Introduction

The Guildowns Group Practice, the subject of this study, is a 21 000-patient general practice operating from four surgeries in Guildford, Surrey, England.1 This case study reports the reasons why this large general practice decided to move towards paperless practice, the progress made and the lessons learned.

Whilst the strategic case for the move towards paperless practice across the health service has already been made,2,3 and guidance has been provided on how to carry out the transition, there are few reports about what motivates individual practices to make this transition.4–8 This case study sets out to fill that gap. It describes when and why the decision was made to move to paperlessness and how the transition was planned for and operationalised, including the timescales involved.

In late 2001, the practice decided to move to paperless practice. A strategy was developed to reduce paper, to focus on data quality and to be an early provider of a general practitioner (GP) electronic patient record.

The principal reasons for the decision being made in this practice were:

- problems associated with moving paper medical records between surgeries
- difficulties in finding records and with missing medical record envelopes

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the realisation that resources to improve the computerised medical record could only come from redeploying the time spent handling paper records. Other contributory reasons are set out in Box 1.

Box 1 Reasons for moving towards paperless practice

National issues
- An environment was being created within which practices were needing to demonstrate that they could achieve national quality standards.9
- Even at the time that this decision was taken, it was conceivable that practices may have remuneration or allowances linked to the achievement of national targets.

Locality issues
- The practice was committed to participating in local audit, and wanted the results of its searches to correctly represent the quality of care provided. There is a strong local culture in West Surrey committed to using computerised medical records as an enabler of quality improvement.10
- There was no funding available for additional staff to perform Read coding. Existing staff would have to be redeployed.

Practice issues
- The ‘legacy’ computer system within the practice needed upgrading, and rather than simply upgrade it there was an opportunity to comprehensively review the practice’s information technology (IT) strategy.
- The partial availability of the medical record on the old clinical system. Although it had been possible to view the clinical record in all the practice’s premises since 1988, it was not possible to view the document record (e.g. referral letters). This was a constant cause of frustration.
- To reduce or stop the need to access MREs once the patient has registered at the practice, as it operates from multiple sites.
- To be an early adopter of pathology messaging across NHSnet (where the practice received its pathology results electronically).
- To use email and intranet communication around the practice to reduce internal paper flows, telephone calls and faxes.
- To use unencrypted email for non-patient-related communications externally.
- There was a partner (SC-B) interested in, and willing to champion and manage, the change within the practice.

Background

Guildowns Group Practice is a nine-partner general practice based in Guildford, Surrey, England.1 It has over 21 000 patients shared between four fully functioning surgery premises. One of these is the Student Health Centre for the University of Surrey. The University allocated the network Internet provider (IP) address range for the entire practice in order to allow a segment at the Student Health Centre to be secured behind a firewall. This was necessary to comply with the University’s security policy and the NHSnet code of connection, allowing access to both services at the student site. All the servers are housed at one of the other sites, delivering email and the clinical system to the rest of the practice via fibre-optic (128k) land-lines.

Method

The project plan

The practice recognised that if it was to move towards paperlessness, it needed to have a system that allowed it to integrate documents (such as hospital letters) and locally performed clinical measurements (for instance, electrocardiograms) with the clinical record. The system needed to integrate with clinical information that was expected increasingly to be delivered online (for instance, pathology messaging from hospital laboratory to GP clinical computer system). Initially, administrative information was planned to be delivered by email, with the hope that in the long term encryption standards would be agreed that would allow the transmission of clinical data.

The principal choice for the practice was between EMIS,11 widely used in the locality, or upgrading to the most recent Torex system. The decision was taken to become one of the early adopters (April 2002) of Torex Synergy,12,13 after many years with Torex System 5. Torex is one of the three major clinical systems used in United Kingdom (UK) general practice.14 In the practice’s
view, its advantages over EMIS were that it allows easy linkage of diagnosis to prescription, so that it is possible to understand why a particular medicine was prescribed; and it would allow easy integration with other software that the practice wished to use. In addition it was felt that what was Read-coded in the Torex system was more obvious – it is not concealed ‘behind the scenes’.

Microsoft Windows XP™ was chosen as the operating system because imaging software, multiple gateways and ‘remote desktop connection’ would be useful features for busy clinicians working between sites.

