Electronic Patient Records: The Pharmaceutical Industry's Requirements

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Abstract

For the last 10 years Remote Data Entry (RDE) has been the great white hope of the pharmaceutical industry in achieving three main aims; cutting Clinical Trial duration times, saving resources and improving data quality. But where is it? Who is using it? I believe that RDE has failed to meet the three aims mentioned above. The time of the RDE paradigm is past and the future will be shaped by the new study site technologies which more and more are able to provide much of the required clinical data directly without the need for the transcription to paper and then re-entry to another system. Direct Data Capture (DDC) from machines such as patient record systems, MRI machines, ECG and EEG technologies, laboratory measurement equipment and an increasing range of other previously manual data providers will enable error free and resource efficient data capture. The substantial reduction and possible elimination of errors will allow early locking of the database and therefore potentially earlier product launch.

There are three main players involved in this future vision. The future providers of the information required are one, that is the medical equipment manufacturers and the providers of patient record systems. From these we require standardised interfaces. The second are the doctors who will be using these systems and who have no desire to duplicate effort by recording information twice. The third is the pharmaceutical industry who produce the products to be dispensed to the patients. If we are to get our products onto the market in time to benefit the patient and at a cost acceptable to the health service we need to reduce development times and costs. Direct Data Capture (DDC) will make this possible.

Keywords:

Direct Data Capture (DDC), Remote Data Entry (RDE), Clinical Data Management, new technology, Human-Computer Interaction.

Introduction

The pharmaceutical industry is bound by international rules and regulations governing the development of new drugs and medical products. The industry is required to undertake extensive testing through controlled "experimentation" - Clinical Trials. The purpose of these trials is to collect information that when analysed will show that the new drug or product is safe relative to the risk of the patient's condition and that it in some way benefits the patient's condition. The sponsor of the Clinical Trial also hopes to show that the product is better than the competition in the area of application so that it will generate profit.

The traditional way of collecting information from clinical trials is to create a paper form called a Case Record (or Report) Form, CRF, with questions designed to capture the relevant data items from the patient, the application of the product and the results. These forms are traditionally complex, often badly designed and sometimes extremely large.

In order to produce reputable results, the industry often attempts to seek the services of the most renowned doctors in the field of application, the Investigators. The Investigators are possibly involved in several clinical trials of different products, sometimes competitors. They have different reasons for participating in clinical trials. The development and testing of a product which will improve their every day and that of the patients for whom they are responsible is the most important. The money received from research can be a temptation and the thought of a publication is tempting. The completion of the Case Record Forms is however not so tempting but it is essential for the outcome of the trial.

Traditional methods, traditional problems.

The quality of Case Record Forms vary enormously from company to company and even from study to study within one company. The Investigators must fill in the CRFs completely and clearly in order for the data to be entered from the form into a computer. From experience this is a far from smooth process.

The paper CRF must first be created using a suitable computer application. The application may limit the flexibility of the CRF design. Once the CRF is created matching data entry forms must be made that will be used to enter the data from the CRF into the computer database. These electronic entry forms have exactly one box for each expected answer. The underlying database is created to accept these answers in a pre-determined format.

There are some major problems built into this traditional method. Firstly Investigators very often do not like filling in CRFs and often do not do it themselves. This may well be because of bad CRF design or simply a question of time and other resources. Each answer box usually requires some form of response, the questions must be answered with either a mark in a box, a date, a number or some text. If there is a reason that a question is not answered it is helpful to enter a reason such as N/A or similar. Often there are many unanswered questions on the CRFs and these result in a request for the missing information or a confirmation that it was intended to be left blank. These requests are called many things but most often DRFs or DCFs, (Data Request Forms, Discrepancy Correction Forms). Sometimes the information entered into the CRF is unreadable. This will also generate a DRF. After the information has been entered into the computer the data are checked electronically for errors and more DRFs are created if errors are discovered.

These DRFs are the cause of much dissatisfaction with the traditional methods of collecting data. They are often sent long after the patient has completed the clinical trial and the information has been archived. The time taken to correct DRFs is often a major reason for delay in the completion of the clinical trial which for the sponsor can cause major problems.

The three main causes of DRFs are then missing data, unreadable data and illogical data. These are three checks that computers can do very well. Electronic transfer of computerised information can be done more quickly than transferring paper CRFs. These points being acknowledged gave rise to Electronic Data Capture (EDC) or Remote Data Entry (RDE).

