

Managing your Clinical Information

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Session 8

The Electronic Patient / Healthcare Record (EPR / EHR)

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1. Personal Note

This set of notes has been produced to help those at board level of Trusts gain insight into the Computerised Patient Record from the clinical perspective. The notes are deliberately discursive and at times provocative to encourage thought and debate.

Personally, I very much welcome the New NHS Information Strategy, having spent much of the last ten years banging my head against a brick wall concerning two issues; the importance of clinical information and the usefulness of care pathways. Both are recognised in the new strategy and I feel my many cries may have at last been heard. I have always espoused the centrality of the Patients Clinical record as a building block for any healthcare information system. The idea that you could begin with developing management level information systems without mature clinical systems always seemed a doomed activity to me. Similarly, the idea of using clinically inappropriate Care Packages, (not permitting variance-recording etc.) when the much more suitable Care Pathway Approach was available and supported by Clinicians seemed ridiculous.

I only hope that the years of frustration and alienation that many clinicians have felt when becoming involved in Clinical systems (I personally know of three who have left the NHS) will be a thing of the past. Much bridge building needs to be done and the EPR project at the Doh (EPR 1998) is one activity that has the ability to achieve much in this sphere.

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2. Introduction

For more than thirty years people have been struggling with computer-based versions of some aspect of the traditional paper based medical record. In some areas, notably Renal Dialysis Units (RDU's) and GP's the process has been relatively successful however these are exceptions rather than the norm.

The concept of a computer based medical record has been given a variety of names over the years:

- Electronic Patient Record (EPR)
- Computerised Patient Record (CPR)
- Computerised Medical Record (CMR)

Etc. etc

The concept of the EPR seems to turn the most stable person into a quivering wreck. Why is this? I believe it is due to three factors; the widely differing messages being given off by the various EPR experts. A hostile attitude towards clinicians involved in systems development encouraged and legitimised by the old IM&T strategy and finally the relative difficulty in developing clinical information systems compared to financial ones for most IM&T professionals

For example, a recent comprehensive handbook of Health Informatics (Bemmal & Musen, 1997) describes the EPR as the Holy Grail of Medical Informatics suggesting that it is unobtainable. In distinct contrast some systems suppliers have been producing complex Clinician oriented systems for several decades, see Simpson & Gordon, 1998. Finally, in contrast the Data modelling division of IMG consumed significant resources developing both generic and clinically specific datamodels for EPRs, which were never fully validated in the field. These wide knowledge gaps between the academic Health Informatics community, systems suppliers and what used to be the IMG (now the NHSIA) present the novice with a formidable task.

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3. The new NHS Information strategy perspective

The new NHS information strategy - described in the document 'Information for Health' - further compounds the situation by offering the concept of levels of computerised record as well as two different varieties.

3.1. EPRs and EHRs

Two types of computerised record are described:

- Electronic Patient Record (**EPR**) describes the record of the periodic care provided mainly by one institution. Typically, this will relate to the healthcare provided to a patient by an acute hospital. EPRs may also be held by other healthcare providers, for example, specialist units or mental health NHS Trusts.
- Electronic Health Record (**EHR**) describes the concept of a longitudinal record of patient's health and healthcare - from cradle to grave. It combines both the information about patient contacts with primary healthcare as well as subsets of information associated with the outcomes of periodic care held in the EPRs. The relationship between the two is illustrated below:

NHS E 1998 p25 [Back to contents](#)

3.2. Importance of Primary Care

The 'Information for Health' document is explicit concerning where the EHR will reside:

'The majority of patient contacts are with primary care, and the information contained within the EHR is essential to support primary care teams. It therefore follows that the creation and maintenance of the EHR is best undertaken within the primary care setting.'