It is also one of the practice’s aims to make maximum use of any IT investment – making the system work for the practice rather than struggling to work with the IT. Any implementation requires considerable management input. The first priority was to explain the reasons for the move and to examine the processes that needed to change if the implementation were to deliver benefits. There was no subgroup or practice manager able to manage the change. The clinicians in the practice have broadly been interested in making IT work efficiently and this was enough of a driver to get the necessary support for funding and developments from the partners. All decisions were made through routine practice meetings. The fact that there are four sites was a major catalyst to making IT work for the practice.

In accordance with British Medical Association (BMA) guidance, a letter of notification was sent to the health authority.8

The technology plan

It was intended to install the new system and complete its implementation over a year. It was perceived that the principal barrier to paperlessness was how to deal with the large volume of letters that came into the practice.

In order to deal with patient letters, it was clear that the practice needed to investigate a scanning solution. This was a slightly frustrating decision to make since the practice could foresee that such paper flows would diminish as soon as a secure email system was in place within the National Health Service (NHS). However, as this solution was only on the distant horizon at the time, it was decided to proceed. Even when encrypted email does arrive, it will not enable old paper correspondence contained within the medical envelope to be computerised – whereas vitally important letters can be scanned. In addition, a sizeable proportion of correspondence – notably from accident and emergency (A&E) departments and community mental health teams – still comes handwritten.

Optical scanning – where an image of the documents is stored – was selected rather than optical character recognition (OCR) – where the scanner actually reads and stores the text. Although the former approach (optical scanning) does require more computer memory for storage, it allows the original document to be reconstituted, making it easier for clinicians to find information. In addition, it copes with handwriting and images, something that OCR cannot handle, and should result in fewer errors as inevitably OCR will misread some words.

The features of a scanning system that were looked for are set out in Box 2.

In addition there was to be an intranet for administrative documents, a website and networked voice dictation software. Back-up is provided integral to the clinical system using tape back-ups.

The people plan

Although there are numerous potential benefits of paperlessness, many of which are listed in the introduction, for many in the practice there was a trade-off between the potential advantages and the challenge of coping with change. The balance, as perceived within the practice, is set out in Box 3.

The range of management issues that need to be addressed for successful scanning implementation includes:

- motivating the practice team through developing an understanding of the benefits of the proposed change
- a commitment to retain staff who were willing to retrain, from finders and filers of notes to coders of

Box 2 The features of the ideal scanning system

- Can be operated across a network.
- Must not exhaust network capacity.
- Must be robust/stable.
- Must be fast.
- Should integrate well with the clinical system.
- Should integrate with Microsoft Office applications.
- Must have integrated document workflow management.
- Must operate an audit trail for scanning/reading.
- Should allow annotations/comments for action.
- Should scan as a graphic image rather than OCR (to avoid errors).
- Should not be heavily dependent on support.
- Must be easy to print off letters when patient leaves.
clinical data – this helped ease the pain of the change
• a comprehensive training package.

The practice wanted the reception staff to ‘work smarter, not harder’. They would continue being the primary interface between patients and the practice, but we wanted them to be able to concentrate on data quality issues in the medical practice and to act as conduits of communication rather than retrieving and filing medical record envelopes (MREs).

Results/implementation

Progress with the implementation plan

Time-scales inevitably slipped. Originally it was anticipated to take a year to completion: six months to become fully familiar with the new Synergy clinical system and then six months for networked scanning. In reality it has taken 18–24 months because of Synergy issues coping with four sites.

Migration from the old Torex System 5 to Synergy was a relatively painless migration and there was minimal data loss.

The main problems with the implementation concerned networking and scanning. A medical scanning technology company, PCTI, was brought in to help with the final configuration, which included checking network speeds and storage capacities. They also installed and provided the initial training. In basic terms, the software scans a batch of letters into image format which can be Read-coded and linked to the patient’s clinical record. After making this link, the document enters the work-flow and is not finally filed until seen by a specified doctor who can comment, request action or ‘end’ the process.

Whilst much was made of the integration with Torex Synergy, it was not immediately apparent at the procurement stage that DocMan created an entirely separate database on another server. PCTI chose to use our email server for this purpose. This database needed regular re-indexing to maintain synchronicity with the clinical server database. Scanning staff commonly found difficulty in allocating scanned letters to patients because they were not in the database. Any new patients would not appear until a minimum of 24 hours after registration.

To view any letters, the clinician would need to have the DocMan client open and active together with Torex Synergy. Indication was given that letters were present for any particular patient record, but there was no direct mapping between the two databases. This program did not meet our original clinical system integration criteria and the re-indexing process was not fully stable.

