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**INM337 – Clinical Records**

Electronic Patient Records and Electronic Health Records  
A Fact or Fantasy?

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## **Introduction**

The National Health Service (NHS) has seen a huge increase in investment in the last 9 years since Labour has come to power. The annual budget for the whole health service is now estimated to be 80 billion pounds for the ending financial year. Nevertheless, one of the most important services – the patient records - is mainly still run on paper. Ward clerks are still searching manually through heaps of paper and folders to find relevant information and General Practitioners take paper records when visiting patients in care homes or day hospitals.

The government is pledging to invest £6 billion pounds into the national program for IT (NPfIT) to make the NHS IT Infrastructure fit for the 21<sup>st</sup> century [Brennan, 2005]. It has been found that doctors are supporting the improvements into the electronic systems that support clinical staff in their daily tasks by a recent survey, undertaken by doctors.net [CfH, 2006].

The government asked different suppliers to propose implementations for Electronic Patient Records (EPR) to feed the Electronic Health Records (EHR) with crucial information about a patient's health and public health promotion. In this assignment, Alexander Beisser will critically discuss the government's effort to provide every citizen with an Electronic Health Record.

### **What are Electronic Patient Record systems and their structure.**

Brennan describes the identification of an incremental model for the development of an Electronic Patient Record from the Electronic Patient Record Programme between 1994 and 1997 [Brennan, 2005]. Paper-based patient records, as they still can be found in GP practices and hospitals, are not fit for purpose anymore [Bainbridge, 2006]. Patient records are collections of medical information in different kind of media, like paper laboratory reports, x-ray images, ultrasound image printouts as well as referral letters and other information deemed necessary to provide medical care to the patient. The structure and form of the stored information makes it difficult to transfer it from one healthcare provider to another. It also can be quite time consuming to locate crucial data for intermediate care provision like in an Accident and Emergency department if you have to rely on paper records.

The government recognized the need of allowing fast and reliable data interchange between care providers; and the current centre of attention in the NPfIT therefore lies in the provision of

electronic patient data for NHS trusts in England. EPR systems will hold all medical relevant data in electronic form, which will allow fast interchange between health organizations and decision makers. Brennan describes the three components of an EPR implementation as active clinical support system to help doctors and nurses to treat patients on the most appropriate way, a 'passive' record which evolves with data over time and a data warehouse for secondary, anonymous data or record analysis.

Electronic Patient Records will eventually allow data interchange between GPs, Pharmacies, local council and secondary care providers. Last month the first electronic patient record interchange between two GPs (GP2GP) has taken place on the Isle of Wight, when a patient has changed his / her General Practitioner, whereas normally the record is either printed out or burned on a data CD [PHCSG, 2006]. Connecting for Health (CfH) is in the process of integrating graphical information through a Picture Archiving and Communication System (PACS) into the EPR.

Brennan describes the six levels of EPR functionalities as the following [Brennan, 2005]:

#### Level 0-1

- Partial implementation of Patient Administration System (PAS)
- Limited data warehouse / Enterprise Information System analysis
- Departmental systems – not integrated into PAS – limited to pathology, radiology and pharmacy

#### Level 2

- Fully implemented PAS
- Data warehouse / Enterprise Information System analysis
- Full range of departmental systems – integrated into PAS

#### Level 3

- Virtually full order communications and result reporting
- Extensive integrated departmental systems
- Some clinical systems
- Care planning and multidisciplinary care
- (Early) electronic prescribing

Level 4

- Complex electronic prescribing
- Development of clinical decision support
- Workflow and imaging starts to appear
- Integration of specialist clinical systems common
- Paper case notes will still be used as prime source

Level 5

- Full electronic patient record available
- Clinical decision support and rules
- Extensive workflow
- Case notes no longer stored in paper form, but electronically available in real time
- Capacity to analyse any information in the EPR

Level 6

- Telemedicine
- Picture archiving and communication systems implemented

Where are we at the moment? Current implementations are on level 3 with some trust implementing parts of level 4.

