any new computer system is highly dependent on the user's enthusiasm for it, and on their degree of motivation to make the transition from previous methods. User enthusiasm and motivation will be enhanced by their involvement from the outset.

The computer program used in this trial is currently being re-written and will in future be used routinely in ante-natal clinics at St. James'. The redesign of the system and its implementation for routine use will be in accordance with the guidelines drawn up as a result of this study. It is hoped that the guidelines will also be useful in the future design and implementation of similar computer systems in different settings. Future evaluations may show that, with attention to the details as outlined above, the quality of the interview can be enhanced by computerized history-taking.

This study's findings closely parallel those of the studies of GP's consulting room use of SPCS, reported in previous chapters. Furthermore, the study has established that the evaluation framework, developed during the course of this project for the study of GPs' computer use, is also transferable to the evaluation of a different system, used by a different type of medical professional, in a different medical setting. It is suggested, therefore, that the evaluation framework will be widely applicable. In the following, concluding chapter, the research framework is more fully described.

CHAPTER TEN: CONCLUSIONS

This chapter summarizes the main findings of the thesis and discusses their practical and research implications. The first section covers the findings on the measurement of doctor-patient communication, and considers their relevance to communications research more generally and for medical practice and training. This is followed by a summary of findings on the effects of doctors' computer use on their communication with patients and their delivery of care. The implications of these findings, for future implementations of consulting room computer systems, are also discussed, and pointers are offered to the most useful directions for the development of such new systems. The final section illustrates explicitly the evaluation framework which has evolved in the course of this thesis and guided the research. A psychological research framework is thus offered for future evaluations of medical consulting room computer systems.

Throughout this chapter it must be borne in mind that the conclusions are all based on observations of a smaller number of doctors. Thus their representativeness of all General Practitioners may be questioned. However, results have suggested a wide range of consulting styles in the doctors studied, who also differed on age, sex and background. Still the major conclusions made here are true for all the ten doctors included in the studies and are thus likely to be further generalizable.

10.1 Doctor-Patient Comunication

10.1(a) The measurement system

The study described in Chapter 4 developed and validated a new and comprehensive system for the measurement of doctor-patient communication. The system includes a supplemented version of Stiles (1978a) Taxonomy of Verbal Response Modes. This provides a method of categorizing and tallying individual utterances by doctor and patient, which then enables the determination of the extent to which different types of verbal exchange occur. The verbal exchanges distinguished are "questioning", "exposition" and "advising". A distinction is also made dependent on whether the exchange is either doctor or patient dominated. The occurence of affective utterances, and non-verbal acts which express affect (e.g. laughter), is also measured. The system also includes two newly developed measures: an Interaction Rating Scale, which obtains subjective ratings of the doctor's manner and of the quality of the doctor's information provision; and an Activity analysis, which assesses non-verbal behaviour and provides information on basic consultation parameters.

The validation of the system showed it to be very reliable (in terms of inter-rater agreement), sensitive to differences in input to the consultation (characteristics of the participating doctor and patient), and able to predict the consultation outcome of patient's reactions. The system is relatively quick and easy to apply and, other than system specific training, no special skills or experience are required of the raters. It is also very wide ranging in the scope of its assessments. These features of the system made it well suited to serve the primary objective of the present research, i.e. to determine the effects of doctors' computer use during consultations on their communcation with patients.

Before moving onto this area a few more comments on the measurement system are inorder. It is hoped that the system will be of value to future researchers of the medical consultation. However, the limitations of the system, in its present state of development, should be noted. These are in three main areas, discussed below.

First, the system has been developed specifically for general practice consultations and, in its present form, may be less applicable to other types of medical consultation. Of course the system may be adapted to make it more suitable to different types of consultation. In the study reported in Chapter 9 the system was adapted to assess history-taking interviews in a hospital ante-natal clinic. The Activity analysis was adapted to better reflect these interviews (which were longer and more consistent than general practice consultations) and (again in view of the consistency of the interviews) the Stiles' Taxonomy was more useful in providing frequencies of different types of individual utterance, rather than of the super-ordinate types of verbal exchange. It is likely that the system in its present form could be similarly adapted to suit other types of medical consultation.

Second, although the system measures many different aspects, or ingredients, of doctor-patient communication, it takes little account of the way in which the different ingredients are combined. It is likely that the combination of the different ingredients of communication, is more important in determining the overall quality of communication, than the given quantities of any individual ingredients. In its present form the system does aggregate particular verbal response modes in measures of more global types of verbal exchange. The Interaction Rating Scale is also used for holistic assessments of the consultation. However, further development of the system in this direction is warranted. Given that we can now measure the quantity of different ingredients of doctor-patient communication, which are of demonstrated importance. The next step should be to investigate the significance of the relative quantities of these ingredients and of overall patterns of communication in terms of the sequence in which the different types of communication events occur. In this way it may be possible, using the basic measures as already developed, to develop measures of more global dimensions of doctor's consulting style. Possibly important dimensions are of doctor vs. patient centredness, directiveness vs. non-directiveness, or authoratative vs.

colloaborative. Along these lines, Stiles (1978b) has provided a method of assessing interactants performances on three different dimensions of interpersonal roles, overall scores for interactants "attentiveness", "aquiescence" and "presumptiousness" may be calculated from basic VRM frequencies. Such possibilities should be further investigated.

Third, the system provides a mainly quantitative, rather than a qualitative, description of doctor-patient communication. Thus although, for example, the system can inform on the quantity of information provided by the doctor, its method of assessing the quality of that information lacks sophistication. The system is therefore not well suited to more focussed research where the quality of a certain aspect of communications is a particular issue. In research of doctors' information provision, qualitative measures, of greater sosphistication than the interaction rating scale developed here, will be required. Such measures have been described by (for example) Boreham and Gibson (1978) and by Wallen et al. (1979) (both these studies were reviewed in Chapter 2). It seems likely that, in research of this type, specific measures will need to be developed for, and determined by, the particular communication issues and the type of consultation in question. Wide ranging, general purpose systems such as that developed here, will be less appropriate.

To summarize these points, a comprehensive system for the measurement of doctor-patient communication, of demonstrable reliability and validity, has been developed. The system was well suited to investigate the effects of computer use and should also be of value in future research. It may be directly transferable to new studies or may require adaptation to suit other types of consultation or other research issues. The system is inherently flexible so that adaptation to many different situations is possible. However, the system also warrants further development, particularly towards the measurement of more global dimensions of communication. Furthermore, for certain research issues (e.g. of the quality of doctors' information provision), alternative approaches to the measurement of doctor-patient communication may be more appropiate.

10.1(b) Consultation input-process-outcome relationships

The development and validation of the doctor-patient communication measurement system required extensive examination of consultation input-process-outcome relationships. Although not the primary focus of this thesis, these produced some interesting findings which are discussed here.

