

Documents and Professional Practice: 'bad' organisational reasons for 'good' clinical records

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ABSTRACT

Despite the widespread introduction of information technology into primary health care within the United Kingdom, medical practitioners continue to use the more traditional paper medical record often alongside the computerised system. The resilience of the paper document is not simply a consequence of an impoverished design, but rather a product of the socially organised practices and reasoning which surround the use of the record within day to day consultative work. The practices that underpin the use of the medical records may have a range of important implications, not only for the general design of systems to support collaborative work, but also for our conceptions of 'writers', 'readers', 'objects' and 'records' utilised in those designs.

INTRODUCTION

Over the last few decades, of the many cited advantages of computer systems, one of the most frequent has been the technology's capability to maintain records in an electronic format. This may be why, despite great innovations in the development of technologies to support real-time collaborative work, it appears to be the systems which principally rely on the capabilities of a shared databases and electronic mail that attract the attention of customers and achieve some commercial success (e.g. Lotus Notes and Windows For WorkGroups). These systems provide for great accessibility to information by a large number of users and for the simple communication and transportation of data, capabilities largely oriented towards the recording and distribution of information. However, as has been recently noted, it is difficult to ascertain whether such systems provide the support for collaborative work their adherents suggest (Orlikowski, 1992). Indeed it is often hard to determine the contribution even the most conventional and widely deployed technologies have had for more general bureaucratic work within organisations

(Landauer, 1995). Moreover, more detailed studies of technologies in workplaces frequently reveal paper records continuing to be used despite new technologies having been introduced to replace them (e.g. Hughes, et al., 1988; Luff, et al., 1992; Suchman, 1993b). It may be the case that our failure to achieve the dream of the 'paperless office' might also be a consequence of our inability, on some occasions, to build technologies which satisfactorily support the socially organised practices which underpin (previously paper-based) collaborative activities. Indeed, in persisting with certain media, or failing to exploit the opportunities which arise with the deployment of innovative technologies, 'users' may not simply be inflexible, sluggish or worst still, Luddite, but rather attempting to reconcile the demands of a system with the intricate and complex organisation which surrounds even the most mundane human (collaborative) activity.

In this paper we wish to briefly consider one such setting where, despite the deployment of a computer system to support record keeping and the distribution of information, participants still persist in using paper documents. The setting in question is General Practice or primary health care within the United Kingdom. Whilst providing new capabilities, the information systems introduced to replace traditional medical record cards, have not been wholly successful and even after some years, there remains widespread use of the original paper documents. The case of General Practice does not simply provide a vehicle for considering how the design of computer systems can undermine working practices, rather, it points to a potentially more profound and interesting issue which has a strong bearing upon CSCW and our attempts to support collaboration. In particular, it allows us to consider how seemingly individual activities, such as reading and writing, rest upon complex and systematic social practices which are not explicitly concerned with the group, or interaction, or

with the organisational, and yet do have relevance to cooperative work.

THE TRADITIONAL MEDICAL RECORD CARDS

One has reached the conclusion that the key to good general practice is the keeping of good clinical records. Time and again one has seen at a quick glance through a well kept record provide either the diagnosis or an essential point in the treatment.

(Taylor, 1954)

The traditional paper medical record used in General Practices in the United Kingdom consists of an A5 envelope containing a number of cards and various pieces of paper such as referral and discharge letters, and notes containing the results from tests. On the envelope is written the patients' name, address, date of birth and National Health Service (NHS) number. The cards consist in large part of descriptions of consultations; each and every consultation requiring a single entry on the medical record card. The records are stored and made available to the doctor whenever he or she consults with a patient, whether it is in the surgery, at home or in hospital. The records follow the patient, and only the death of the patient can result in the deletion of a record. Even then the record is kept for up to six months in case any contingencies or enquires arise. The following extracts are drawn from various patient records:

- 28/9/85 c. Vomited x2 in night
Maxolon 10bd (300m)
- 11.8.95 c. Not good- irritable
Pain better, but drowsy in morning
restart diary
- 22.5.95 a. Diary OK for 1wk
R elbow pain
-less tender
^ Doth to 150
- 12/1/86 v. Died 12.30 am
- 3/12/86 c. Dog bite
Rf (.....)
Tetanus Toxoid 0.5 ml
- 22/4/86 c. cold
also rheumatism
cert 1/52 Paracetamol
- 24.2.95 a. all tests normal
feeling low tearful fragile
start prozac
see 10d for inj R tennis elbow

At first glance the entries in the record appear brief and unsystematic and one wonders why so much trouble is dedicated to their upkeep. Certainly researchers in the social sciences and epidemiology have long complained about the quality of information kept in the records and argued that the records fail to provide a secure foundation for reliable analysis. Despite the apparent quality of the paper records, doctors go to some effort to maintain the medical

documents. The records play an important part in day to day professional practices, not simply in providing a bureaucratic dossier which documents the contact between doctors and their patients, but actually in the organisation of the consultation. Both diagnosis and prognosis are often inextricably linked to information which is documented in the patient's medical record card.