NHSE 1998 p26 para2.17

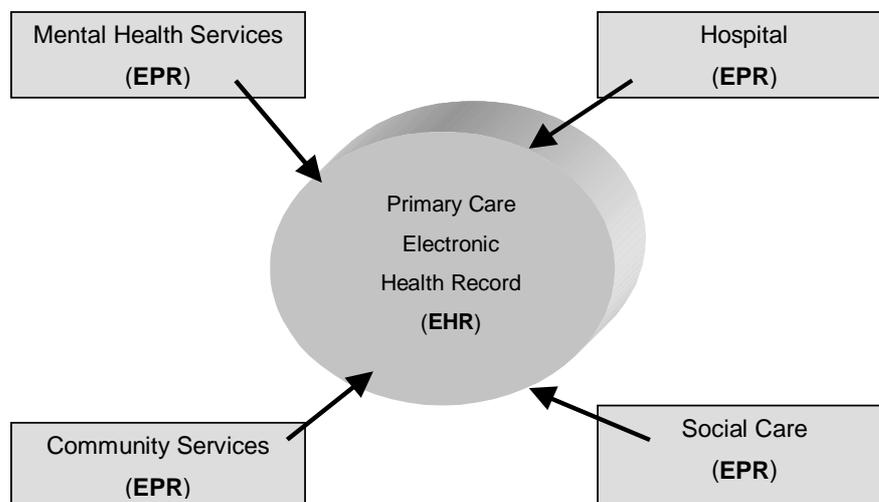
1. Exercise:

Do you feel that the criterion of 'number of contacts' is appropriate when deciding where the EHR should reside?

What reasons do you think the NHS may have had for selecting the Primary care setting for the residence of the EHR?

List a set of criteria you feel to be appropriate.

Do you think that your criteria mean that the EPR should reside in Primary Care?



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3.3. Linking EPRs

The mechanism to achieve this will be the unique NHS number obtained from a central database.

This is all very well within the rhetorical ideology of the 'Information for Health'. However, over the past decade, many projects within the NHS (notably the Community Information Systems for Purchasers project) have attempted to link disparate community systems with little or clinical success.

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3.3.1. Confidentiality, access and availability

One of the perceived problems with the EHR is that of confidentiality. Below is given part of a reply to a open electronic newsgroup (GP-UK) by one of the eminent writers on confidentiality in the NHS, Ross Anderson (PG-UK 1996)

"The sharing of administrative data as envisioned by the NHS Executive is flatly in breach of medical ethics as laid down by the GMC and explained in the BMA handbook. It also conflicts with my own perceptions and expectations as a patient.

I do not accept, for example, that when a girl has a TOP [termination of pregnancy] and asks for this to be kept private, the hospital should submit a CDS [Common data set] to clearing which then passes on the record - still identified by date of birth and postcode - to HES [Hospital episode statistics] where it will be accessible to all manner of civil servants, any of whom might be bribed or blackmailed into releasing this information to people with less than altruistic motives.

I do not accept that when patients have self-referred to a distant hospital with a view to getting confidential treatment for HIV, the hospital administration should - without their knowledge and consent - fill in forms that identify them by date of birth, post code and the soundex code of their surname, and share this information with health authorities and laboratories, on the grounds that it is necessary 'to plan the number of nurses'.

I do not accept that whenever a GP orders a test, the hospital should enter it onto the HISS 'to prevent duplication in the event that the patient is admitted to hospital', then the effect is that instead of the result of that test being private to the patient, the GP and the pathologist, it is now available to over a thousand people at the hospital.

A do not accept that the AR [Administrative register] should tell all in sundry who has had a relationship with a GUM [Genito-Urinary Clinic] clinic or a psychiatric department.

The GMC guidance states that 'Patients have a right to expect that you will not pass on any personal information which you learn in the course of your professional duties, unless they agree'.

Consent, not 'need to-know' can be the only ethical basis of sharing clinical information in the NHS. I should have to go private to maintain my privacy.' " (GP-UK Archive1996)

2. Exercise:

What do you think of the above quote, is it presenting valid scenarios?

How could the problems mentioned be resolved, or contained within the context of implementing a EHR?

Along with the problem of confidentiality comes that of availability. Now nearly all hospitals only provide information support on a 9 to 5 basis. In contrast 'Information for Health' (p32) states that; "in an age when 24 hour banking services provide round the clock access it is unacceptable that personal medical histories are only properly available in office hours".

3. Exercise:

What are the staffing implications, including IM&T support, of the above?

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3.4. EPR Levels

Six levels of EPR are presented in the Information for Health document (p37):

From the above it is easy to draw up a checklist for each system, including that concerned with Patient Administration.