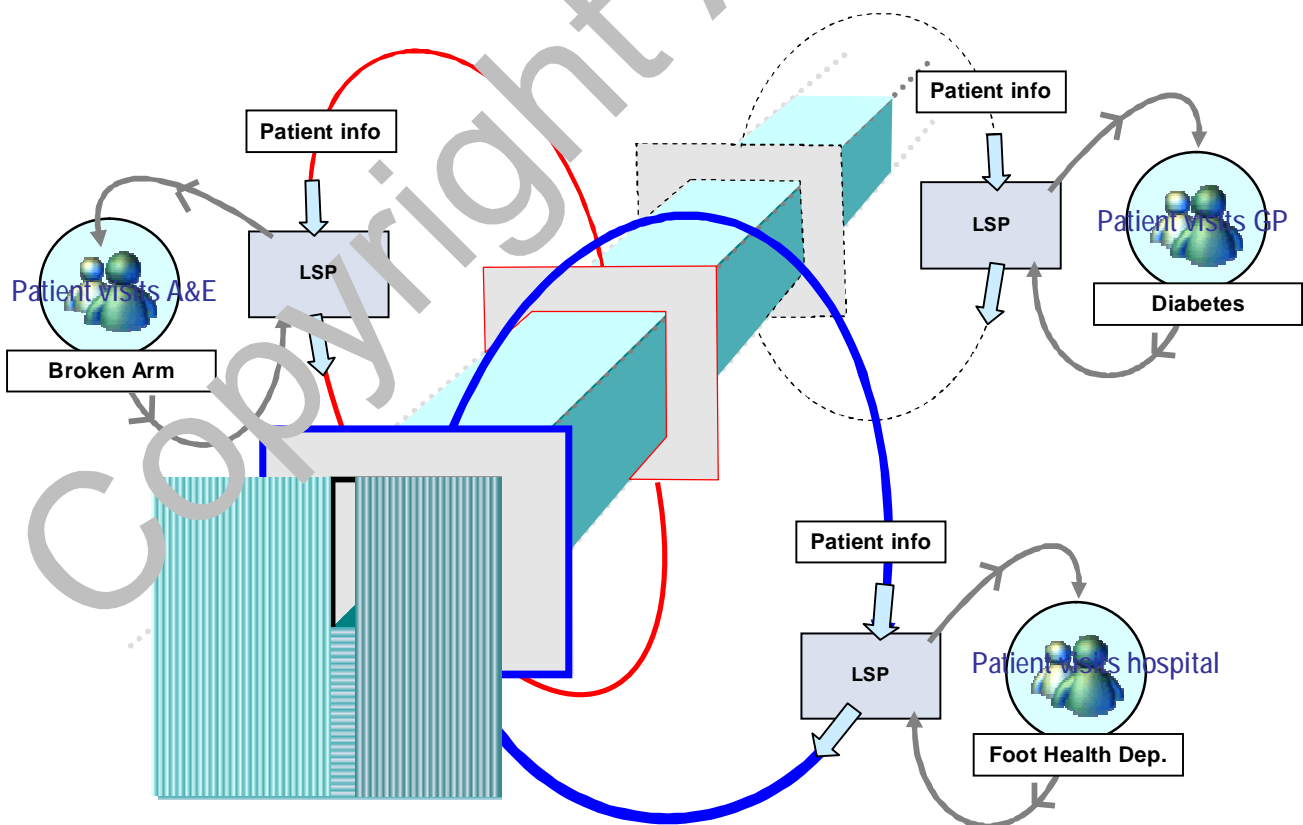
Electronic Patient Record systems are really only a powerful tool if data can be interchanged between service providers in a standardised manner at the time of need. This process will be discussed in the next chapter.

**Electronic Health Records – Sharing data from the Electronic Patient Records**

Electronic Patient Records have been developed and implemented to some stage to allow the fast storage, retrieval and sharing of medical information. Nevertheless, the government recognized the need to make medical records available throughout all parts of England and the rest of the UK to meet the need of a 21<sup>st</sup> century in which citizens are much more mobile and use medical services in different parts of the country. Patients want to be ensured that they get the best possible treatment when they have an accident away from home on business or leisure activities.

Key medical data has to be available around the clock around the country and only electronic systems would be appropriate for this task and you cannot make people responsible for carrying their medical records with them all the time. Some previous attempts in other European countries where citizens were asked to carry a paper medical emergency card with their medical emergency records (i.e. blood group, allergies etc.) have been defeated by lack of interest from people.