The most important determinants of the doctor-patient communication process were differences between the doctors themselves. Doctors differed significantly in the proportion of consultation time in which they attended exclusively to the patient, in showing solidarity with patients and showing and encouraging tension release, in the amount of information they elicited from patients, in their interpersonal manner, and in the quality of their information provision. The findings thus demonstate clear differences between doctors in consulting behaviours, and furthermore that these differences have important consequences for the doctor-patient communication process. A related point is that this consistency supports the existence of doctor "styles", and measurement systems capturing this could be developed (see page 249).

Differences between patients were also shown to affect the communication process. For example: the patients' presenting symptoms had a significant effect on the amount of attention the patient received from the doctor.

the amount of information and advice the patient received from the doctor. and the clarity of the doctor's information provision; patient's age affected the quantity and quality of the doctor's information provision: and patients' sex affected the doctor's inter personal manner and the amount of tension release in the interaction. Of course, by necessity, there will be differences between the processes of different consultations, determined by the differing needs of different patients. However, the findings summarized above suggest the existence of stereotyped approaches by doctors, to patients from different groups, which are not based in clinical necessity. These result in differences in the doctor-patient communication process for different patients, which could have consequences for important consultation outcomes.

The particular aspects of the communication process which were shown to significantly affect patient reactions were: the duration of any interuptions to the consultation (e.g. by a receptionist or a phone call), which was negatively associated with patient's satisfaction with the doctor's information provision; the amount of information and advice offered by the doctor, which was positively associated with the patient's satisfaction with their relationship with the doctor and their confidence in the efficacy of the treatment; the cheerfulness of the doctor's manner, which was positively associated with the patient's confidence in the efficacy of the treatment; the doctor's apparent degree of organization, which was positively associated with the patient's reported intention to follow the doctor's advice and their satisfaction with the doctor's information provision; and the apparent degree of tension in the interaction which was negatively associated with the patient's satisfaction with the doctor's information provision.

Patient reactions are of course important in their own right. More so, however, because of the likelihood that patients' reactions will affect their subsequent compliance with the doctor's advice, and thus the most important outcome of patient health (see Chapter 2).

The implications of these findings for doctors' consulting styles are clear. Doctors should be careful that their direction of the consultation process is aimed to meet the patient's needs. They should guard against any (probably unconcious) tendencies to treat different patients in different ways on any other grounds. During the consultation, doctors should take pains to avoid interruptions, they should give clear and comprehensive information and advice, they should seem cheerful and well organized, and they should avoid tension. The findings lend strong and broad support to those of previous studies of doctor-patient communication, and emphasize the importance of communication skills training in medical school curriculae.

10.2 The Use of Computers in General Practice Consultations

10.2(a) Effects on doctor-patient communication

Two separate studies of the effects of computer use on doctor-patient communication were described. As the computer provided facilities for general patient record keeping, and an interactive management protocol specifically for use in consultation for chronic hypertension, "general" consultations and consultations for hypertension were considered separately.

In general consultations the significant effects revealed were as follows: (1) Computer use lead to a significant increase in consultation duration (mean durations in non-computer and computer consultations were 294 seconds and 372 seconds, respectively, $F=5.36$, $p<0.05$); (2) Ratings obtained with the Interaction Rating Scale showed that doctors seemed less well organized and less attentive when they used the computer; (3) Doctors showed more solidarity with patients when they used the computer; (4) Doctors and patients showed more tension release when the computer was used.

Computer use during consultations had no significant effects on the actual amount of time doctors spent attending exclusively to the patient (though this tended to increase), or on the quality of information provided, the number of questions asked, or the amount of advice offered, by either doctor or patient. On individual ratings of the doctors' apparent sympathy, friendliness, cheerfulness and collaborativeness, of the quality and quantity of the doctors' information provision, and of the apparent empathy and tension in the interaction, there were similarly no signifcant effects of computer use. However, across all these ratings there was evidence of a slight impairment of the doctors' manner.

Perhaps the most worrying effect of computer use was revealed by an analysis of the relationship between the duration and manner of doctor' computer use, and patients' subsequent reactions to the consultation. This showed that the more time doctors spent attending exclusively to the computer, the less satisfied the patient was with their relationship with the doctor, and the lower was their intention to follow the doctors' advice. Thus if doctors spend a high proportion of consultation time on the computer in a way which excludes attending to the patient, it does have a detrimental effect.

In consultations for chronic hypertension, doctors' use of the protocols (either paper or computer) had no major effects on doctor-patient communication, other than those which could be expected as a result of doctors conducting more verbal and physical examinations (the protocol was intended to increase such examinations). These might make the consultations seem more formalized, and the doctors more directive, i.e. as there are more closed questions and more instructions by the doctors, but patient questioning exchanges were also more frequent, suggesting greater patient involvement when the protocols were used. Otherwise the verbal exchange was unaffected. There were no differences in the number of affective statements or the amount of tension release by either doctor or patient, and no difference in the amount of exposition.

In consultations for hypertension, as in general consultations, it seems that computer use did impair the doctor's manner. However, again the effect was not great. It may have been due to the unfamiliarity of the computer and might be expected to disappear if computer use became routine.

Overall, these findings give no indication that the effects on doctor-patient communication should deter doctors from using a computer during consultations. This is for three main reasons: (1) Although negative effects of computer use were found for some aspects of doctor-patient communication, these must be seen as minimal in the light of the much greater proportion of communication variables which were unaffected, and as some positive effects were also revealed (i.e. more solidarity and tension release); (2) the processes of doctor-patient communication were affected much less by doctors' use of a computer than they were by pre-existing underlying differences between the doctors who used it; (3) the computer system was a very early, experimental one and the doctors using it had no previous experience of computers, computer use was also made more problematic for doctors in view of the continued need to keep manual records.

If the system had become established for routine use then the negative effects on doctor-patient communication and on patients' reactions may have dissappeared. The system design could have been improved to make it quicker and easier to use, with pratice the doctors could have become more adept in its use and, with the discontinuation of manual records, the extra time pressure imposed by computer use would also have been reduced.

It is also possible to suggest a number of specific stategies which doctors might consider, in order to more successfully integrate computer use into the interaction:

(1) maintaining the interaction with the patient as much as possible while using the computer (the activity analysis showed that this is common practice in the use of manual records);

(2) seeking the patient's prior approval if it is necessary to concentrate on the computer to the exclusion of the patient; and,

(3) involving the patient with the use of the computer, e.g. by sharing information or through a seating arrangement which will enable the patient to see the computer screen.

Attention might also be paid to the design of the computer hardware and software, to make it more amenable to use in this manner, e.g. the screen could be made more legible through the use of colour and graphics.

10.2(b) Effects of computer use on the delivery of care

Findings from the evaluation of the consulting room use of SPCS, as discussed so far, have shown that while this had no major effects on patients' reactions to the consulation or on doctor-patient communication, computer use was a stressful experience for the doctors (Herzmark et al., 1984, see Chapter 3). This finding raises perhaps the most important issue of all: whether or not the use of a computer as an integral part of the consultation directly affects the standard of medical care provided. If such a system is demanding or stressful then it may distract the doctor from his or her primary clinical task.