A snapshot for one week prior to choosing the solution indicated that we would be scanning approximately 80–100 patient-related letters per day for a total of 13 doctors. This still left a lot of correspondence that was difficult to file. For example, prior to the implementation of scanning, Department of Health circulars would be photocopied and distributed around the practice. Now these could be scanned into the intranet and the relevant recipients alerted by email that there was a new document to read.

Some six months later, the above problems unsolved, we migrated to an upgraded version and retrained. The database is still separate, but the synchronisation issue is now solved.
Some documents do not scan readily and it can be difficult scanning a batch of papers with different thicknesses and sizes. Flimsy discharge copies and A&E reports can be particularly difficult and occasionally simply will not scan. In these cases, the content is typed directly into the clinical record and the paper still destroyed.

The other developments have gone more smoothly. An intranet was set up in August 2002 by SC-B using Microsoft Sharepoint, but this has proved too costly to maintain, though potentially useful for sharing and amending documents prior to final versions. An internal website has been more recently established from the clinical server. This is a little less elegant, but allows the practice to share documents around the practice. SC-B also created the practice website (www.guildowns.nhs.uk, see Figure 1) in Macromedia Dreamweaver and Adobe Photoshop.

The practice uses networked audio Express Dictate, which centrally stores digital audio files (one per letter) for collection by any practice typist, but is printed back to the local surgery for the author through a networked printer.

Encrypted email is just starting to be piloted within the Primary Care Trust, and the practice will be part of this pilot.

### Changed roles and working practices

The lapsed months between the two versions of scanning software allowed us to add a ‘Read code’ step to the work-flow. If a doctor highlights any text for Read coding using the electronic highlighter pen, the scanning operator knows this and forwards it on for Read coding.

Members of staff are encouraged to develop IT skills and there was some resistance to scanning initially following training. This is not surprising considering the considerable impact the new task had on their existing roles. When replacing administrative staff in the future, we will now look for keyboard skills and use of Microsoft Word, Internet Explorer and Outlook as key requirements.

Not all doctors and staff have rallied to the new technology with equal enthusiasm. There are ‘affordances’ of paper (the ability to visually scan, annotate, fold and do other things with paper that simply cannot be done on screen) which cannot be determined directly from an image of the paper.

A year ago, Read coding seemed a specialised task and Guildowns had funding for a dedicated ‘Read coder’; now this function, and issues surrounding data quality, are the responsibility of everyone. The

![Figure 1 The Guildowns Group Practice website](image-url)
practice is using its computer systems more and more for audit, and data collected across local practices suggest that its data quality is as good as other West Surrey practices – and would meet the quality standards set for the new GMS Contract.18

Discussion

The development of a largely 'paperless' general practice has taken around two years, but information flows have dramatically altered, and in our view improved over this time period. Many of the improvements in the clinical system, the intranet and website, and in the setting up of more resilient and secure systems, have occurred with little drama. However, document management and scanning have proved a bigger obstacle and hence are the main focus of this paper.

A critical success factor was the existence of a champion to lead the process through the inevitable implementation difficulties, supported by his partners. Even when a well-informed practice champion sets out to implement a plan, shortcomings of the chosen system may not be apparent.10 Visiting one or two reference sites might have identified in advance the issues that emerged. However, as the practice was pioneering Synergy in a multi-site practice, this is unlikely to have met the particular practice needs. On the positive side, as a pioneer the practice accessed good support in the installation phase – numerous engineers were sent to get the system to work. It was clearly a learning experience for them to take to other multi-sites.

There is no evidence that the move to paperlessness has saved staff time or costs; however, that staff time is being reinvested in improved clinical coding. A drawback of the current system is that it takes longer for clinicians to read their clinical letters on screen. There have been no complaints from patients about the use of technology in the consultation; possibly they associate this with their doctors being more up to date, as hypothesised by Ridsdale and Hudd.19

A major limitation of all scanning methods is that they are only of value in the scanning practice. Until the standard for national GP to GP transfer of the clinical record (planned for end 2004) is resolved,20 to send a complete patient record to a new doctor either means printing off the correspondence once more or sending the record on a disk. This is of particular concern to the Student Health Centre where approximately 1500 patients join and leave the practice every year. It should be possible to devise a reporting method combining the resources of Torex and PCTI to allow for the batch printing of complete patient records from both databases. The suppliers are being pursued to try and achieve this.