Therefore, the British government awarded British Telecom (BT) with a £ 620 million contract to develop, implement and maintain the National Spine system [Brennan, 2005]. The National Spine – commonly known short as Spine – will be at the heart of the Electronic Health Record. The Spine will hold all important medical data about patients together, similar to our own (human) spine that keeps us upright and walking. It has been intended that every person who has registered with the NHS will have his or her important medical data shared on the national Spine to allow doctors appropriate treatment in case of a medical emergency. This means that hospital consultants can retrieve Mr. Smith's medical record in case he attends the Accident and Emergency department to find key information like allergies, adverse reactions to medicines and previous hospital diagnosis (i.e. broken leg or arm). This information will save time and allow therefore a faster and more appropriate treatment of Mr. Smith.



LSP = Local Service Provider (GP, PCT or Acute Trust). Service local to the patient

**Figure 1: How information is entered / exchanged into the National Spine. Taken from lecture given by Mike Bainbridge and modified to fit example for patient Mr. Smith [Bainbridge, 2006]**

Let's keep with Mr. Smith and have a look how his Electronic Health Record is build up. Mr. Smith has Diabetes Mellitus and therefore needs to visit his GP regularly. The diagnosis of Diabetes Mellitus is the key figure in his medical record, which can have implications on his health in several ways (i.e. problems with his feet), and will therefore be extracted from his GP record and synchronised with the National Spine to be available for other health care providers. Other diagnoses which are not key factors like the common cold will not be saved on the Spine. When Mr. Smith now needs to attend a hospital in Leeds while on a business trip, the diagnosis of Diabetes Mellitus will be available to the hospital consultants in Leeds and his treatment can be adjusted to this fact if necessary. The hospital treatment – like a broken arm – will now be synchronised back to the GP's medical record system EMIS (which is used in the London cluster where Mr. Smith lives).

Several new technologies have emerged mainly from the Internet boom in the late 1990's that allow an easy exchange of information. Financial institutions are for a long time able to exchange data electronically between there branches in near real-time for decades, but it took the NHS up to now to allow electronic data interchange efficiently. The Electronic Record Development and Implementation Programme (ERDIP), which has been started before the NPfIT has evolved, has investigated the setup of an electronic record system, but it was defeated by difficulties in bringing together different record and coding standards and systems [Brennan, 2005].

The complexity and ambiguity of medical and the lack of a national wide used standard that can disambiguate the medical terminology hindered the development of an Electronic Health Record. Connecting for Health decided to use a new medical coding standard called SNOMED-CT, which is a combination of SOMED and CT and has been developed together with the College of American Pathologists (CAP). This standard combines the longest used coding system in the USA and the widely used coding technology Clinical Terms v3 – which uses XML standards.

Clinical data will now be coded in 'Standard Nomenclature of Medicine' (SNOMED) which is accepted nowadays as international medical coding standard in combination with the Clinical Terms (formerly known as Read Codes) that has been used predominately in the NHS. The first version of SNOMED-CT was released in 2002, but Connecting for Health is working in cooperation with CAP on an improved version that fits the need to the NHS more closely [Brennan, 2005 and CfH, 2005].

Coding medical data in a way to avoid ambiguity is the key requirement for sharing medical information between healthcare providers. It is of utmost importance that all medical staff can read and understand medical records. Electronic record systems can support users in medical decisions and flag up warning messages when ambiguous data occur, but data need to be coded in a common standard to allow the correct import and export of data from electronic record systems. GPs are using different record systems, which makes the record exchange more difficult.

Nevertheless, if clinical terminology is coded in a commonly agreed standard, modern programming language like XML and SGML can extract data from electronic record systems and format it on such a level to allow easy data interchange. XML (eXtended Markup Language) is a language that describes data by using metadata – data about data - so that it can be identified correctly by the source and target systems. This makes it an ideal candidate for the data synchronisation between GP systems (like EMIS) and the National Spine. An example of an extraction of medical data by using XML can be found below.