In the present project doctors' delivery of care was measured using two different approaches. In general consultations doctors' clinical performance was assessed by a group of six independent GP trainers, using a "delivery of care rating scale" designed for the purpose (see Chapter 7). In the case of consultations for hypertension, doctor's performance was gauged against a specification of good practice, i.e. of relevant health questions asked of the patient, and physical examinations conducted.

In general consultations there were no significant differences between computer use and non-use conditions on ratings of any of the items in the delivery of care rating scale. With or without computer use the doctors seemed to attain satisfactory standards of clinical care. The results showed clearly that even when doctors were relatively inexperienced in computer use, using it for the review and update of patients' medical histories and encounter notes had no appreciable impact on the standard of the delivery of care. When coupled with the findings of previous research, showing no major negative effects on patient reactions (Cruickshank, 1984; Brownbridge et al., 1985) and with other findings from this project showing no major impact on doctor-patient communication, the results are encouraging for the development of computer systems for the consulting room.

In contrast with the computer's facicilities for general consultations, its hypertension protocol was intended to have a direct, positive impact on the standards of care attained in consultations for hypertension. The study reported in Chapter 8 showed that such improvement was indeed obtained.

The most positive of this study's findings were that: (1) The numbers of recommended physical examinations conducted and recorded tended to increase threefold when paper or computer protocols were used; and (2) The number of recommended verbal examinations conducted also increased significantly, although not to the same extent as did the physical examinations. However, some possibly negative consequences of using the computer protocol were also found. The number of verbal examinations recorded when protocols were used increased disproportionately to the increase in such examinations actually conducted, as doctors often infered the absence of problems about which they had not specifically enquired. Doctors also asked fewer specific, non-protocol, health related questions when the protocols were used - suggesting a focusing effect of protocol use. The more comprehensive coverage of hypertension thus comes with a danger of missing other medical problems.

Undoubtedly, these findings are very positive overall. As the clinical algorithm on which the protocol was based represents a good standard of care for patients with hypertension, the increases in the numbers of physical and verbal examinations (included in the algorithm) conducted and recorded when the protocol was used represent a major improvement in the standards of care attained. These increases always tended to be higher when the computer protocol was used than when the paper version was used, confirming the greater efficacy of the computerized version. However, the findings also suggest a need for caution in the design and use of computerized management protocols.

There was a tendency for doctors to record unsubstantiated information into the computer protocol. This may have reflected a fault in the protocol's conceptual design. In order to encourage doctors' adherence to the protocol, the design made it easier for doctors to record a problem as absent than to overide a prompt for information. In practice, doctors preferred to use their own judgement and usually they deemed it unnecessary to ask specifically about all the events prompted, while still feeling able to enter "no" in response to the prompts. A simple "not applicable" response option may have reduced this problem.

Another possible problem with protocol use was its "focusing effect". On the basis of the study evidence it is not possible to conclude whether this was a desirable or undesirable effect. However, to guard against possible adverse consequences in this respect the protocol could have made the non-specific "other" category for verbal examinations, more prominent.

The findings discussed above emphasize the need for a broad research and development framework if computerized management protocols are to lead to improved clinical care in general practice. The clinical algorithm used in such protocols is of prime importance and consensus between practitioners on the algorithm must be achieved. However, the user interface is of equal importance, and the evaluation of any protocol should also include investigations of the type used here. Use of the protocol in practice must be acceptable to a wide variety of individual doctors and patients in a variety of locations. It must not seem onorous and must not place undue pressure on doctors to conform. The computer protocol used in this project was based on a simple algorithm and was only intended to jog the doctor's memory. It is unlikely that expert systems capable of bettering the doctor's own decision making abilities in all situations will be available in the forseeable future, if ever. Thus doctors must be ready to override computerized prompts with their own judgement, for they, not the system, take responsibility.

10.2(c) Consulting room computer systems - Directions for Future Development and Research

As was the case in 1981, when the consulting room terminals of SPCS were first installed, the use of computers in primary care consultations is still very rare. However, since that time many GPs have become much more experienced in the use of computers, albeit in their office areas only. Furthermore, the pressure on our primary health care system, to place greater emphasis on prevention and generally to increase the quality of health care, has noticeably increased. This pressure comes from within the medical profession, from government, and from health service consumers. A perusal of recent media reports on, for example, cervical cancer, breast cancer and AIDS, supports this point.

Along with these developments, the sophistication of medical computing systems has also significantly increased. Several primary care systems designed for consulting room use are now commercially available. Given their potential for improving standards of care, and the present climate as described above, it seems likely that consulting room computers will become much more common during the next decade. If this is the case, it is of the utmost importance that their use does not in any way detract from the overall quality of health care provision, e.g. by interfering with doctor-patient communication or patient satisfaction.

The studies reported in this thesis show that the use of a computer during medical consultations need not detract from the quality of care provided, indeed that it can improve standards. It is important however that future implementations take heed of the lessons learned and guidelines provided here. Furthermore, as the "new generation" of systems will undoubtedly differ significantly from SPCS, and will be used by different doctors in different settings, it is important that they are also evaluated before their routine use is accepted.

The present studies also suggest directions for the future development of consulting room systems, with respect to the optimal type and pace of implementation. Computer users should have an understanding of, and desire for, the potential benefits of the system, if they are to be motivated to the extra effort which will be required during the process of change. New skills will need to be learned by users, not only in operating the system, but also in order to successfully integrate computer use into their interactions with patients. Effective consulting room applications are more likely in practices which are already successfully operating a system without consulting room access. Furthermore, doctors will be more likely to make the effort required in learning to operate and integrate the computer if they perceive some immediate benefit from its use.

The hypertension protocol provided by SPCS was the one facility which was both acceptable to doctors and resulted in improvement of the standard of care provided. This finding suggests that in the short term, consulting room terminals might be most effectively used to provide the doctor with direct clinical support during the consultaton (e.g. through management or history taking protocols, prompts for opportunistic preventive measures, or prescribing information) rather than for general record keeping.

It is also likely that for any consultation based computer system a gradual implementation process will be more successful than an attempt at rapid and extensive change. Systems such as SPCS, which are designed to provide wide ranging facilities, might be more successful if their different functions are introduced one at a time. The order in which different functions are introduced will also be important. This should take account of the relative ease of implementation and use, of the different proposed facilities, and of the perceived priorities of the would be users.

10.3 A Psychological Research Framework for the Evaluation of Medical Consulting Room Computer Systems

The basic questions which have been addressed by this thesis are simple: (1) How does a doctor's use of a computer during medical consultations affect communications between doctor and patient? and, (2) How does a doctor's use of a computer during medical consultations affect the doctor's delivery of clinical care?

However, although the questions posed were simple, prior to the research described here, the ways in which they might be addressed were very obscure. It is hoped, therefore, that the research framework which has been developed and used in the present research will also be of value to future researchers. Figure 12 lists the basic components of the framework. The interrelations of these components are illustrated in the following discussion, which aims to make the framework more explicit.