For example, before beginning a consultation the doctor glances at the patient's medical records normally turning to the most recent entry, this reading allowing the doctor to assess whether the patient is returning with an illness which has already been discussed. If this is so, the document provides the resources with which to tailor the beginning of the consultation (cf. Heath, 1981). Or, for example, when faced with a problem the diagnosis of which is unclear or ambivalent, a doctor will often read the record in order to see whether there are any previous illnesses which explain the current difficulties. As well as a resource for hints or ideas, the records also provide the doctor with factual versions of the patient medical biography, so that previous treatment programmes, allergies and the like can be checked and confirmed by a brief glance at the record. For doctors therefore, the records provide a reliable source of information which is adequate for the uses it serves in the day to day consultative activity.

Doctors therefore rely upon the records to accomplish their professional work. They expect the records to contain certain sorts of information and to be adequate for the uses to which they are regularly put. Given that any doctor within a practice may see a particular patient, and that records follow patients if they happen to move, the documents must inevitably embody a powerful and generic body of practices which inform both the writing of the record and their reading by 'any' general practitioner. In large part these practices, the social organisation which underlies the production and use of medical records, are not formally codified. Indeed, though there is a professional obligation, there is no legal requirement for doctors to actually keep medical records. We wish to suggest that the practices which inform the production and intelligibility of the record are thoroughly embedded in the practical use within the consultation and that these practices and their practical application are highly relevant to the successful design and deployment of technologies to support collaborative medical work in primary health care.

THE MAPPING OF CATEGORY ITEMS

Entries in the medical records consist of standardised elements, or better, classes of particular items. For example, consider the following relatively brief entry.

- 29/2/85 c. 'feeling tired'
Depressed
Librium (30) (5mg)

This record consists of the following: the date and location of the consultation (c. for consultation being held in the surgery, v. for a home visit); the patient's presentation of the problem or symptoms; the practitioner's diagnosis or assessment; and the treatment, its strength and the amount.

A single entry in the record can thus be seen to consist of distinct classes of items: the occasion of the consultation; the complaint or illness; and the management of the complaint. These classes can include different items. So for example, the patient's complaint can include such things as the patient's presentation of symptoms or the doctor's diagnosis, and the management of the complaint can consist of drug treatment, referrals, certificates, and the like. None of this is to suggest that items are documented for each class for every consultation, however if an item is not recorded then various sorts of inferences can be drawn, for example the item could be inferred or its absence considered relevant.

An important feature in producing and making sense of the medical record cards, is the ways in which entries are organised both in relation to each other and internally. Each entry follows a former with some break between. The order of entries reflect the temporal organisation of the consultations; the most recent consultation being the last entry in the record. The geography of a single entry is also important. The respective items are presented across and then down the page, providing a serial or even sequential order. How they are positioned with regards to each other provides an important resource with which to recognise what the particular items mean. For example, 'depressed' in the previous entry gains its status as an assessment or diagnosis by virtue of its position following 'feeling tired'. If 'depressed' was the first item, and say 'paranoid' the second, then paranoid would constitute the assessment whereas 'depressed' would become the presenting complaint or symptoms. Similarly 'paranoid' could be the patient's presentation of the complaint, if followed by for example 'exam tension' as the professional assessment.

The various items which constitute entries therefore do not have a fixed and determinate sense. Rather their meaning is generated, in part, through their position within a entry. The geography of items within in the record is a critical resource in both reading the entry and making sense of its constituent items.

DESCRIPTIVE ECONOMIES

In writing entries in the records, doctors orient to a certain, descriptive economy. They largely avoid repetition of particular items and information and exploit a competent readers' ability to draw inferences from particular items and their configuration within the entry. An adequate description of a consultation relies not so much on an extended description of the event and its findings, but rather from a few short remarks assembled with regard to a particular impression. The adequacy of a description relies upon what is both recorded and retrievable by a competent reader, that is, a fellow general practitioner. To enable us to discuss the ways in which practitioners assemble a coherent and economic description and provide readers with a particular impression, it may be useful to introduce the expression 'defeasibility'. The term has been widely used in pragmatics and jurisprudence to describe the ways in which any rule or law, no matter how precise its formulation, will inevitably confront circumstances, where despite their potential relevance, it is inappropriate.