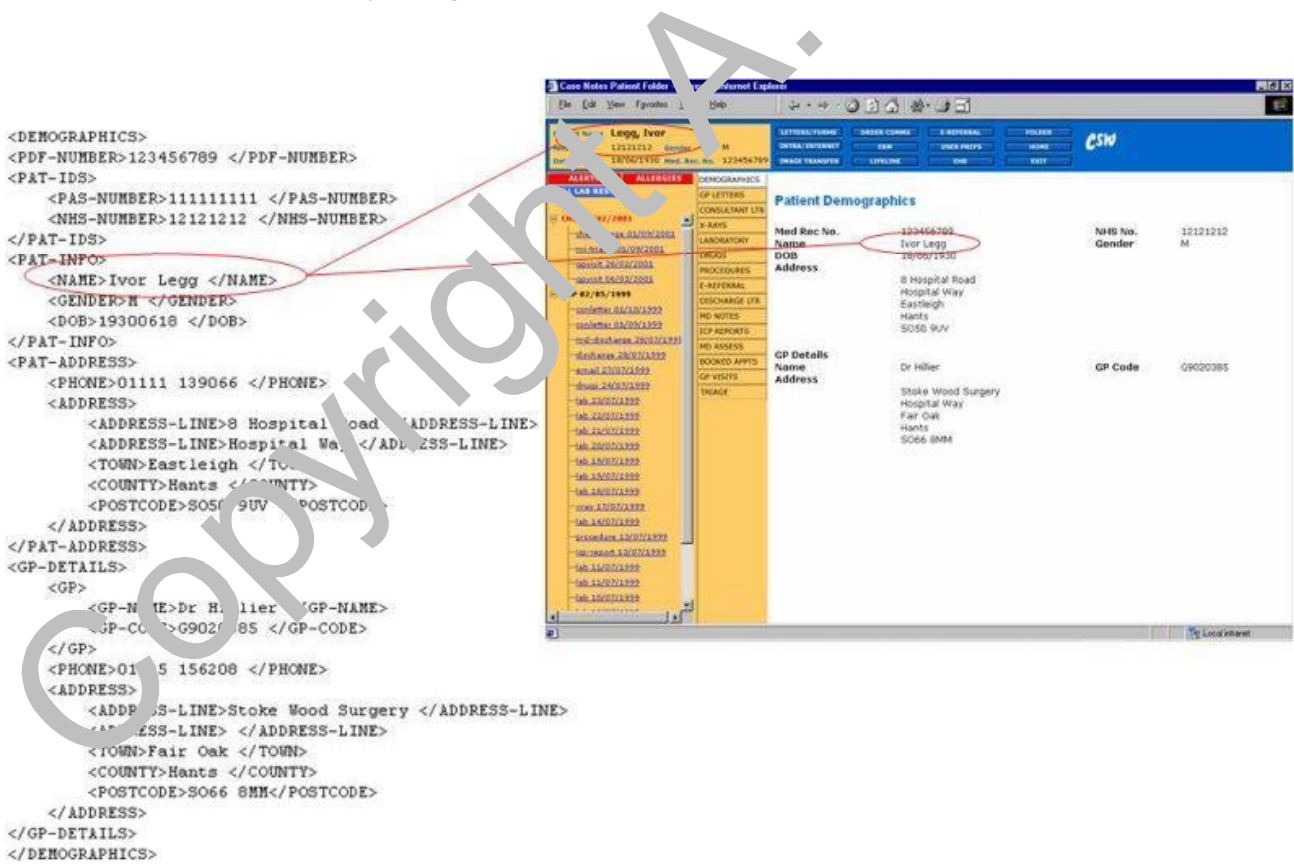


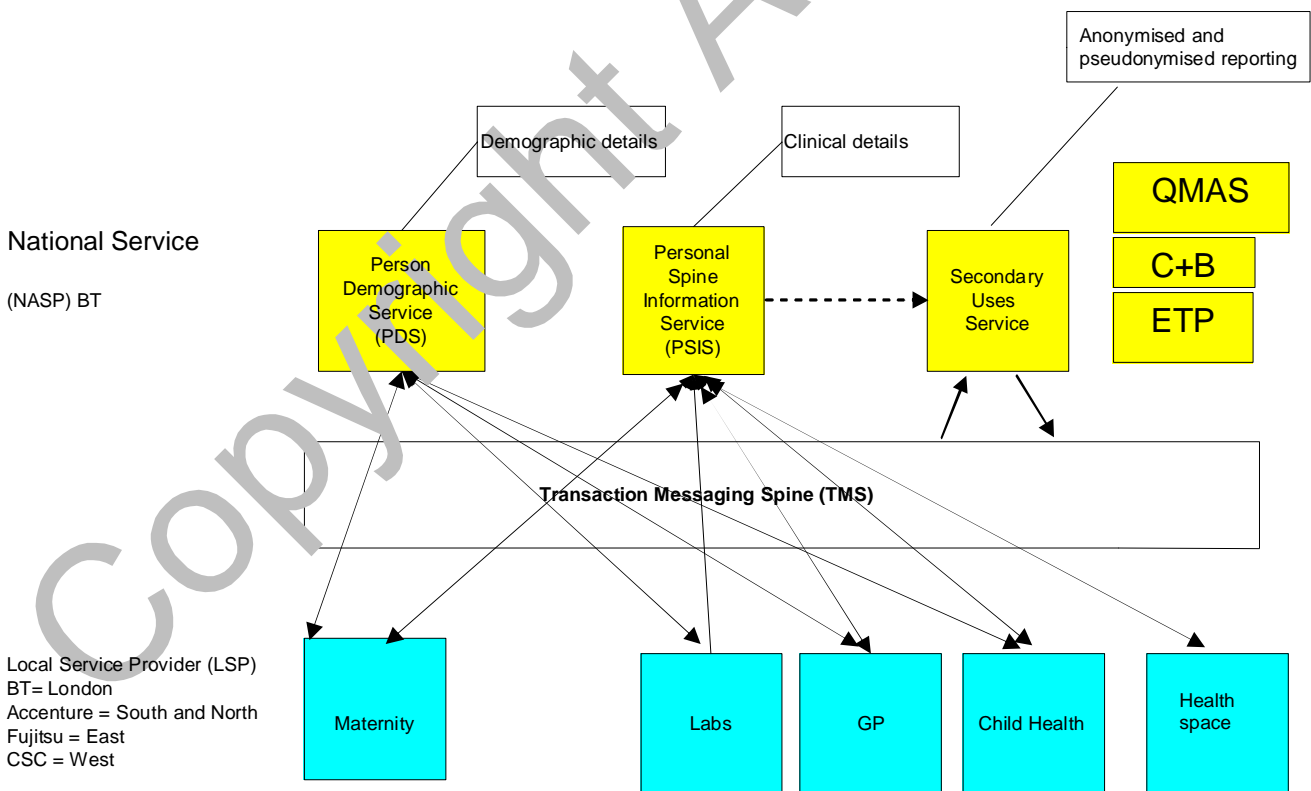
Figure 2: Data extraction from an Integrated Care Record by using XML [Dykes, 2005].

This data could now be sent to the National Spine. It is assumed that the clinical data has been coded in SNOMED-CT to ensure data consistency and accuracy.

**Did we learn our lessons from previous health informatics applications and programmes?**

Computers are not new hospitals. They have been around before the NPfIT has been initiated by the Labour government. Information systems have been widely used in the Intensive Treatment Units (ITU) to monitor vital organ functions and computers have been used in operating theatres for years and years to provide the surgeons with crucial information about the patient’s heart rate or the blood’s oxygen level just to name two examples. Those information terminals or apparatuses are just not the ‘normal’ PC terminals, which the public is used to.

Since new government has taken office, billions of pounds have been invested to improve the National Health Service. Between £ 6 and 13 billion pounds will be invested in the next five to ten years to improve the IT infrastructure within the NHS. EPR and EHR are not the only systems to be implemented, but there is a whole National Care Record Service (NCRS) to be developed, which provides many services to the NPfIT. The diagram below will show an overview of the parts of the NCRS.



QMAS = Quality Management and Analysis Service

C+B = Choose and Book

ETP = Electronic Transfer of Prescriptions

**Figure 3: The components of the NCRS in context with the National Spine. [Bainbridge, 2006]**

The Choose and Book system finally has gone live at the end of last year after a long delay and going over its assigned budget [Computing, 2005a]. Another article in the weekly IT newspaper 'Computing' reported back in March 2005 about the delay of implementing EPR nationwide EPR systems [Computing, 2005b]. County Durham and Tees Valley Health Authority has setup a local EHR project in which data between the NHS and social services is exchanged to have "information resources ... to support patient care by making relevant and appropriate information about patients available to the clinicians and other professionals charged with their care" [Durham, 2006]. The Primary Care Trust (PCT) where the author of this assignment works uses EMIS as GP system and Cerner's EPR system provided by the local acute trust. He has not been exposed in great details to neither of those systems yet.