RESEARCH DESIGN

Experimental

Ideally Longtitudinal

RESEARCH SUBJECTS

Patients

Doctors

Other Health Workers

The Consultation

The Doctor-Computer Interaction

RESEARCH METHODS

Structured Interviews

Questionnaires

Interactional Analysis

Analysis of Medical Records

Figure 12: Components of the Evaluation Framework

a) <u>Research Design</u>

In research of computer use in medical consultations an experimental approach is particularly suited. This is for a number of reasons, e.g.: (i) the consultation is a very self-contained interaction, which, once commenced, is little affected by outside events; (ii) different experimental conditions can be easily acheived, e.g by using a computer or not; (iii) the consultation may be easily observed in its entirety; (iv) medical consultations are of very frequent and widespread occurance, enabling large samples to be obtained.

In the present research, an experimental research design was approached by comparing consultations conducted by the same doctors, with very similar patients, with and without use of the computer. In the circumstances under which the research was conducted this was the closest approximation to a "true" experimental design which could have been acheived. A more rigorous research design would have been possible. For example, a repeated measures design in which control and experimental conditions include the same doctors consulting the same patients. A control for the "time factor" could also be built into such a design, if half the patients were first consulted under the experimental condition and half were first consulted under the control condition.

Although the experimental approach may be useful, researchers should not adopt a "tunnel vision", as a result of their research design. In a "real world" setting, researchers will inevitably absorb a wealth of information which will not readily submit to the constraints of their research design. It is of course impossible to assimilate all observations into the findings of an evaluation. However, researchers should not ignore or discard "extraneous" observations and impressions. These may at some time be important in placing empirical research findings in an appropriate context, or may illuminate weaknesses, and thus necessary refinements, of the adopted research design.

Another research design issue concerns the duration of the research and the timing of its assessments. The design used in the present research may be termed cross-sectional, as, for individual patients, assessments were made at a single time period. That is, during and immediately after a medical consultation. Ideally a longtitudinal research design would have been used (for practical reasons it could not be). For example, patient assessments could have taken place immediately before and immediately after their consultations, a few days after their consultations, and a few weeks after their consultations. This would have enabled direct investigation of: (i) changes in the patients' attitudes, concerns and understanding, brought about by the consultation; (ii) patients' compliance with the doctors' instructions; and (iii) changes in patients' health status. In investigations of the quality of care provided to patients with chronic conditions, the research design would ideally include assessments of series of consultations.

PAGE

NUMBERING

AS ORIGINAL

b) <u>Research subjects and research methods</u>

In evaluations of computer use in medical consultations five major "research subjects" may be identified: (i) patients; (ii) doctors; (iii) other health workers; (iv) the consultation; and (v) the doctor-computer interaction. [In the present discussion the term "doctor" is used to refer to the health worker who uses the computer during the consultation. This may not always be an actual doctor, in the study described in Chapter 9, for example, it was a midwife. "Other health worker" is used to refer to any health worker whose work may be affected by the "doctor's" computer use, although they do not themselves use the computer in consultation.] The computer itself may seem conspicuously absent from this list. However, for present purposes, the computer may best be regarded as a "research object", as the object of the research is to inform the design of a better computer.

To research such subjects, four main types of research method seem to be particularly useful: (i) structured interviews; (ii) structured questionnaires; (iii) interactional analysis; and (iv) analysis of medical records. The following section delineates each of the identified research subjects and the research methods by which each may be addressed.

(1) <u>Patients</u>

Within the evaluation framework patient inputs to the consultation and consultation outcomes for the patient, are of prime importance. Patient inputs include socio-demographic variables, e.g. age, sex, ethnicity and socio-economic status; presenting problems; and attitudes, e.g to health and the medical establishment, or to computers. Such inputs to the consultation must be considered as they are known to affect consultation processes. Outcomes of consultations for the patient are the acid test of the quality of care provided. These include patients' immediate reactions to the consultation, their subsequent compliance with the doctor's instructions, and their subsequent health status. In the present research, practical constraints limited investigations to the immediate consultation outcome of patient reaction. Ideally a broader framework should have been employed, which would have included the intermediate outcome of patient compliance, and the longer term outcome of patient health. Interview and/or questionnaire techniques may be used to assess patient inputs, and patient reactions. They may also inform on patient compliance and patient health status. However, ideally, more objective data from medical records should also be used in systematic assessments of compliance and health status. Medical records may also inform on certain patient inputs (e.g. age, sex, presenting problems).

(ii) Doctors

The most important doctor characteristic within the evaluation framework is their behaviour during consultions. Undoubtedly, many factors interact to determine this, e.g. the doctor's age and sex, education and background, working environment, and personality. However, in the present context such finer distinctions are less important given the small number of doctors one would expect to be involved in a particular evaluation. A doctor's behaviour during consultations may be assessed through interviews, questionnaires and through interactional analysis of their consultations.

(iii) Other Health Workers

In the present project there has been little mention of other health workers. For practical reasons the focus had to be limited. Ideally, other health workers, whose work is affected by the doctor's consulting room computer use (e.g. the doctor's receptionists, hospital consultants, pharmacists), should also be included in evaluations. This could be through interview or questionnaire techniques.

(iv) The consultation

Two aspects of the consultation process are of major importance to the evaluation framework: doctor-patient communication; and the doctor's delivery of clinical care. A research method which may be used to assess either is interactional analysis. The present research has developed a number of methods of interactional analysis which should also be of value in future evaluations. These are the comprehensive doctor-patient communication measurement system developed in the study described in Chapter 4, the delivery of care rating scale developed in the study described in Chapter 7, and the analysis of doctor's clinical behaviour in consultations for hypertension, which was described in Chapter 8.

Although they were not extensively used in the present research, retrospective methods may also be considered for assessments of consultation processes. In the present project, patients' perceptions of their consultations, elicited through post-consultation questionnaires, were employed. Doctors' retrospective views of consultations might be similarly used, as might retrospective analyses of medical records.

(v) <u>The doctor-computer interaction</u>

The evaluation framework employed in the present research reflects a mainly social psychological approach. Thus the research has rarely focused directly on the doctor-computer interaction itself. Rather it has focused on the human interaction (between doctor and patient) within which the doctor-computer interaction takes place. Indirectly, of course, the doctor-computer interaction has been a major research subject, as it is the effects of this interaction on the doctor-patient interaction which has been the primary subject of the thesis. It is useful to consider, however, that a cognitive and ergonomic approach, while being less concerned with such social consequences, would have focused directly on the doctor-computer interaction. Such studies would have aimed to identify those characteristics of the computer hardware and software which made it easier or more difficult to use. Such an approach to evaluation can therefore be very useful in informing future systems design. The present project has to an extent assessed the doctor-computer interaction and has thus provided some important guidelines for future systems design. For example, the analysis of the doctors' entries into the treatment screen (reported in Chapter 3), pointed to the need for more structure and standardization, while the analysis of doctors' entries into the computer's hypertension protocol (Chapter 8) indicated the need for a more flexible design. A greater emphasis on ergonomics might have produced further practical guidelines. It is therefore suggested that the framework used in future evaluations should include, and balance, both social psychological and ergonomic approaches.