INTERCLASS DEFEASIBILITY

Consider for example the following entries drawn from various patient records.

- | | | |
|---------|----|--|
| 10/2/73 | c. | Tonsillitis
Apsin (30) 250 mg) |
| 14/3/84 | c. | 'fed up' |
| 13/2/73 | c. | feeling sick
Depressed.
Valium (15) (5 mg) |

In the first instance, we find no details concerning the patient's presenting complaint or symptoms. Tonsillitis would be treated as the diagnosis, especially given the next item. Antibiotics are rarely prescribed unless there is evidence of an infection. However, any competent reader confronting this entry would be able to infer the symptoms suffered by the patient from the diagnosis, namely sore throat, temperature and perhaps associated headaches and drowsiness. As for 'fed up' in the second entry, its character coupled with the single inverted commas would lead one to assume that it is a description of a complaint presented by the patient. The absence of a diagnosis and any treatment, or referral, allows the reader to assume that following the appropriate medical enquires, the practitioner was unable to formulate an assessment or diagnosis. Indeed, standing alone, the item suggests that the patient has not only presented a deeply trivial complaint, but is potentially someone for colleagues to be wary of. Finally, 'Depressed' constitutes the professional assessment and diagnosis, further confirmed by the treatment that the practitioner has recommended to the patient, an antidepressant. The patient's symptoms are largely excluded, however 'feeling sick' is documented, since such a symptom would not necessarily be associated with the diagnosis in question.

In writing an entry therefore, practitioners are sensitive to the inferences that colleagues can draw from particular items. They can rely upon those inferences not only to include information which might otherwise seem relatively trivial, but to exclude particular items (or even categories of object) knowing that any competent reader would be able to make sense of the entry and retrieve the relevant information. The descriptions are designed for a particular class of recipient, namely general practitioners. Doctors orient to, in the production of the records, the uses to which the information is regularly put and the knowledge and competencies that suitable qualified colleagues will bring to bear on the text.

THE DESCRIPTION AS A WHOLE

The defeasibility of items may not only occur within particular classes, but also across classes within an entry. As noted above, for example, that the presence of an antibiotic in an entry gave further support to the impression that 'tonsillitis' was the professional diagnosis rather than simply a characterisation presented by the patient. Consider the following instances which include various forms of intra class defeasibility.

- 14/4/83 c. 'badly bruised'
cert 1/4
r/f Brook Centre
- 12/6/74 c. can't get up
Librium (30) (10mg)
r/f AA
- 2/11/82 c. tired and weepy
r/f GC

The first entry is rather curious, 'badly bruised' in inverted commas is the patient's presenting characterisation rather than an assessment by the practitioner. There is no treatment for bruising and no confirmation of the patient's claim provided. However, whilst the practitioner appears to suggest he could not find evidence of the bruising, the recommended management gives a slightly different flavour. The Brook Centre, to which the patient was referred 'r/f', is a hostel for battered women. So, whilst the doctor appears to have been ambivalent as to the evidence of the patient's 'claim', he was obviously concerned enough to refer the woman in question to the Centre. The practitioner has deliberately built in ambiguity and uncertainty into his characterisation of the consultation. The second example is interesting as it looks as if the doctor is avoiding a diagnosis. Despite the relatively trivial symptom he does give the patient a treatment, which would suggest that he is treating the patient's problem seriously. Perhaps the most significant item, in terms of a potential assessment of the problem, is 'r/f AA' namely Alcoholic Anonymous. Finally, 'tired and weepy' would undoubtedly be treated as relatively unimportant, especially since the practitioner avoided any diagnosis or treatment. 'r/f GC' is a referral to the psychiatric social worker in the practice which leads the reader to believe that the doctor has decided to have an expert see the patient. The referral is locally relevant in that it is only doctors in the practice which would understand what the referral means.

The production of an entry therefore, does not involve applying a set of clearly formulated rules as to what items and information should be gathered into an entry. Rather entries are assembled with respect to the overall impression they provide. It is not so much a précis of what went on, but rather a sketch, drawn through a few elements which provide a certain sense or impression of the event. The consultation is drawn by interrelating components in such a way as to provide a certain impression. Each item is dependent for its sense on the other items, and the sense of the whole emerges from the interrelationship of the parts. The process is not unlike a hermeneutic circle suggested by Husserl or the Gestalt contexture described by Gurwitsch (1964):

Between the parts or constituents of a Gestalt contexture there prevails the particular relationship of Gestalt coherence defined as the determining and conditioning of the constituents upon each other, In thoroughgoing reciprocity the constituents add to, and derive from one another, the functional significance which gives one its qualification in a concrete case.