So far, to the best knowledge of this assignment's author, only one hospital, Queen Mary Hospital in Sidcup (Kent), has fully implemented the new SNOMED-CT coding standard for its clinical record systems. So there is still a lot way to go before we confidently can say that we are happy with the implementation of the NPfIT. Computer Weekly reported in January this year about a survey conducted by Medix UK with 1329 responses which shows widespread support for the aims of the national IT programme. Some participants commented on the poor communication and consultation between clinicians and Connecting for Health. But many others praised the long-term benefits and boost for the healthcare in general [Computer Weekly, 2006a].

### **Critical appraisal of the Electronic Health Record system implemented by Connection for Health: How can we improve future versions?**

The National Programme for IT is the biggest IT project that the world has seen, as Sean Brennan describes its scale [Brennan, 2005]. It is an investment to overcome the limitations from previous systems into to the future of a modern health service, which can cater more flexibly for the needs of an ever increase demand in healthcare in the United Kingdom (UK).

The government has started an ambitious programme to modernise the NHS; and this means not only the IT infrastructure, but also the way healthcare is provide on a local and national level. The commission of a patient let care provision as it is being discussed on PCT level will mean just another change to the way we work in the NHS. The structure and governance of the NHS is

constantly changing, which inevitably will slow down the implementation process of the EPR components.

Jonathan Michael, Chief Executive of Guy's and St Thomas' Hospital in London, has been given a presentation at a recent Health Informatics Symposium at the City University London in which he described his view on the developments in the NPfIT and questioned if some projects could have not been solved by of the shelf IT products already used successfully in other industry sectors. Michael describes the "NHS plan is evolving, but one-size-fits-all is a fundamental flaw" [Computer Weekly, 2006b]. The author of this assignment agrees to some extent with this statement. National standards need to be clearly defined (according to e-GIF policies) and then adapted locally with the special needs of PCTs and Acute Hospital Trusts in mind.

The Health Informatics Forum of the British Computer Society (BCS) produced a draft consultation paper in which it stated the lack of communication between CfH and NHS staff and "fundamental ignorance of what new solutions are intended to address" [BCS, 2005 and Computing 2005c]. Alexander Beisser can agree, from own experience working for a London PCT, that CfH does not communicate very well with NHS staff on PCT level about the NPfIT. Most of his knowledge about the NHS IT project comes from his studies at City University London, from talks and discussions given by the BCS and from newspaper articles. He would appreciate if CfH would start a more regular briefing of NHS staff directly through PCTs to ensure that more clinical and administrative staff is at least informed (if not involved) about the implications of new IT systems in the NHS. The communication process needs to widen out over the borders of e-newsletter to which staff and the general public can subscribe to. A change from the pull towards the push approach of information would be welcomed. Nevertheless, Connecting for Health is doing the right thing by publishing electronic newsletters – Information is available, you just need to find it.

The Electronic Patient Record and its associated Electronic Health Record will change the way the NHS is working. The amount of paper used in the healthcare sector is enormous and there will always be papers sent around the NHS, as Alexander Beisser believes that the NHS cannot be run without the use of analogue information and paper. We won't be able to find a complete paperless office in the frontline services of the health service – for a long time at least. EPR and more the NCRS systems have a lot of other electronic solutions that will enable us to work for flexible and to make the life of our patients and staff easier. The Electronic Transfer of

Prescriptions (ETP) arrangement, where GPs will be able to send prescriptions electronically to the patient's pharmacy of choice, will make prescribing more efficient, cost effective and accessible for patients and care provider. GPs are using electric patient systems and hospitals are using electronic Patient Administration Systems; if those systems will be able to communicate (HL7 or a standard TCP/IP solution doesn't matter) not only between themselves but with other, some still to be developed, systems then the EHR is not a fantasy anymore.

## **Conclusion**

If cost and privacy concerns that erode doctors' confidence in NPfIT [Computer Weekly, 2006c] and patients' safety fears [Computer Weekly, 2006d] are overcome then not only the EHR will be a success, but the whole IT modernisation programme will provide us in the UK with the most modern health informatics environment in the world. Healthcare solutions need to communicate with each other and should work across the borders of England. We have the chance to be the leaders in the field – Let us use our knowledge to be them.

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