Further research is needed as to whether the factors that contributed to this successful implementation, in the face of some considerable difficulties with the initial scanning system, are generalisable across general practice. Certainly the 'social' factors appeared to be as important as the 'technical' ones.21

Conclusion

A motivated practice has moved from a legacy system with a text-based interface – which allowed sharing of the registration details and consultation text – to a fully integrated Windows-based system, that includes access to the full computerised medical record, within around two years. Improved technologies, supportive national and local policies, and a local champion supported by a forward-looking practice with sound management have all been components of this successful migration to paperlessness.

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Carr-Bains and de Lusignan describe in this case study their experiences of moving their multi-site practice from a paper-supported practice towards a paperless practice. The main problems they experienced before making the decision to go paperless were problems associated with the movement of medical records between surgeries and difficulties in finding records.

In order for a paperless office to be successful, documents and locally performed clinical measurements should be integrated with the clinical record. Therefore it was decided to scan the documents and use a document management system to manage the documents, and to use a GP clinical computer system for the clinical record. The main problem appeared to be the interfacing between the document management system and the GP information system: the document management system used its own database, independent of the database managed by the Torex Synergy information system.

It is not entirely clear what caused the technical difficulties in integrating the letters database with the clinical records database, but it is certain that without such integration, indexing documents so that they are ‘visible’ when using the clinical information system is impossible. This problem was eventually solved, but it may be that the specification of the integration between the two systems was not adequate. From the point of view of practices wishing to implement similar scanning systems, it is helpful to know that this integration must be carefully considered beforehand.

The authors indicate that not all documents can be scanned, so that the information contained in these documents has to be manually entered into the clinical record. This of course is extra work that will have to be carried out as long as these types of documents are received. The authors state that the original documents were destroyed: but is there not a legal obligation to keep the original documents for a certain period of time?

Although it is stated in the Method section that there was no subgroup or practice manager able to manage the change, in Box 1 it is mentioned that there was a partner who was interested in, and willing to champion and manage, the change in the practice. In the discussion it is stated that the presence of such a champion was a critical success factor. The paper does not explain, however, why that was the case. I can imagine that migrating to a new GP information system and at the same time also introducing a document management system could be too much change at one time (especially since one can expect problems in interfacing both systems), and that such a project will only survive when a champion is present who convinces the staff that the chosen direction is the good one, even though a number of things do not work as they should at the time.

This paper focuses heavily on the technical problems encountered and their subsequent solutions. However, it does not state very clearly what the authors really have learned that is also worthwhile for other practices to know. The main message of the paper that I perceive is: beware of document management systems!
The authors state that a champion is a critical success factor. Was this the main factor that contributed to the successful implementation, even given the difficulties that were encountered with the scanning system, or were there other factors as well? For example, were the majority of the staff in favour of the project?

Although in the paper several aspects are distinguished, such as the project plan, the technical plan, the changed staff roles and changes to working practices, I would like to know more about the impact of these aspects on the whole process.

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High expectations are placed on the increased use of information and communication technology (ICT) in health care. The American Institute of Medicine, for example, argues that efficient, high-quality health care mandates the use of well-developed ICT applications, including electronic patient records that replace paper records. For individual practitioners introducing electronic patient records, however, the lofty goals of increasing efficiency and improving the quality of care are often pushed to the background by more mundane challenges such as selecting systems, preparing implementation strategies and solving technical hurdles. The case study presented by Carr-Bains and de Lusignan provides an account of the practical, often technical, issues that had to be addressed when moving to a paperless practice.

In the Netherlands, most GPs have gone paperless. Patients are accustomed to the GP using a keyboard to record medical data. Though it seems that the Dutch GPs started the move towards paperless offices a few years earlier, the similarities between the two countries are striking. The reasons Carr-Bains and de Lusignan report for going paperless resemble the motivation of Dutch GPs. As also reported by Carr-Bains and de Lusignan, it took many Dutch practices about two years to move to a paperless office. Many Dutch GPs faced the same practical challenges as their counterparts in the UK.

The early Dutch systems focused on the automation of financial transactions – in this area the practical gains seemed most obvious. Bills no longer had to be handwritten after office hours, but were produced by the computer more or less automatically. This saved time and freed physicians from boring clerical work. From the beginning, however, the so-called ‘medical module’ of primary care information systems was an important focus of attention. A national automation taskforce took the initiative to write a reference model, in which the basic requirements of a primary care electronic patient record were formulated. Following Lawrence Weed, the patient record was to be problem oriented; all data, action plans and progress notes were, ideally, to be organised around the problem(s) of the patient rather than kept in mere chronological order. Having an electronic medical record available has had an important impact on Dutch general practice. The ability to code chronic diseases or risk factors for influenza, for example, has made preventive medicine more feasible: appropriate populations can be selected, letters (such as an invitation for a vaccination) automatically generated, and the progress of the vaccination programme monitored. In addition, basic electronic communication functions have been added over the years (for instance, prescriptions can be sent to pharmacies or laboratory results can be received electronically), facilitating communication with other healthcare workers.