(Gurwitsch, 1964)

INTRA-ENTRY DEFEASIBILITY

Entries are not only produced with regard to the mutual dependence of items within an entry, but also with consideration to other entries within the patient's medical record cards. For example, in the following entry, it can be noted that there is neither presenting complaint nor professional assessment or diagnosis. Furthermore whilst treatment is mentioned, namely eye ointment, it does not provide an adequate basis with which to infer the symptoms or character of the patient's problem.

- 3/12/80 c eye now appears virtually normal
Neospurin

The absence of potentially relevant information within the entry, would encourage any general practitioner to turn to the previous entry to see whether it casts light on the consultation. In the case at hand we find:

- 26/11/80 c conjunctivitis
Albacid 10%

Given the proximity of the two events, some eight days between each consultation, the reader could assume that the most recent entry reported a return visit; a consultation which was principally concerned with the progression of a problem which patient and doctor had discussed on a previous occasion. In such circumstances, the practitioner knows that the diagnosis and the treatment details may be found in a previous entry and that there is no point (re)documenting the same information at each consultation. In the case at hand, the reader might also assume that the eye was taking some time to clear up, and this would account for the change of treatment during the subsequent consultation.

Similarly entries such as:

- 12/4/84 c. weepy and tired. nervous at work and
perhaps difficulties at home
Depression Valium 10mg (30)
cert 1/52
- 19/4/85 c. valium 10mg (30)

are written with regard to each other and provide a competent reader with the resources to retrieve the information that they can ordinarily find within a single entry. The very brevity of the entry, the omission of

certain categories of item, coupled with the presence of some mentioned treatment, serve as an embedded instruction to the reader to turn to previous entries in order to retrieve the relevant information. The practices that doctors use to assemble the records are a resource both for documenting information and for inference and discovery; they provide for a delicate and subtle range of inferential work through which conventional sorts of information concerning consultation can be routinely assembled.

The defeasibility of items across two or more entries is not simply a matter of saving the doctor time in producing a description of a particular consultation. By designing an entry so that a colleague turns to read other, related, entries, a practitioner provides a sense of the career or course of a particular illness and the ways in which various consultations featured in its development. It also provides a resource, as mentioned earlier, for a practitioner to determine wherever an upcoming consultation is itself an event within the progression of an illness. In such circumstances the beginning of the consultation and its overall shape is very different from occasions where the patient is presenting a new difficulty or problem. By defeasing items across entries and assembling the text with regard to an impression as to how this event is related to previous meetings concerning the particular illness, doctors produce careers or trajectories of illness. The records reflect and embody the routine progression of particular problems and the ways in which the proper management of illness by the members of the profession attends to, and of course (re)produces, the routine progression and cure of particular troubles. The design of the text therefore, the ways in which items are described and assembled, provides instructions as to its span of potential relevancies and what information within the document potentially features in this gestalt of the particular illness. As Garfinkel (1967) suggests however, on any subsequent occasion, the record may be examined with regard to the contingencies which demand a retrospective re-characterisation as to what is indeed relevant to some (emergent) particular trouble (Garfinkel, 1967).

THE COMPUTERISATION OF CLINICAL RECORDS

The computer system most widely deployed in general medical practice in the United Kingdom is known as VAMP 'Value-Added Medical Products'. This is available on standard personal computers and is intended to be placed on the doctor's desk and used during consultations. VAMP provides a computerised record system for the documentation and retrieval of medical biographical information and a facility for issuing prescriptions. It also includes a database for information concerning available drugs and treatments. The system is aimed to be a replacement for the paper medical record cards whilst also providing the advantages of computer technology, including enhanced access to and distribution of information. It was assumed that within a year of its deployment, that the system would largely replace traditional paper record.

However, in order to rationalise certain aspects of the paper records, the system has made a number of relatively small

changes to the ways in which diagnostic and prognostic information is documented and presented to the general practitioner. Whilst these appear trivial, they are consequential to the ways in which doctors are able to use the new clinical records within the consultation:

- Unlike the paper record, the details of each consultation are no longer written into a single entry. With VAMP, diagnostic and prognostic information are stored separately in distinct locations which cannot be accessed simultaneously. One file, called the "medical history", contains details of the type of consultation, a description of the problem and outcome, the results of tests, and any comments by the doctor. The other, called the "therapeutic history", contains details of drugs, appliances and dressings that have been prescribed.
- The medical history file stipulates both the type of information which is entered and the amount of information. It is divided into two sections. The assessment or diagnosis and a section for 'free text'. In the original version of the system, each section could consist of no more than one line of ten characters. The information entered into the diagnostic section has to use a fixed set of diagnostic categories drawn from established system known as Oxmis (though this has recent been replaced by an alternative system known as Reedcoding). Free text can be entered alongside if the practitioner wishes to elaborate the assessment or diagnosis, but as mentioned above, the original system allowed for no more than one line or ten characters.
- The therapeutic file is itself divided into two components. One details information concerning repeat prescriptions, for example, relating to chronic difficulties, the other details treatments for acute problems. With the VAMP it is not possible to view both the files simultaneously.