EDC and RDE

The history of EDC and RDE systems is long, over ten years. It has not however made a universal breakthrough even though it has the potential. There are many reasons for this. Expectation failure and technology failure I believe are the two main reasons.

There are three commonly given goals in any EDC project for the collection of clinical data. 1) Reduce the duration of clinical trials, 2) Reduce resource use or use resources more effectively and 3) Improve the quality of received data. These were then the basic expectations. But how much will EDC reduce the duration, how much resource will be saved and what improvement in quality?

To start with the third goal, data quality. This was perhaps the easiest to achieve. As mentioned earlier, computers can check for missing data and inconsistent data highly efficiently and avoid the aspect of illegible data completely. The only requirement for this is that all the data controls that are to be carried out are built into the EDC system before it is sent to the study site. This is a change in routines which can cause some problems. Studies performed with this new technology have indeed shown a reduction in all three types of DRF generating errors. There is often NO missing data and all data is readable. DRFs are only sent in cases where an error check was missed in the planning or it is suspected that a value entered is not correct even though it passed the in-built error checks.

Reducing resource use is debatable. Certainly the time used for data entry in traditional systems is removed but CRFs still have to be created or at least Electronic CRFs, eCRFs, error checks still have to be programmed, and data still has to be checked after data transfer, although perhaps not as thoroughly. Extra resources are needed for the purchase and maintenance of the computer equipment used and this should not be underestimated in a large multi-centre international trial. Extra training of all involved personnel is required and this training is usually more extensive than with paper CRFs. Financial capital resources are certainly not reduced.

The expectation that EDC would reduce trial duration was, I believe, fundamentally flawed. At the time the idea of EDC was conceived it was often the case that all CRFs would be collected before data entry would start. This would mean that all the data entry and the creation and resolution of DRFs is delaying the study completion. Any change that could improve this situation would be of great benefit. The idea of placing a computer at the study site and entering data directly after an examination of a patient or other

event which can then be sent to the sponsor daily was tempting. It appeared from the first systems tried that they had succeeded in this. A closer examination however shows that the process change from end-study processing to parallel processing was the reason for the improvement. The same savings could have been achieved, in theory, by traditional methods. If the CRF was completed immediately and sent immediately there would only be a one or two day delay over the EDC systems and this does not justify the added cost and complexity.

EDC failed therefore to live up to its expectations.

New technology is always a risk. EDC systems involve the combination of computer hardware, computer applications and communications technology. Each one of these has its inherent risk factors. Computers break down, computers get stolen, computers get out of date extremely fast. Applications are often unstable, badly designed and not flexible to changing requirements. Communication technologies, modems and telephone lines, ISDN, satellite, diskette by courier, The Internet are all high risk. In the USA communication by modem is much more stable than attempting a European multi-international study. ISDN is new and not yet universally available. The use of the Internet for transferring highly confidential patient information is to say the least still controversial.

Technology failure is a matter of risk control.

There is one final problem often ignored in the discussion. The Human aspect. It must still be accepted that not every Investigator is computer literate and this will be true for a number of years still. Computer literate or not it is still humans that have created the systems being used for EDC. Humans who often have no knowledge of the Investigators requirements or activities. There is an adjustment in status as a result of new technology implementation. Those who understand it rise up whereas those who do not are looked at as less. One however is no less a good doctor if one does not understand new technology. Being a good doctor is about understanding people and their problems.

Any new technology that will allow the Investigator to concentrate more on their primary task of treating patients and less on the secondary, but none the less essential, task of providing data for analysis will be the future.

The Future - Direct Data Capture (DDC)

The future requires an holistic view of all the actors in the provision of patient care and treatment. There are the patients themselves, their general practitioners, hospitals, specialists, consultants, drug manufacturers, study site technology and information system developers.

All of the above are providers or users (or both) of information used for the treatment of patients. An holistic view of all of the information requires one to create the information once and use it many times without further human intervention. There is one more thing that computers do better than their human counterparts other than checking data and that is communicating with each other highly effectively. Putting this fact into an holistic information view raises the concept of Direct Data Capture (DDC) for the collection of clinical trials data. Direct capture of data from the General Practitioner., from the patient, from the Electronic Patient Record, from the laboratory equipment, from the MRI, x-ray machines and other such technology.