EPR Levels (NHSE 1998 p37)

Level 6	Advanced multi-media and telematics Level 5 plus Telemedicine, other multi-media applications (e.g. picture archiving and communications systems)
Level 5	Specialty specific support Level 4 plus Special clinical modules, document imaging
Level 4	Clinical knowledge and decision support Level 3 plus Electronic access to knowledge bases, embedded guidelines, rules electronic alerts, expert system support
Level 3	Clinical activity support Level 2 plus Electronic clinical orders, results reporting. Prescribing, multi-professional care pathways
Level 2	Integrated clinical diagnosis and treatment support Level 1 plus Integrated master patient index, departmental systems
Level 1	Clinical administrative data Patient administration and independent departmental systems

EPR Compliance						
System name	Level 2 compliance	Level 3 compliance	Level 4 compliance	Level 5 compliance	Level 6 compliance	Integration with PAS / MPI

4. Exercise:

Taking the top four departmental systems in your service area, list to what EPR level each is currently at NOW (NOT planned) and the level of integration with the Patient Administration System (PAS) or Master Patient Index (MPI).

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The EPR levels are particularly interesting from a number of perspectives.

To a limited extent they appear to follow the standard incremental HISS [Hospital Information Support System] approach by first developing a Master Patient Index (**MPI**) for generic data and then gradually developing the functionality of the departmental systems. However, there do appear to be logical anomalies in the above plan when studied in more depth. Several issues need clarification:

Level 1 - It is clearly necessary to have a generic 'patient administration' dataset or at least the production of one to allow migration to the next level. Considering the developmental process it would seem sensible to ensure this at the outset. The difference between a **PAS** and Master Patient Index (**MPI**) is blurry at the best of times, Usually the latter is derived from the former.

Level 2 - I'm not sure what 'treatment support' means at this level? Integration of departmental systems would also appear to be at this level.

Level 3 - This is clearly derived from the various findings from the HISS sites that found 'Order communications Systems' (**OCS**) to be one of the most beneficial functions to clinicians of a HISS system. For a detailed review of OCS's along with their relationship with HISS see J Thorpe 1992. At this level I would also add the functionality of bed monitoring / reporting as consultants using the Sunderland HISS found it very useful to produce reports of where their patients were at the start of each day.

Including prescribing and care pathway functionality at this level suggests the existence of a highly structured computerised nursing record as well as integrated computerised ancillary clinical departments. An ancillary department is one indirectly involved in patient care; see Bemmell & Musen 1997 p195 for details of such systems.

The use of an Intranet to support clinical practice has been shown to be very beneficial in several hospitals, for an example of such a system to support nurses see Dugas 1998.

Level 4 - This is where I feel the problems with the proposed development process begin. Most of the information required of 'knowledge bases' will be, through the strategies eyes, be available via the NHSNet in the 'National Electronic Library for Health' (see p58 Information for Health for details). 'Expert systems' have been around for the last thirty years, and have virtually died a death. These have been replaced by far simpler systems that provide the clinician with advice rather than remove the decision making process from them. One such system is the PRODIGY system in the UK. For a through discussion of implementation, maintenance and problems with Expert and Decision Support Systems see M Berg 1997.

Level 5 - This I find the most ambiguous of the levels. 'Specialty specific support' would have been developed from level 1 within the independent departmental systems. Such examples of 'Specialty specific support' are Kinetic Modelling modules for Dialysis Units (see Simpson & Gordon 1998) or specific monitoring modules for differing varieties of Intensive Care Unit. I feel that if such functionality were not included at the specialty level at an early stage in their development they would rapidly become shelf wear.

Document imaging is a term that can mean many things. A small number of GPs regularly scan TYPED or WORD PROCESSED referral and discharge letters and then use software to convert the contents to the appropriate textual format for storage in their systems. A large amount of research has looked at understanding hand-written documents with some success, I don't know of any that have looked specifically at Doctors handwriting!