The system also includes a number of other features which, whilst seemingly insignificant, are consequential to the use of the computerised clinical records in the consultation. For example, information entered into the system through the keyboard is organised in terms of a series of prompts which require the practitioner to move progressively through the options in a particular sequence. For instance, in order to issue a prescription, the doctor must first enter the relevant component of the system. Subsequently the system displays details of past prescriptions and a series of prompts for details of the new prescription. The prompt line requires such details as the name, form, strength, dosage and quantity of the item(s) being prescribed. In each field the doctor normally uses the alphanumeric keys to type in abbreviations of the relevant information; for example, to enter a names of drugs, appliances or dressings, the doctor need only type the first three or four letters of each word. After details of the form and strength have been entered, the system will then attempt to match the details to check whether the appropriate quantities are available the on-line dictionary of drugs, appliances and dressings.

Alternatively, the doctor may summon a list of the items contained in the treatment dictionary and choose an item from this list. This facility is most frequently used when doctors are uncertain about what to prescribe. If the system fails to recognise input, or two or more names in the dictionary match an abbreviated entry, then it will request for clarification or correction of the input. In working through the sequence of prompts, the doctor presses the carriage return key to move to a subsequent field or the control key in conjunction with a character key to return to a previous field. After exiting the final field, the system prints out a prescription and displays and updates the patient's prescription history.

DEPLOYING THE TECHNOLOGY: CONSIDERATIONS FOR GENERAL PRACTICE

Whilst reproducing and rationalising the classes and categories of information ordinarily documented in the paper medical record, and providing various additional facilities, small changes to the ways in which details are documented or made available to doctor have inadvertent consequences for professional practice. For example:

- the separation of files into medical and therapeutic means that information which might normally be defaced across the two classes of entry is no longer possible, since both fields have to be completed, and can only be viewed independently. In consequence the economies of intra-class defeasibility are removed by the system, as are the ways in which doctors can generate particular inferences by omitting or including particular diagnostic or assessment items;
- the separation of acute and chronic treatment files can also be significant. Whereas with the paper records doctors could draw a range of inferences concerning the patient by glancing at the variety of treatments that he or she is receiving, the separation of the acute and chronic treatment files means that this sort of inferential work is more difficult to achieve, since both files have to be opened separately;
- the limited diagnostic and assessment categories which the practitioner is now constrained to use, coupled with the limitations on space allowed for free text, forces the practitioner to actually nominate one of an admittedly large set of pre-specified diagnoses and precludes certain recurrent forms of interclass defeasibility. It also undermines the doctors' ability to embed a certain ambivalence in the diagnosis or assessment of the complaint or to avoid a diagnosis in order, for example, to generate a more reliable assessment on a future occasion.

A number of further potential difficulties are also generated by the system. As suggested, the system pre-specifies a certain series of moves for any activity, such as issuing a prescription, the doctor has to respond to system prompts even when the specific categories are not appropriate. Since the system is largely used whilst the doctor is simultaneously interacting with the patient, then these preset response sequences can undermine the flexible and

contingent use of the technology and the doctors' ability to delicately coordinate system use with the real time contributions of the patient (Greatbatch, et al., 1993).

Handwriting also provides a rich array of resources to practitioners which are precluded by the computerised system. For example, it has long been argued that the doctors' ability to recognise the handwriting of their colleagues, and therefore who saw which patient for what, is an invaluable resource for making sense of the consultation. The system also precludes various stylistic devices commonly used by practitioners to give a certain flavour to statements that they included in the medical records. So for example, we saw earlier how inverted commas were used to attribute an item to a statement uttered by a patient, but other sorts of punctuation, such as commas, exclamation and question marks, underlinings, crossings out, and the like are also commonly used by doctors to flavour the ingredients which make up an entry. In addition, there are some practices which whilst remain possible with the system no longer appear with such frequency. This may be a consequence of the ways in which the system inevitably standardises the information it holds. A case in point are the liberal use of amusing anagrams and abbreviations that one would find in the paper records, for example, SEFN (Sub-normal Even for Norfolk), AWF (Away with the Fairies), and CTL (Close to lay-lines - an area in Southern England where some of the more peculiar Churches have established centre).