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APPENDICES

APPENDIX A

Excerpt from a consultation transcript rated according to the methods of Bales; Byrne and Long; and Stiles.

KEY

D: utterance(s) by doctor
P: utterance(s) by patient
/ boundary between utterances

X: code(s) according to Bales categories (see figure 5, p)
Y: code(s) according to Byrne and Long categories (see figure 7)
Z: code(s) according to Stiles' verbal response modes (see figure 6)

* not coded

D: Hello my dear/ Make yourself at home/

X:	shows solid.	shows solid.
Y:	giving recog.	giving recog.
Z:	KK	AA

D: Right/ What can I do for you?

X:	*	Asks for orient.
Y:	*	Offering Self
Z:	IK	QQ

P: Well/Since last time I saw you/I came with a pain in my stomach

X:	*	gives orient.	gives orient.
Y:	*	*	*
Z:	KK	DE	DE

D: Thats right/ yes/

X:	agrees	agrees
Y:	indic. und.	indic. und.
Z:	EC	KK

P: I've felt awful on and off/ fluey and aching and shivering/

X: gives orient. gives orient.
Y: * *
Z: DD DD

P: and then hot and weak and tired/

X: gives orient.
Y: *
Z: DD

P: and also I think I've had a bowel problem on and off/

X: gives orient.
Y: *
Z: DD

D: What's happening?/

X: asks for orient.
Y: direct question
Z: QQ

P: Some days I can be alright/

X: gives orient.
Y: *
Z: DD

P: and then another day I can go 3 or 5 times in a day and it finishes up watery/

X: gives orientat.
Y: *
Z: DE

P: I keep off fried stuff/ I've found out it still happens/

X: gives orient. gives orient.
Y: * *
Z: DE DE

P: even with just sandwiches I can still get it/

X: gives orient.
Y: *
Z: DE

P: It doesn't happen everyday/Ican go 2 or 3 days or even longer/

X: gives orient. gives orient.
Y: * *
Z: DE DE

P: and I seem alright/

X: gives orient.
Y: *
Z: DE

D: Well/ purely as a precaution/ because there's a bug going round/

X: * gives orient. gives orient.
Y: * gives inf. or opin. gives inf. or opin.
Z: KK EE EE

D: lets give you this chit/

X: gives suggestion
Y: directing
Z: AA

D: and you can fetch us down a sample of your faeces/

X: gives suggestion
Y: directing
Z: AA

D: and we'll send it straight off/ That's before I forget it/

X: gives orient. gives orient.
Y: gives inf. or opin. gives inf. or opin.
Z: DD ED

D: right/ yeh?/

X: * asks for orient.
Y: seeking ackno. seeking acknowledgement
Z: IK KQ

P: I'm just wondering if it could be a side effect of .../

X: gives orientation
Y: *
Z: DD

D: They don't say so/ but its not impossible/

X: gives orient. gives orient.
Y: anwering pat. quest. answering pat. quest.
Z: EE EE

D: But the first thing we have to do is to feel your tummy again/

X: gives orient.
Y: gives information or opinion
Z: EE

D: Its 2 months since we did/ so we might as well feel it again/

X: gives orient. gives orient.
Y: gives inf. or opin. gives inf. or opin.
Z: EE EE

P: Mmm/

X: agrees
Y: *
Z: KK

D: Its a possibilty that you might have a bug/ right/

X: gives orient. asks for orient.
Y: gives info. or opinion seeking acknowledgement
Z: EE QE

P: Its possible/ yeh/

X: gives orient. agrees
Y: * *
Z: EC KC

D: So thats one problem/

X: gives orient.
Y: gives inf. or opin.
Z: EE

D: So having said that do you need any of your tablets today or not?/

X: asks for orientation
Y: closed qouestion
Z: QQ

P: Yes/ the..../

X: gives orient. gives orient.
Y: * *
Z: KE EE

D: So that's all you need today?/

X: asks for orientation
Y: closed question
Z: EQ

P: yes/

X: gives orient.
Y: *
Z: KE

D: Right/ well/ how about nipping in next door/

X: gives orient. gives suggestion
Y: * * directing
Z: IK KK QA

D: and just unzipping a little so I can feel your tummy/ right?/

X: gives suggestion asks for orient.
Y: directing seeking acknowledgement
Z: AA QQ

D: So I'll come straight in in a moment/

X: gives orient.
Y: gives info. or opinion
Z: DD

APPENDIX B

RAYNE'S (1980) CATEGORIES OF PATIENTS' PRESENTING SYMPTOMS.

(1) Physical symptoms

(2) Psychological symptoms (mood, behaviour, depression, anxiety, marital problems, delusions, phobias)

(3) Social problems (housing, leisure, work or family problems, excluding marital problems)

(4) Patient feels unwell but is unable to identify specific symptoms

(5) Problems relating to pregnancy

(6) Improvement in condition being treated

(7) No change in, or worsening of, condition being treated

(8) Physical symptoms with psychological symptoms superimposed

(9) No symptoms

APPENDIX C

THE PATIENT QUESTIONNAIRE ITEMS USED IN THE STUDY

Indices of patient reactions used in the study reported in Social Science and Medicine: Brownbridge, G., Herzmark, G. A., and Wall, T. D. Patient reactions to doctors' computer use in general practice consultations. Soc. Sci. Med., Vol. 20, No. 1, 47-52, 1985

Questionnaire index of: Doctor attentiveness and rapport

Questionnaire items included	Response format
1. The doctor was very interested in me as a person	strongly agree ☐☐☐☐☐ strongly disagree
2. The doctor listened carefully to what I said	☐☐☐☐☐
3. I was able to tell the doctor all the things I wanted to	☐☐☐☐☐
4. The doctor took a lot of trouble to get it right	☐☐☐☐☐
5. The doctor explained everything in terms I could understand	☐☐☐☐☐
6. The doctor was kind and understanding	☐☐☐☐☐
7. Do you feel the doctor gave you sufficient time and didn't hurry you? *	plenty of time ☐ a bit hurried ☐ fairly hurried ☐ very hurried ☐
8. How satisfied are you with the way you and the doctor got on with each other *	completely satisfied ☐ very satisfied ☐ fairly satisfied ☐ a bit dissatisfied ☐ very dissatisfied ☐

* N.B. Asterisked items were presented in two forms to all patients, relating to patients perceptions of the doctor 'TODAY' and 'USUALLY'. Initial analyses showed no significant differences in responses to the two types of item and so responses to the latter type ('USUALLY') were excluded from subsequent analyses.