OMR (Optical Mark Recognition) **OCR** (Optical Character Recognition) software including integrated questionnaire design / monitoring software (e.g. Teleform TM) has been used in a number of hospitals. It has been used for audit or management of **Patient Encounter Forms**, a method of data collection for clinicians who do not want to enter it directly into the computer (See . Bemmell & Musen 1997, p105). If 'the Information for Health' document is referring to this technique as 'document imaging' it would be seen as a backward step. The reasons being that within the development process of clinical information systems three of the principle objectives are to:

**Guidelines for developing clinical information systems
(Bemmell & Musen 1997, adapted)**

- Data should be acquired as close as possible to the source of the data (e.g. at the encounter). Often called Point Of Service (**POS**) data collection.
- Persons who enter the data should benefit from this data entry, either because they will use the data latter or because it will improve the quality of their work.
- Coding [.....] should be done by the person making the observation.

Level 6 - Several Radiology departments already store and manage digitised images using **PACS** (Picture Archiving and Communications Systems). Telematics has been used in areas where there is a low density of both medical resources and patients. Queens at Belfast possesses the first professor of Telematics in the UK.

5. Exercise:

Discuss the above comments about the EPR levels.

Discuss the resource implications if one adopted the three guidelines for clinical systems development suggested above.

The levels suggest that the NHSE expect a **iterative developmental process** to be adopted. Unfortunately, this method is not as popular as the traditional linear approach with system suppliers and will undoubtedly have affects upon the methods hospitals and community trusts adopt to implement this strategy.

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3.5. Implementation Plan

The Information for Health document divides the local implementation into three phases. Below are given the milestones that I feel relate to the EPR and EHR.

1998 to 2000 (phase one)

Connecting all computerised GP practices to NHSnet

Completing the national NHS email project

Establishing local Health Informatics Services

Completion of cancer information strategy

2000 to 2002 (phase two)

35% of all acute hospitals to have implemented a Level 3 EPR

Substantial progress in implementing integrated primary care and community EPRs in 25% of Health Authorities

Use of NHSnet for appointment booking, referrals, radiology and laboratory requests/results in all parts of the country.

A National Electronic Library for Health accessible through local Intranets in all NHS organisations.

Beacon EHR sites have an initial first generation EHR in operation.

By 2005 (phase three)

Full implementation at primary care level of first generation person-based Electronic Health Records.

All acute hospitals with Level 3 EPRs

24 hour emergency care access to patient records

6. Exercise:

Within your service area, do you think it is possible to attain the above deadlines?

What will be the main challenges for you?

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4. The EPR in Action

The pivotal role the clinician is now required to play is very different from the often marginalised and hostile position they found themselves in the past when they attempted to become involved in departmental system development.

A superb (American) book describing the role clinicians can play in hospital systems development is by Bria Rydell, 1992. All hospitals should have copy and any clinician interested in becoming involved in systems development should read it.

Before considering the electronic version of the Patient Record it is pertinent to reconsider the paper version.

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4.1.1. Views of the Paper Patient Record

Patient records were originally seen as 'case histories' each entry describing the condition or the patient over time, they were said to be **time orientated**. However, particularly in primary care a move has been made away from this approach towards records that were **'problem oriented' and Patient Centred**. Particularly the first approach is more suited to the community / primary care sector than that of the hospital sector. In the hospital environment in America the concept of **Managed Care** and **Care Pathways**, which have also become popular in the UK, present new demands for the patient record. Paper patient records are extraordinary entities having legal status, which contain information that ranges from numerical objective data to idiosyncratic value judgements.

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4.1.2. EPR and Consultation Style

To develop clinical information systems clinicians must move from being largely passive information consumers to becoming actively involved in the whole process of information management. This requires a great deal of commitment. Traditionally clinical information systems were of two types:

- **Front office** - used during the consultation
- **Back office** - used before after the consultation information 'fed' into the computer directly from traditional patient notes or from **Patient Encounter Forms**.

It is now generally accepted that front office systems are preferred; as primarily they ensure a higher level of data quality and provide the clinician with immediate feedback. This also is in agreement with the guidelines for clinical systems development listed in an earlier section.

Clinicians need training in how to use computers as part of the consultation process, and must have the same level of confidence with the computer system as they would have with paper records during the consultation.

7. Exercise:

Considering the context of the 'consultation' in the hospital setting compared to that of the PGs surgery what challenges do you see with the 'front office' approach?

Are there any solutions? Consider the use of modern technologies?