The system therefore removes the sorts of economy, gestalt, and tailorability which is critical to the production and practical use of the paper records during the consultation.

These problems however are not simply the product of a poorly designed system. Indeed, one can see that the system was designed to carefully reproduce properties of the paper record. It reproduces the classes and categories of items within an entry which are ordinarily used on the traditional medical records. It builds in a certain economy to an entry, restricting the amount of free text and providing abbreviations for pre-specified diagnostic categories. It also provides an important distinction between treatment for chronic and acute troubles so that the general practitioner can differentiate the status of the various illnesses that a patient might be suffering. However, the system understandably attempts to formalise the components which were traditionally recorded, or retrievable from the record. This rationalisation includes differentiating classes of object and the necessity to document categories of items within each class. The system attempts to clean up, or polish the records, to make sure that each entry does indeed include the information that practitioners routinely expect to find and ordinarily rely upon in everyday professional practice. In so doing, the system also provides the possibility of providing a more reliable database concerning diagnosis and treatment which can be then used to inform research, policy decisions and even the allocation of financial resources.

In trying to improve the medical record however, the design of the system ignores some of the practical reasons which

account for the messy and apparently unsystematic character of the original paper documents. In a sense, the design of the system reflects a rigorous, but limited requirements analysis. The relevant classes and categories have been identified, but the practices through which the document is written, read and used within the consultation have been largely ignored. By ignoring why the record is as it is, the design has failed to recognise that the very consistencies which have been identified, are themselves the products of systematic and socially organised practices. By ignoring these practices, the design not only discounts the indigenous rationality oriented to by the doctors themselves in the producing and reading the records, but fails to recognise that such practices are themselves inextricably embedded in the day to day constraints of *in situ* medical work. This is not to suggest that doctors cannot change the ways in which they produce and read records, indeed that is just what they are trying to do in using the system at the present time. Rather, it is to suggest that the troubles they encounter in using the system may themselves be a consequence of attempting to introduce procedures which are insensitive to the local, practical constraints of professional work.

The VAMP system was developed and deployed at a time when there has been a growing emphasis within the United Kingdom in supporting an outstanding public service, the National Health Service, with private money. In consequence the funding for VAMP and its deployment was not provided by the Government but rather, indirectly, by the pharmaceutical firms. The system was designed and deployed not only to serve general practitioners, but provide a database, which VAMP could then sell, duly anonymised, to pharmaceutical companies. Little needs to be said about the potential value for marketing drugs of a database which details the diagnostic and prescribing practices of general practitioners throughout the United Kingdom. The design of the system therefore was subject to various practical constraints, only one of which was the day to day demands of consultative medical practice. For various financial and bureaucratic reasons, it was important to formalise the data held on the patient medical record, in particular concerning the nature of treatment currently being provided to patients. It is certainly the case that the computerised record does provide a more rigorous database, whether it is more reliable or accurate than the original document, especially in the area of diagnosis, may be a moot point. Despite the system providing an important resource for more innovative strategic marketing by the pharmaceutical companies, at least as it is currently conceived, it fails to support the sorts of practical uses to which the information is put within the consultation. The practical demands which bore upon the design of the system therefore, demands which were extraneous to the practical, day to day, circumstances in which the documents are used, perhaps undermined the development and deployment of a useful and innovative technology.

One way in which a number of practitioners have attempted to deal with some of the shortcomings of the computerised record is to continue to use the paper cards both to document, and retrieve information, during the consultation.

It should be added that there remains an ambivalence in General Practice as to whether the computerised record constitutes a professional and legal report of the consultation; some practitioners believing that a handwritten entry should still be made for each consultation. As one might expect however, attempting to maintain the paper records alongside the computerised system has not proved particularly fruitful, in a sense the very existence of the alternative document undermines the reliability of the original cards. In particular, general practitioners can not rely upon their colleagues turning to the paper document as well as the computerised system, so that whilst they might document an array of potentially relevant information, it may not necessarily be accessed. These problems are exacerbated by the commitment to using the VAMP system to issue prescriptions and thereby log treatment details. Doctors also do not necessarily enter treatment details on the patient record, so that intra-class defeasibility and the gestalt of the traditional entry is not necessarily available. Sadly, therefore, despite attempting to preserve the traditional record in the face of the difficulties encountered by the system, the possibility that some information may to have documented undermines their potential usefulness for consultative practice.

CONSEQUENCES FOR REQUIREMENTS AND DESIGN

Taking together the foregoing observations of the use of medical record cards and the VAMP computer system suggests some fairly basic requirements for new technologies to support medical interactions. For example:

- the length of entries should be left to the writer and not constrained by the system;
- diagnosis and treatment information should be presented together;
- it should be possible to read an entry in relation to a prior history of entries; and
- the entries should be maintained in relation to a potential course of a treatment i.e. in chronological order and it should be possible to read details of chronic and acute treatment together.