The period of successful introduction of electronic patient records in Dutch primary care, however, was followed by a period of stagnation characterised by little or no further development of the systems. The majority of the electronic patient record systems currently in use were designed more than ten years ago, and they reflect the organisation of general practice in that period. The organisation of Dutch general practice, however, has been changing. The number of single-handed practices is declining, and increasingly GPs are located in health centres that include other disciplines such as physiotherapists, social workers or pharmacists. Also, GPs are reorganising on a regional level. Previously, small groups of GPs, typically ten to 15, were acting as locums for each other after office hours. In the past two or three years, this service has been transferred to a regional level, where during the night and at weekends physicians are available for the patients of 100 to 300 GPs. Systems designed ten years ago have great difficulties adapting to these changes.

One of the main limitations of the systems is their limited ability to communicate with the systems of other healthcare workers. The need for electronic communication has expanded rapidly in the past years, both in terms of the amount of communication and the number of different parties involved in those communications. When the first versions of the systems for
general practice were designed, however, electronic communication was not one of the design criteria. Functionality that supports electronic communication was added later on, yet this functionality was often not fully integrated with the electronic record. As a result, the integration of incoming electronic data in the medical record is often difficult and cumbersome. For example, when a patient moves from one practice to another, the record is often printed, handed to the patient (or sent by surface mail to the next GP) and re-typed by the staff in the new practice.

While the Dutch GP electronic patient record ‘diffused’ into Dutch general practices very rapidly during the 1990s, the success story has turned into a near disaster during the last few years. Several leading Dutch software vendors initiated major efforts aimed at building a ‘new generation’ of systems for primary care. Vendors, however, underestimated the effort required to build these systems. Though in some instances marketing of a new system had already started, several companies had to abandon further development of their new products. Companies facing financial difficulties changed owners and some companies changed hands several times in the course of just a few years. Other vendors left the highly fragmented and small Dutch primary care electronic patient record market. As a result, many of the current systems for GPs are best described as legacy systems – systems developed based on the general practice setting of some ten years ago but insufficiently adapted to the changing requirements of general practice. These systems, however, are deeply ingrained in the administrative and medical work practices of the Dutch GP.

Where do we go from here? Recently, new chapters have been written in the history of the electronic patient record. These developments do not start with a focus on ‘record keeping’, let alone on a solution for the current stagnation. It is, however, not the first time that fundamental healthcare ICT achievements have been triggered by seemingly unrelated developments.\(^5\) As mentioned above, GPs have reorganised themselves on a regional level to provide services during the night and at weekends. At present, the physician on call for the whole region has little or no medical data available from the patient’s own GP. This absence of medical data during out-of-office hours is increasingly judged to be unacceptable. The need to have the medical records of several hundred GPs available from one location is prompting the development of new systems dedicated to retrieving data from existing local systems. Initial trials with these new systems are presently being conducted.

The need to have medical data available on a regional level is also changing how an individual practitioner makes decisions about their own system. In the past, individual GPs decided themselves what system to purchase. In addition, they also took upon themselves the role of system manager. The individual practice was, in essence, an autonomous unit responsible for its own decisions. In recent years, however, GPs view their system as part of a larger system. Increasingly, GPs are taking decisions about electronic records on a regional level in order to improve the availability of patient data.

The emerging regional networks of GPs are often taking a leading role in the development of the regional ICT infrastructures that also include other disciplines. In contrast to the UK, where NHSnet has been operative for some years now (with varying levels of physician enthusiasm), the Dutch healthcare system has no strong central co-ordination point which could direct the development of such a national infrastructure. However, regional infrastructures, supported by regional insurance companies, governments, local GPs and larger healthcare institutions, are developing.

This trend away from individual practice and towards a more comprehensive system able to better support continuity of care will drive developments in the coming years. Instead of an individual asset, the GP electronic patient record will become a collective asset – and maybe the collective ‘owners’ are the regional practitioner groups that were set up to solve the entirely different problem of after-hours GP service.

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