The collection of data from the General Practitioner, from the patient and from hospital records has been the area where the drug manufacturers have least succeeded with new technology. Demographics, medical histories, specific risk factors, other drugs being taken, Adverse Drug Reactions etc. are orally elicited and manually recorded. The idea of a “patient smart card” containing such information is one technological advance being mentioned. Other areas such as laboratory data and imaging machine data have had more successes. A good example - in Europe there is a standard for the transfer of laboratory data - the ACDM Lab. data format. Most central labs. need only to write one routine to convert data into the standard format and then all drug manufacturers have a standard to convert this format into their own database. Another similar standard is the transfer of Adverse Drug Reaction data to the regulatory authorities being developed under the auspices of the ICH M2 - ESTRI.

Conclusions

If the drug manufacturers are to make use of the information systems developments of Electronic Patient Record systems then they need to be involved and the earlier the better. Information requirements need to be identified like those above and extraction utilities or interfaces or hopefully a data transfer standards need to be developed. There should be no need for the Investigator to enter patient information in more than one place.

By achieving this the goals of the early EDC systems can be realised. Error free data guaranteed to match source data, reduced resource use because the systems will be much simpler to use and much more will be standardised, and a reduction in trial duration achieved by reduced resource use in correcting errors discovered after the study is completed at the centre. The Investigator will only need to learn one system, the electronic patient record system and how to export the necessary data to the sponsor responsible for the trial.

Faster and cheaper production of new drugs will ultimately benefit the patient which is our common interest but this future can only be realised by co-operation between all the parties involved.

Biography

I am 33 years old and work as a Clinical Systems Developer developing Electronic Data Capture solutions and Management Information Systems. I have recently completed a Master's Degree in Applied Computing where my project was a comparative analysis between paper based data collection and new technology data collection in clinical trials.

Key Words

1) Direct Data Capture (DDC)
2) Remote Data Entry (RDE)
3) Clinical Data Management
4) New Technology
5) Human-Computer Interaction.
6) Pharmaceutical Industry

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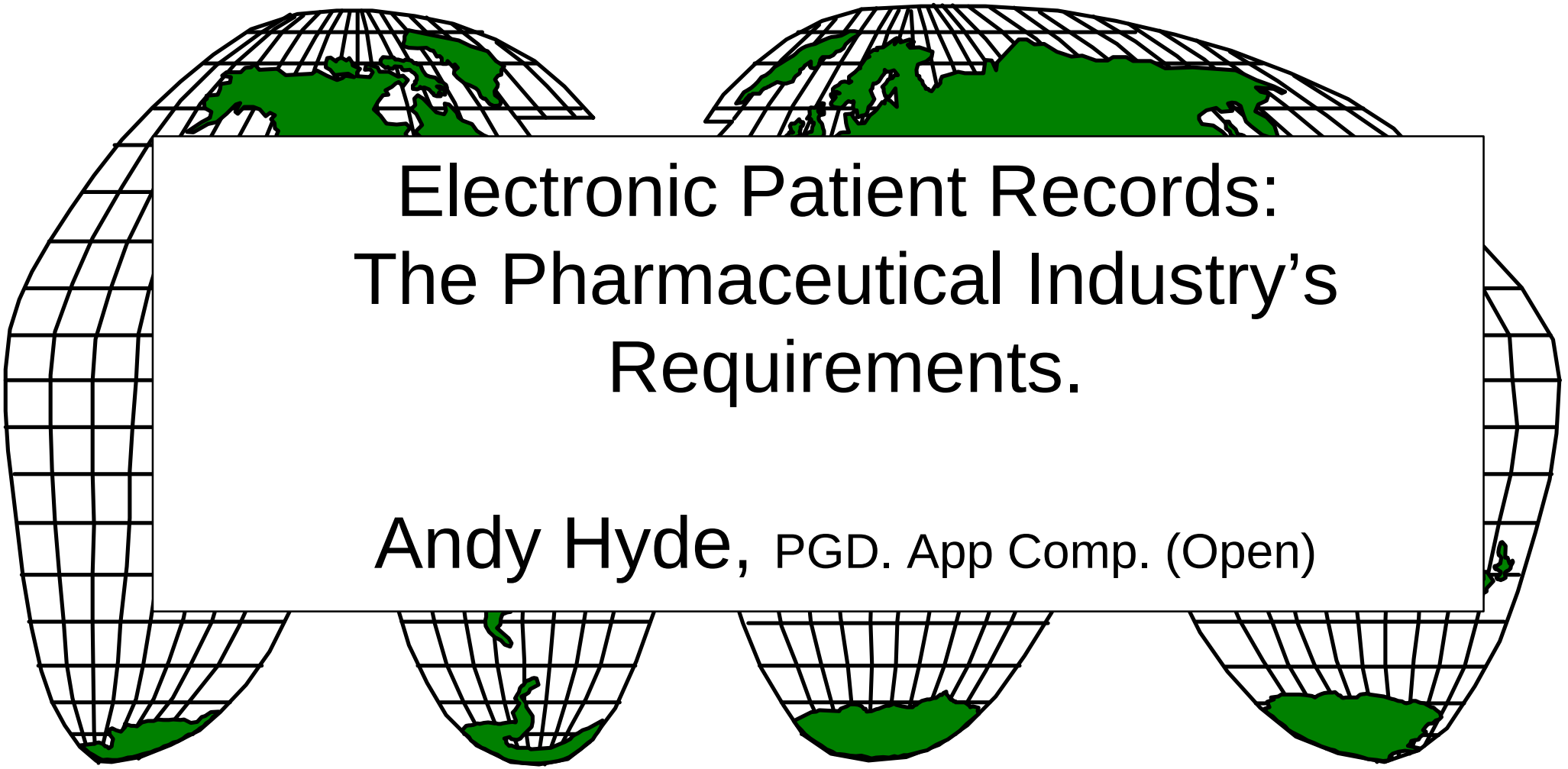