Furthermore, the analyses of the use of both medical record cards and computer systems within medical consultations (Greatbatch, et al., 1993; Heath, 1986) would suggest some more fundamental properties that are required of a new technology. First, the system should allow for the collocation of reading and writing. Ideally reading and writing should not be spatially separated, as in the case with a standard keyboard and monitor. Instead, text should be retrieved, entered and read in the same general location. Second, the technology should allow documents to be read at a glance and entries to be written with economic conciseness. Doctors need to be able to make a variety of marks and annotations on the document and to enter information at various levels of completeness. Third, the technology should allow for the records to be accessible whilst being used in relation to a variety of other activities,

including the diagnosis, the physical examination, discussing issues with the patient and when prescribing treatment. Therefore, records may have to read by the doctor when he is away from the desk, when he is on the phone and when he is talking to the patient. Some idea of the mobility required can be gleaned from examining the use of the medical record cards. They can be propped up to be viewed whilst the doctor is examining a patient, they can be lifted off the desk to be read at an angle and the doctor can place a record on his knee and towards and away from the patient.

It could be possible to envisage a variety of technologies that could fulfil both these specific and general requirements, for example, systems that preserve the possibility of using paper documents in relation to electronic ones or devices that project images of documents in a variety of orientations in a range of locations (e.g. Newman and Wellner, 1992; Wellner, 1992). However, perhaps a more straightforward solution would be to adopt a mobile technology which maintains the general format of the medical record cards whilst augmenting these with various computational capabilities (cf. Luff, 1992). Utilising a stylus as the input device for the 'notebook' computer may also allow for the production and recognisability of particular marks, including the possibility of preserving some of the distinctiveness of a colleague's handwriting. It may also be possible, in the design, to preserve some of the geographical features of the paper medical cards, for example, the 'open area' for recording entries and the ability to locate one item close to another, independent of class or type. The principal focus of the technology, therefore, would not be on trying to maintain a formally consistent document for various bureaucratic and financial purposes, but rather to give doctors greater ecological flexibility and the freedom to adapt their use of documents to the varying circumstances and contingencies that arise as they conduct verbal and physical examinations and prescribe treatment.

It may be that some of these requirements apply to similar domains where co-participants interact and collaborate over documents, for example, other service enquiries and advice giving activities. However, this study could have more broad implications for the design of more wide-ranging systems. It has been frequently noted how computer systems appear to constrain the ways individuals carry out activities previously accomplished by other means. Indeed, Landauer (1995) has recently questioned whether the increased use of computers over the past 25 years, particularly for office work, can be shown to have actually resulted in any significant improvement in productivity. He points to the 'usability' of computer systems as the critical factor in impeding their effectiveness. Others have offered more detailed analysis, revealing how new technologies can be seen to constrain the ways in which work is organised, stipulating, for example, pre-defined orderings of activities and restricting the flexibility by which these can be achieved (e.g. Bowers and Button, 1995; Button and Harper, 1993; Suchman, 1993a).

The foregoing analysis of the documenting of records may suggest why some systems for bureaucratic work have been seen to be 'constraining', 'restrictive' or 'unusable'. The practices surrounding the writing (and reading) of paper records provide for the defeasibility of items. The use of the paper record can thus be sensitive to the contingencies facing both the reader and writer. This could have implications for the general development of systems, by pointing out how consequential to the activity-at-hand are the ways in which the information is ordered and where items are located. The design of particular interfaces could then be sensitive to: the visibility of entries so that items can be read alongside one another; to whether entries need to be complete so items can be defeasible, and to the range and constraints on items that can be entered so that information can be recorded using a variety of marks and methods. Needless to say, the consequences of such decisions go 'beyond the interface' relying on flexible and open computer architectures and, perhaps, transforming how records can be processed for other purposes.

In CSCW particular attention has focused on the development of flexible computer architectures and infrastructures to support different ways of collaboratively accessing (information, or computer) objects. These aim to support a range of capabilities from the simple exchange of objects, through the sharing of objects and to common views of the same object. However, when considering even the case of the simple record card, this range appears to be unduly limited. This may be due to the rather static conception of the object that pervades most current CSCW platforms. The practices which support the writing and reading of the paper record cards relies on a complex interrelationship between the items in an entry, the entries and the collection as a whole. This relationship is more than a simple hierarchy leading from the single component through to the record as a whole. It also relies on more than just providing more 'links' between items and entries, as in some complex hypertext system. The entries on the paper record card, are tightly interweaved, they rely on a certain ambivalence to the recording of categories, particular vaguenesses in the entries and flexibility in the type of components which are entered. This flexibility is required so that readers can read the record 'as a whole' and 'at a glance'. Formalising and categorising records, required for financial and bureaucratic purposes not only places additional demands on the users of systems which are designed to satisfy these requirements, but also on any designer considering more sensitive support for individuals having to accomplish such record keeping activities (cf. Bentley and Dourish, 1995; Goguen, 1994; Jirotko, forthcoming).