Often clinicians are dissatisfied with clinical systems because they slowdown the consultation. However this has found to be in certain instances to be perceived rather than real, due to the amount of information presented on the screen increasing cognitive load (see Prodigy Web site).

Clearly, a poor clinical system will slowdown the consultation, and traditional functional specifications do nothing to help the situation which is a Human computer Interaction (**HCI**) issue discussed more fully in the next section.

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Another consequence of the presence of a computer in the consultation is the effect it may have upon the relationship between the Clinician and the Patient. This has been used to re-engineer the consultation in many ways:

- Introduce patient information screens and production of patient advice leaflets
- Provide help screens for junior doctors giving departmental clinical information
- Allow patients to enter information prior to the consultation. Used with drug abusers in Newcastle as it has been shown that they are more truthful to the computer!

Certain tasks require a drastic change in working practices. For example, ordering a Blood test electronically automatically may prevent a clinician from specifying the relative urgency in an inadequate system. In contrast, the system may provide without any additional data input the facility for monitoring length of time before the test result is available along with other aspects such as status of requests, and searching historical data.

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4.1.3. The EPR is not equivalent to the Paper Patient Record

From the above it is clear that the EPR is not equivalent to the Paper Patient Record, offering both advantages and disadvantages.

Advantages of the EPR include:

- a) Simultaneous access from multiple locations
- b) Legibility
- c) Variety of views on data
- d) Support for structured data entry
- e) Decision support
- f) Support for other data analysis
- g) Electronic data exchange and sharing care support
(above points from Bemmell & Musen, 1997 p114)
- h) Confidentiality - Access to subsets of data can be restricted including the Creation, Reading, Updating or Deleting of (**CRUD**) individual records fields
- i) Security - A audit system can provide very detailed information about who did what when.

In contrast, Paper records do have advantages:

- a) They can easily be carried around
- b) Much freedom in recording information
- c) Easy data browsing
- d) Requires no special training or 24hr support on hand
- e) Never 'down' as computer systems can be.
(above points from Bemmell & Musen, 1997 p114)

8. Exercise:

Can you think of any more points to add to the above lists?

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4.1.4. Viewing the EPR

Clinicians are extremely dextrous, manually and cognitively, when dealing with paper based records. Because of this, it is essential that they can view the information in the EPR from a number of perspectives:

- Over time (graphically and tabular where appropriate)
- By problem / condition.
- By status of investigation.
- Allow individual clinicians the ability to view additional Research data.
- Navigate very freely through the system.
- Develop and save ad hoc searches.

Additional Research Data - Most GP systems, notably EMIS, allow the user to develop 'templates' which allow the clinician to collect additional data they specify, for personal interest / research purposes. With the individualistic nature of medicine, it is essential to offer this type of facility. Activities aimed at removing individualism such as Evidence Based Medicine (**EBM**) and **NICE** are unlikely to have a dramatic effect upon individual clinical practice in Hospitals.

It is essential that development processes takes into account the specification and evaluation of the User Interface (**UI**) which is one aspect of Human Computer Interaction which must involve assessment of the system within the consultation. A standard technique is to video either real or mock consultations using specialist actors. Most Medical Schools have a group of suitable individuals (At Newcastle Medical School contact John Spencer).

Specifying the UI involves both specifying **screen layouts** along with possible **navigation routes**, as well as designing a comprehensive **help / online tutorial system**.

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4.1.5. Virtual Patient Encounters

With the Internet becoming a part of everyone's life, amazingly the fastest growing sector of users being the elderly, it is now possible to receive medical advice on the Internet. This can be done either by looking up the information or by subscribing to a virtual clinic with 24hr online access to trained nurses and doctors. (see Dr Schueler's web site, WellCom). This may end up being a fly in the ointment for the EHR?

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5. The EHR in Action

The new NHS Information strategy presents a significant turnaround, adopting the Scottish approach. However there have been sections of the DoH that did not buy fully into the management information culture, notably the HES section. This tactic has paid off, as the HES record could easily form the basis of an EHR.

Another approach may well be to investigate the possibilities with the main GP systems suppliers.

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6. Summary

9. Exercise:

Look back through the pages and make no more than one page of notes from them.

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