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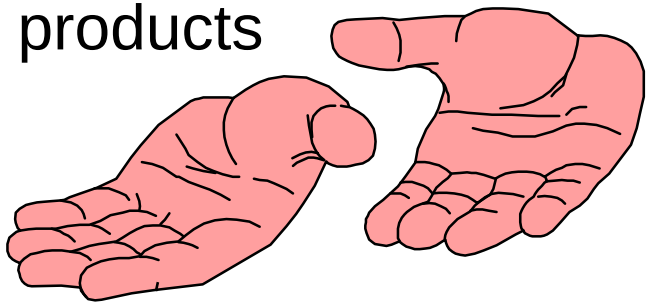
Introduction

- Background
  - Clinical Trials of new pharmaceutical products
- Current methods of data collection
  - Paper and pen data collection
- Current New Technology methods
  - Electronic data collection (EDC, RDE)
- Future New Technology methods
  - Direct Data Collection
- Optimized New Technology method
  - Integrated Data Collection
- Issues and the future.....



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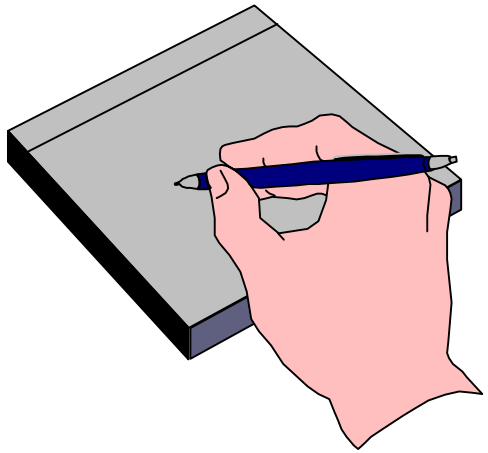
Background

- The collection of patient data and clinical trials results data for the submission of a file for marketing approval.
- Paper based data collection in 95% of all studies
- Electronic Data Capture (EDC) prototyping for over 10 years
- Electronic Patient Record development for over 10 years
- Un-coordinated parallel development of similar concepts

Paper and Pen data collection

- Paper Case Record Forms (CRFs)
  - Complex
  - Bad design
  - Wrong Questions
  - sometimes over 100 pages
  - “simple” *technology*
  - can introduce errors
  - disliked by many investigators
- Time consuming for the pharmaceutical industry to process



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Electronic Data Collection

- The use of a computer for collecting data instead of paper and pen
- Requires Investigator to have a computer with electronic form application installed
  - The computer is usually provided by the trial sponsor
  - Several trials/several sponsors - several computers
  - “complex” technology
- Duplication of data entered into Electronic Patient Record
  - 2nd highest concern amongst Investigators

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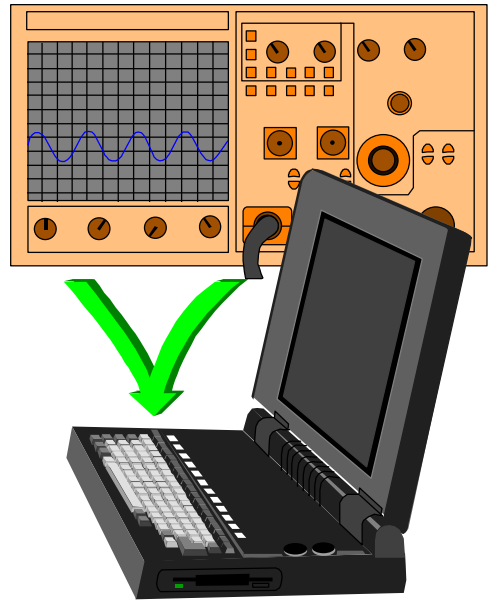
Direct Data Collection