(292a)

Index: Perceived information provision by the doctor

Questionnaire items included	Response format
1. Did the doctor tell you enough about what was wrong with you? *	enough ☐ almost enough ☐ not enough ☐ nothing ☐
2. Did the doctor tell you enough about what the treatment for your illness or problem would be? *	enough ☐ almost enough ☐ not enough ☐ nothing ☐

Index: Perceived computer use by the doctor

Items included	Response format
Did the doctor have to get any information from a computer	yes ☐ no ☐ possibly ☐
Did the doctor use a computer terminal during the consultation	yes, a great deal ☐ yes, a fair amount ☐ possibly a little ☐ no, not at all ☐ don't know ☐

Index: Expected ease of compliance

Item included

How difficult will it be to follow the advice *

Response format

very difficult [ ]
quite difficult [ ]
quite easy [ ]
very easy [ ]

Index: Reported intention to comply

Item included

How well will you follow the advice? *

Response format

completely [ ]
most of it [ ]
some of it [ ]
little or none of it [ ]

Index: Satisfaction with standard of treatment received

Item included

How satisfied are you with the standard of treatment you've received from the doctor? *

Response format

completely satisfied [ ]
very satisfied [ ]
fairly satisfied [ ]
a bit dissatisfied [ ]
very dissatisfied [ ]

(292c)

Index: Perceived effect of computer on consultation

Item included

Response format

Do you feel the consultation was in any way affected by the doctor using the computer?

- yes, a great deal ☐
- yes, a fair amount ☐
- possibly a little ☐
- no, not at all ☐

If yes, please say in what way:

____

____

Index: Patients' post-consultation stress

Items included

Response format

1. Are you feeling tense?
   - not at all ☐
   - slightly ☐
   - fairly ☐
   - very ☐

2. Are you feeling puzzled?
   - not at all ☐
   - slightly ☐
   - fairly ☐
   - very ☐

3. Are you feeling worried?
   - not at all ☐
   - slightly ☐
   - fairly ☐
   - very ☐

(292d)

APPENDIX D

RELATONSHIPS BETWEEN CONSULTATION INPUT, PROCESS AND OUTCOME MEASURES AS REVEALED BY STEPWISE MULTIPLE REGRESSION ANALYSES (SEE CHAPTER 4)

KEY

Consultation Inputs

DR	Doctor consulted
SYM	Patients' presenting symptom(s)
AGE	Patient's age
SEX	Patient's sex
REG	No. of years patient has been registered with the practice
VIS	No. of visits patient has made in the last year
ODR	Wether consultation was with the patients own doctor

Consultation Outcomes (questionnaire measures)

RELSAT	Patients' satisfaction wih their relationship with the doctor
EXPCOMP	Patients' intention to comply with the doctors advice
TRECONF	Patients' confidence in the efficacy of the treatment received
INFSAT	Patients' satisfaction with the information provided by the doctor
STRESS	Patients' level of anxiety after the consultation

Significance of relationship between process measures and input or outcome measures

*	$p<0.05$
**	$p<0.01$
***	$p<0.001$

(1) BALES INTERACTION PROCESS ANALYSIS

BALES CATEGORIES	SPEAKER	CONSULTATION INPUTS WHICH AFFECT PROCESS MEASURES							CONSULTATION OUTCOMES PREDICTED BY MEASURES				
		DR	SYM	AGE	SEX	REG	VIS	ODR	REL-SAT	EXP-COMP	TRE-CONF	INF-SAT	STR-ESS
<u>Diag. Phase</u>													
shows solidarity	Dr.	***											
	Pat.		*										
shows tension release	Dr.	**			*								
	Pat.	*			**								
agrees	Dr.	***											**
	Pat.	**	*		*								
gives suggestion	Dr.	***	*								*		
	Pat.	*											
gives opinion	Dr.												
	Pat.	*		*									
gives orientation	Dr.	***		*									
	Pat.												***
asks for orientation	Dr.	**	*										
	Pat.	*								***			
<u>Pres. Phase</u>													
shows solidarity	Dr.	**											
	Pat.												
shows tension release	Dr.				**			**					
	Pat.				**			**					
agrees	Dr.	*		**									
	Pat.	***		**		*							
gives suggestion	Dr.												
	Pat.						**						
gives opinion	Dr.												
	Pat.												
gives orientation	Dr.	***	*	*									
	Pat.			***	*	*							
asks for orientation	Dr.	*		*									
	Pat.			**		*							

STILES' TAXONOMY OF VERBAL RESPONSE MODES

STILES' VRM'S (form/intent)	SPEAKER	CONSULTATION INPUTS WHICH AFFECT PROCESS MEASURES							CONSULTATION OUTCOMES PREDICTED BY MEASURES				
		DR	SYM	AGE	SEX	REG	VIS	ODR	REL-SAT	EXP-COMP	TRE-CONF	INF-SAT	STR-ESS
Diag. Phase													
DD	Dr.	**											
	Pat	**											
DE	Dr.												
	Pat.	**											
QQ	Dr.	**								**			
	Pat.												
EE	Dr.								*				
	Pat.	**											
ED	Dr.												
	Pat.	**											
KK	Dr.	**											
	Pat.	**	**	**		**							
KD	Dr.												
	Pat.	**											
KE	Dr.									*			
	Pat.	**											
KC	Dr.												
	Pat.	**											
AA	Dr.	**	**	**		**							
	Pat.												
IK	Dr.	**	**	**		**					**		
	Pat.												
Pres. Phase													
DD	Dr.	**	*	*									
	Pat.	**		**									
DE	Dr.	**	*	**									
	Pat.	**		*									
QQ	Dr.	**		**									
	Pat.												
EE	Dr.	**											
	Pat.	**		**									
ED	Dr.	**	*	*									
	Pat.	**		*									
KK	Dr.	**		*									
	Pat.	**	**	**		**							
KD	Dr.												
	Pat.	**											
KE	Dr.			**									
	Pat.	**		**									
KC	Dr.												
	Pat.											**	
AA	Dr.	**	**	**		**							
	Pat.												

THE BYRNE AND LONG SYSTEM FOR CLASSIFYING DOCTORS' VERBAL BEHAVIOURS

BYRNE & LONG CATEGORIES	CONSULTATION INPUTS WHICH AFFECT PROCESS MEASURES							CONSULTATION OUTCOMES PREDICTED BY MEASURES				
Diag. Phase	DR	SYM	AGE	SEX	REG	VIS	ODR	REL-SAT	EXP-COMP	TRE-CONF	INF-SAT	STR-ESS
giving or seeking recognition	***											
direct question	*									***		
indicating understanding	**		*									
answering patient question	*	***	*									
giving info. or opinion	*							*				
directing	**	***	*		*							
seeking acknowledgement												
Pres. Phase												
giving or seeking recognition												
direct question			*								*	
indicating understanding	*											
answering patient question												
giving info. or opinion	*									**		
directing	***											
seeking acknowledgement												
termination (direct)			***			*						

THE ACTIVITY ANALYSIS

ACTIVITY (focus of dr.'s attention)	CONSULTATION INPUTS WHICH AFFECT PROCESS MEASURES							CONSULTATION OUTCOMES PREDICTED BY MEASURES				
	DR	SYM	AGE	SEX	REG	VIS	ODR	REL-SAT	EXP-COMP	TRE-CONF	INF-SAT	STR-ESS
Diag. Phase												
solely with manual records	**											
shared - manual records/patient	***											
solely with computer	**											
shared-computer/patient	**											
interuptions	*						*				**	
duration of phase	***			*								
Pres. Phase												
solely with manual records	***											
shared - manual record/patient			***		*						**	
solely with computer									***			
shared - computer/patient	***											
interuptions								**			**	
duration of phase												