The practices surrounding the writing of a paper record are sensitive to the ways in which colleagues, at other times, will read the records. These practices then have certain parallels to particular uses of systems designed to support 'asynchronous' collaborative work. The utility of such systems has often been accounted for by their capability to provide information to colleagues who may either be remote or may require information at some other time. The uses of the medical record card reveal how individuals can

also be sensitive to the potential circumstances in which a reader may have to read that record, they preserve a certain economy of description, and are designed with respect to the professional competencies of the reader. The range of ways in which records can be flexibly assembled to facilitate reading may not only provide for particular options for interface design, but may reveal why contributing to groupware systems can be problematic. For shared databases and the like to be more than repositories or archives, and for contributions to be appropriate for some practical purpose by colleagues and co-participants, the entries have to be tailored for the demands, or 'designed' for their recipients and sensitive to their circumstances. The case of the medical record card reveals how in one domain this work can be done. It relies on a set of practices produced and recognised by both writers and readers. One challenge for designers of 'asynchronous CSCW systems' would be to provide capabilities which allow for individuals to both flexibly design their contributions and to facilitate their reading. The layout, ordering and appearance of entries on a simple paper medical record - its geography, and the practices underpinning its organisation - might suggest features, at least at the interface, which may be useful to support.

DISCUSSION

In the case of VAMP, choices in the design, particularly in the ways in which information can be categorised, appear to have constrained the flexible ways in which professionals could both enter and examine their records. Attention has recently focused on the practices surrounding documents in similar domains and revealed that, despite the specification of formal procedures for completion, which items are entered and how these are classified can be subject to a great range of variation (e.g. Bowker and Star, 1994). This has led to the suggestion that particular documents may act as 'boundary objects' between different communities of practice (cf. Latour, 1986; Star, 1989). In this paper, the analysis of documentary practices has examined the details of how entries in medical cards are written. This has revealed how the design of individual items and collections of these items are sensitive to the contingencies and skills of potential readers. These practices are embedded within the practical use of documents in the consultation. They may appear to be rather mundane but, the organisation of paper records reveal a certain economy in the ways they are produced. Despite records being mapped out in a standardised format, particular items and classes of items are defeasible, so that entries and sequences of entries can be read at a glance by a colleague at another time. It may be that such close attention to the details of a documents' production could have consequences for system design. Furthermore, the detailed examination of documentary practices, particularly the inferences individuals commonly utilise for their production and for their recognition may provide a resource for assessing the shortcomings and possibilities for new technologies, whether these practices surround the use of either paper or electronic documents (cf. Heath, et al., 1995).

This paper has revealed how even the apparently individual activities of reading and writing are, in some ways,

collaborative. Particular features of this social organisation can be revealed by paying close attention to the nature of texts produced in the course of everyday activity. This may suggest a reconsideration of how not only how 'writers', readers' or 'users' of such documents may be considered, but also how 'documents', 'records' and 'objects' are conceived of within CSCW and system design. The shortcomings with the VAMP system appear to derive from the ways in which 'use', 'user' and 'record' are embodied in its design. The use of the medical records is an essential part of the successful accomplishment of the consultation. Indeed given it is a critical aspect of diagnostic and prognostic activity, it has does not appear to have been given the primacy in the design that it deserves. Rather, the document has been conceived primarily as presenting a retrospective version of events rather than an essential resource in the production of the consultation. The 'user', the general practitioner, has been conceived as a rule 'follower', a 'judgmental dope', rather than an active, reasoning and situationally sensitive participant in the production and use of the document. In consequence, the doctors' practical reasoning, their flexible use of the document in day to day circumstances and the whole array of competencies and skills that they rely upon, were largely treated as epiphenomenal in the system's design. As a consequence, whilst the system appears to have provided a more accurate and reliable record for extraneous and bureaucratic purposes, it has failed to enrich medical practice, and the use of the paper records persists. To reverse the title of Garfinkel's (1967) famous paper on the apparent inconsistencies in clinical records, in the case at hand we find perhaps 'bad' organisational reasons, for 'good' clinical records.

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