- Collection of data from source by computer to computer links
  - Laboratory equipment, Imaging technology (MRI, x-ray, Ultrasound), EEG, ECG, etc etc etc
- Removes duplication of data entry
- Requires standardisation of interfaces
- Duplication of data collection and storage at the hospital
- Parallel development of interfaces



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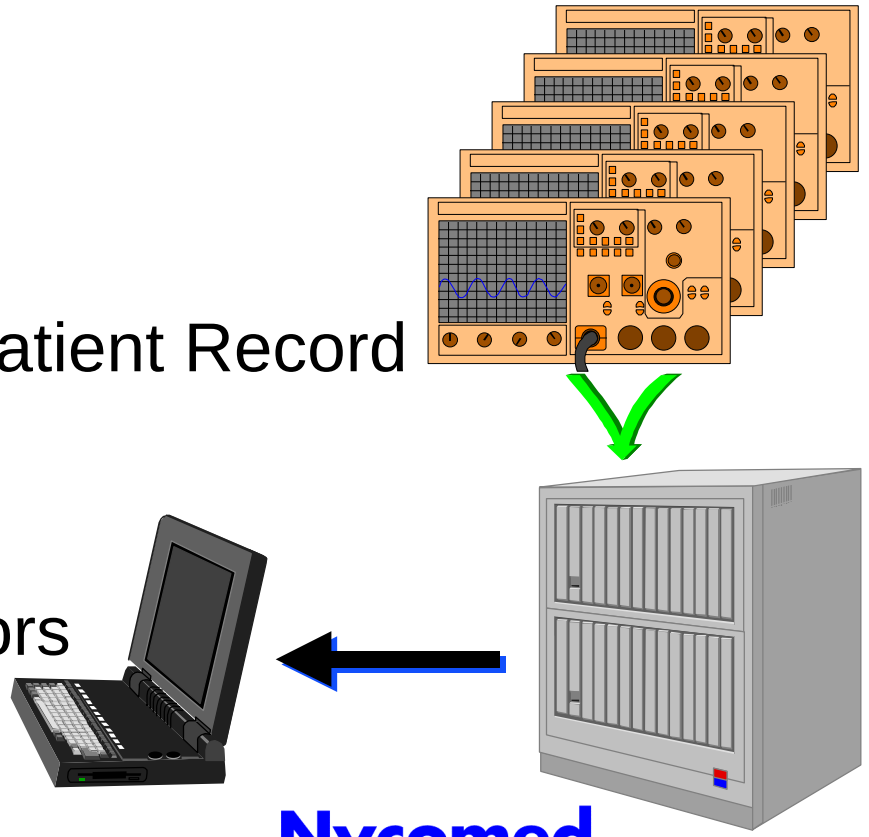
Integrated Data Collection

- Collection and storage of data in one place for multiple re-use
- All data under hospital control
- Data flow greatly improved
- Data quality guaranteed
- Data export utility required on Patient Record systems
- Co-operation with hospitals
- Co-operation with system vendors
  - EDC and EPR



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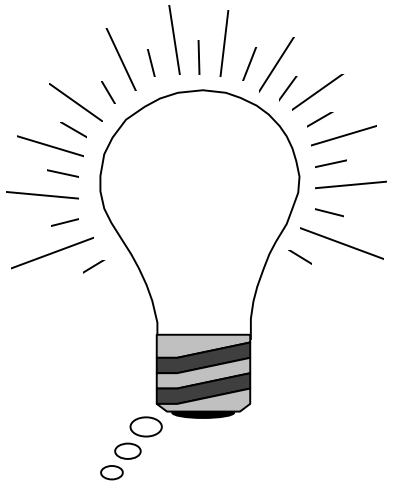
Issues and the future.....

- THERE ARE MANY ISSUES (known and unknown)
- This is a vision not a solution!



- Ethics
- Security
- Standards for transfer
- Who owns the data?
- Will we pay for it?
- Do we want this to be more than a vision.....?
- Invitation to begin a dialogue.

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Thank you

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