INTERACTION RATING SCALE

RATING SCALE ITEMS	CONSULTATION INPUTS WHICH AFFECT PROCESS MEASURES							CONSULTATION OUTCOMES PREDICTED BY MEASURES				
	DR	SYM	AGE	SEX	REG	VIS	ODR	REL-SAT	EXP-COMP	TRE-CON	INF-SAT	STR-ESS
<u>Diag.Phase</u>												
sympathetic	**											
friendly	**											
cheerful	**				*					***		
organized	***										***	
attentive	***	**										
collaborative	**				*							
info.-enough	***					**						
info.-clear	***					**						
tension					*						*	
empathy	*											
<u>Pres.Phase</u>												
sympathetic	***											
friendly	*			**	*							
cheerful	**			*								
organized	**								**			
attentive	***											
collaborative	***											
info.-enough	***	*										
info.-clear	***											
tension	*											
empathy	*											

APPENDIX E

THE DELIVERY OF CARE RATING SCALE AND INSTRUCTIONS TO RATERS

Please complete this box

rated by:	______
on:	______
consultation number:	______

SCALE FOR RATING G.P. CONSULTATIONS AGAINST CLINICALLY IMPORTANT CRITERIA

(Please read the INSTRUCTIONS TO RATERS before making your assessments.

1. Has the doctor identified the relevant complaint(s) and explored its (their) history?

inappropriately						appropriately
-3	-2	-1	0	+1	+2	+3
☐	☐	☐	☐	☐	☐	☐
			not relevant, can't tell			

inadequately						adequately
-3	-2	-1	0	+1	+2	+3
☐	☐	☐	☐	☐	☐	☐

2. Has the doctor identified relevant background factors?

inappropriately						appropriately
-3	-2	-1	0	+1	+2	+3
☐	☐	☐	☐	☐	☐	☐
			not relevant, can't tell			

inadequately						adequately
-3	-2	-1	0	+1	+2	+3
☐	☐	☐	☐	☐	☐	☐

3. Has the doctor conducted a physical examination?

inappropriately						appropriately
-3	-2	-1	0	+1	+2	+3
☐	☐	☐	☐	☐	☐	☐
			not relevant, can't tell			

inadequately						adequately
-3	-2	-1	0	+1	+2	+3
☐	☐	☐	☐	☐	☐	☐

(299a)

4. Has the doctor interpreted the findings of the verbal and physical examinations?

inappropriately						appropriately
−3	−2	−1	0	+1	+2	+3
☐	☐	☐	☐	☐	☐	☐
			not relevant, can't tell			

inadequately						adequately
−3	−2	−1	0	+1	+2	+3
☐	☐	☐	☐	☐	☐	☐

5. Assess the outcome of the consultation. (This may involve a prescription, plans for further investigations, recall or referral.)

inappropriate						appropriate
−3	−2	−1	0	+1	+2	+3
☐	☐	☐	☐	☐	☐	☐
			not relevant, can't tell			

inadequate						adequate
−3	−2	−1	0	+1	+2	+3
☐	☐	☐	☐	☐	☐	☐

6. Assess the completeness of the doctor's communication with the patient.

inappropriate						appropriate
−3	−2	−1	0	+1	+2	+3
☐	☐	☐	☐	☐	☐	☐
			not relevant, can't tell			

inadequate						adequate
−3	−2	−1	0	+1	+2	+3
☐	☐	☐	☐	☐	☐	☐

(2996)

7. Assess the records made by the doctor during the consultation.

inappropriate						appropriate
-3	-2	-1	0	+1	+2	+3
☐	☐	☐	☐	☐	☐	☐
			not relevant, can't tell			

inadequate						adequate
-3	-2	-1	0	+1	+2	+3
☐	☐	☐	☐	☐	☐	☐

8. Has the doctor made efficient use of time?

inefficient			not relevant can't tell			efficient
-3	-2	-1	0	+1	+2	+3
☐	☐	☐	☐	☐	☐	☐

(299c)

INSTRUCTIONS TO RATERS

(Please read these instructions carefully before you start the rating task).

This consultation rating scale has been designed for the assessment of a doctor's performance, during any general practice consultation against, 8 clinically important criteria.

You will be given written transcripts of several general practice consultations (you may also be asked to view the video recordings of consultations from which the transcripts were made) along with summaries of the patient's significant medical history, a copy of the notes made by the doctor during the consultation and a blank rating scale.

Please use your experience as a general practitioner to rate the doctor's performance in each consultation against each of the criteria set by the scale. The first 7 items of the scale each require 2 separate scores to be allocated, the first rating the appropriateness of the doctor's actions, the second rating their adequacy. Appropriate and adequate performances may be scored from +3 to -3 depending on <u>how</u> 'good' or bad you think they are.

Remember a doctor's actions may be appropriate without being adequate (e.g. the doctor's intentions in asking certain questions may be appropriate but his actual question asking may still be inadequate) or they may be adequate without being appropriate (e.g. it may sometimes be appropriate to ask a patient about his/her smoking habits and this may be done adequately, however if the doctor also pursues other background factors this may be judged inappropriate). A score of zero may be allocated for one of 2 reasons-

(i) If you think a particular rating would be irrelevant to a specific consultation.

(ii) If you feel unable to rate a consultation on a particular criteria due to shortcomings of the transcript.

<u>It is desirable however that you keep your use of the zero category to the minimum possible.</u>

In making your ratings please use your own experience of the pressures of general practice, the 'perfect' consultation may be rarely possible under the usual time constraints. The consultations should be judged against your idea of what could be achieved in the circumstances. The transcripts are literal representations of the consultations (complete with grammatical errors, hesitations, etc.), doctors and patients utterances are sometimes represented as "mumble (inaudible)", however we <u>cannot</u> assume that these utterances were inaudible to the participants, only that they could not be transcribed. Thus doctors should not be penalized for their "mumbles", some doctors speak more quietly than others but they may well be compensating for this by being nearer to their patients.

APPENDIX F

PATIENT QUESTIONNAIRE USED IN THE STUDY OF ANTE-NATAL HISTORY TAKING INTERVIEWS

MRC
Medical Research Council

ESRC
ECONOMIC AND SOCIAL RESEARCH COUNCIL

MRC/ESRC Social and Applied
Psychology Unit
Department of Psychology
University of Sheffield
Sheffield S10 2TN

telephone 0742 756600

A SURVEY OF PATIENTS' VIEWS OF ANTE-NATAL CARE

We are looking at how women feel about the service they receive from this clinic. This study is being carried out by a team from the Medical Research Council with the full agreement of all the clinic's midwives and doctors.

We would like you to help with this survey by answering a few questions about the interview you have just had with the midwife.

Your replies are completely CONFIDENTIAL. No one working in the clinic will know your views. The replies from all women will be summarized by the Medical Research Council in a way that will not identify individual women or individual midwives.

If you cannot spare the time today it will in no way affect your treatment now or in the future, but it would be very helpful if you could spare us a few minutes. In the long term we trust your co-operation will also be of help to yourself, other women and the clinic.

(300a)

Name: .... Age ....

OFFICE USE ONLY:

Interview No:	....	0- 3
Midwife:	....	4- 5
Date:	....	6-11
Comp:	....	12
T:	....	13
O:	....	14
R:	....	15
A:	....	16-17

(300 b)

THESE QUESTIONS ARE ABOUT WHAT HAPPENED WHEN YOU SAW THE MIDWIFE TODAY.

PLEASE TICK ON EACH SCALE THE EXTENT TO WHICH YOU AGREE OR DISAGREE WITH EACH STATEMENT.

1. The midwife was very interested in me as a person.

strongly agree ☐☐☐☐☐ strongly disagree 18

2. The midwife listened carefully to what I said.

strongly agree ☐☐☐☐☐ strongly disagree 19

3. I was able to tell the midwife all the things I wanted to.

strongly agree ☐☐☐☐☐ strongly disagree 20

4. The midwife took a lot of trouble to get it right.

strongly agree ☐☐☐☐☐ strongly disagree 21

5. The midwife was kind and understanding.

strongly agree ☐☐☐☐☐ strongly disagree 22

6. The midwife explained everything in terms I could understand.

strongly agree ☐☐☐☐☐ strongly disagree 23

(300c)

7. The midwife gave me plenty of time and didn't hurry me.

strongly agree ☐☐☐☐☐ strongly disagree 24

8. I was completely satisfied with the way the midwife and I got on with each other.

strongly agree ☐☐☐☐☐ strongly disagree 25

9. The interview was very business-like.

strongly agree ☐☐☐☐☐ strongly disagree 26

10. The interview achieved everything I expected.

strongly agree ☐☐☐☐☐ strongly disagree 27

11. I felt well reassured by the interview.

strongly agree ☐☐☐☐☐ strongly disagree 28

12. I have considerable confidence in the history taken during the interview.

strongly agree ☐☐☐☐☐ strongly disagree 29

(300d)

13 The following are some statements which might describe the interview you have just had.

Please tick one box, by the statement which best describes your interview.

	Tick one box
The interview focussed on me as a person	☐
The interview focussed mainly on me as a person but also on my condition	☐
The interview focussed equally on me as a person and on my condition	☐
The interview focussed mainly on my condition but also on me as a person	☐
The interview focussed on my condition	☐

30

14. People sometimes find visiting hospitals a rather stressful experience. These questions are about how you are feeling now.

Please tick one box in each row.

	Not at all	Slightly	Fairly	Very	
Are you feeling tense?	☐	☐	☐	☐	31
Are you feeling puzzled?	☐	☐	☐	☐	32
Are you feeling worried?	☐	☐	☐	☐	33
Are you feeling nervous?	☐	☐	☐	☐	34

(300e)

AS WELL AS ASKING YOU QUESTIONS MIDWIVES IN THIS CLINIC SOMETIMES ALSO TELL YOU THINGS AND OFFER ADVICE. THESE QUESTIONS ARE ABOUT THIS.

PLEASE TICK THE APPROPRIATE BOX FOR EACH QUESTION.

15. Did the midwife give you any information or advice today?

No	☐
Yes, a little	☐
Yes, a fair amount	☐
Yes, a great deal	☐ 35

16. Did you understand everything the midwife told you?

She didn't tell me anything	☐
I didn't understand any of it	☐
I understood a little	☐
I understood most of it	☐
I understood all of it	☐ 36

17. How well will you follow the midwife's advice?

She didn't give any	☐
Little or none of it	☐
Some of it	☐
Most of it	☐
All of it	☐ 37

(300f)

ON OCCASIONS OVER THE NEXT FEW MONTHS SOME CONSULTATIONS WILL BE FILMED (WITH YOUR PERMISSION) FOR RESEARCH PURPOSES. THE FOLLOWING QUESTIONS ARE ABOUT THIS.

PLEASE TICK THE APPROPRIATE BOX.

18. Was your consultation with the midwife filmed, and if so were you aware of it?

- No, it wasn't (If no, please omit next question) ☐
- It was, but completely forgot about it during the consultation ☐
- Was aware of it from time to time ☐
- Aware of it much of the time ☐ 38

19. Do you feel the consultation was in any way influenced because it was filmed?

- No, not at all ☐
- Possibly a little ☐
- Yes, a fair amount ☐
- Yes, a great deal ☐ 39

If YES, please say in what way:

....

....

....

....

....

(300g)

MIDWIVES IN THIS CLINIC SOMETIMES USE A COMPUTER TO HELP THEM WITH THE HISTORY TAKING. THE NEXT QUESTIONS ARE ABOUT THIS.

PLEASE TICK THE APPROPRIATE BOX.

20. Did the midwife use a computer during the interview?

Yes	No	
☐	☐	40

(If NO, please go on to question 24).

21. Do you feel the interview was in any way affected by the midwife using the computer?

No, not at all	☐	
Possibly a little	☐	
Yes, a fair amount	☐	
Yes, a great deal	☐	41

If YES, please say in what way:

....

....

....

22. What do you think using the computer was like for the midwife?

Don't know	☐	
It caused a lot of problems	☐	
It was probably a little difficult to use	☐	
She managed it easily	☐	
She found it easy and enjoyable to use	☐	42

(3004)

23. If you were to have your history taken again in this clinic, would you like the midwife to use a computer?

No, I'd rather she didn't ☐

I wouldn't mind either way ☐

Yes, I'd rather she did ☐ 43

If you have a preference please say why:

....

....

24. The following are statements people have made about the idea of computer use in medical interviews and consultations. Please indicate how much you agree or disagree with each statement. Tick one box in each row.

	Agree strongly	Agree slightly	Am uncertain	Disagree slightly	Disagree strongly	
Using computers will save time for medical staff	☐	☐	☐	☐	☐	44
I'd feel uncomfortable in a medical interview if a computer was used	☐	☐	☐	☐	☐	
Computers will mean that you see even less of the doctor than before	☐	☐	☐	☐	☐	
With a computer around you'll lose the personal touch	☐	☐	☐	☐	☐	
A computer could be a useful check against mistakes	☐	☐	☐	☐	☐	
Medical staff will make more mistakes if they have computers distracting them	☐	☐	☐	☐	☐	
Computers will improve the standard of history taking	☐	☐	☐	☐	☐	
Computers will improve the standard of treatment	☐	☐	☐	☐	☐	51

(300i)

THANK YOU VERY MUCH FOR YOUR HELP. IF YOU HAVE ANY EXTRA COMMENTS YOU WOULD LIKE TO MAKE, EITHER ABOUT YOUR INTERVIEW, ABOUT COMPUTERS, ABOUT THE CLINIC OR ABOUT THIS QUESTIONNAIRE, PLEASE WRITE THEM BELOW:

(300j)