The Origins of openEHR

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David Ingram October 2002

Some ten years after the GEHR project was established in 1989, partners in that project have come together again to review experience gained over the intervening years. It is especially encouraging that a forthcoming ISO standard will elevate formally defined clinical requirements to the highest level in the standards process for electronic healthcare records. So many systems describe themselves as electronic healthcare records and yet share little common concept of what such an entity is and what it is for.

The research and development in this field has followed a chaotic and tortuous evolution, influenced inevitably by commercial, political and academic considerations and rivalries and also by severe inertia because of powerful needs to continue to accommodate legacy systems. Confused and confusing arguments have raged about esoteric models of ill-defined clinical terminology, processes and communications. Continuing reinvention of wheels at these levels of abstraction (more precisely concoction of alternative definitions and plans of possibly wheel-like objects!), has inhibited progress. There is still an urgent need for empirical study of the implementation and comparative evaluation of a diverse range of approaches to the provision of high quality electronic healthcare records. This must be informed by international consensus about the requirements to be met.

Introduction - the AIM Initiative in Europe

In 1988, the European Union established the Advanced Informatics in Medicine (AIM) initiative, within the wide-ranging Framework Programme for Research and Technology Development in Europe.

The rationale for the Framework Programme was:

- To strengthen the economic and social cohesion of the Community
- To offer obvious benefits through the collaboration of several States
- To apply significant and complementary results across the whole Community
- To contribute to a common market and to scientific and technical unification

It succeeded in catalysing a wave of new partnerships across all sectors of the European economy.

In relation to health, the Framework Programme objectives set out in 1988 were:

1. #intro
2. #gehr
3. #gehr-participants
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5. #cenTc251
6. #synapses
7. #australia
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10. #openehr-manifesto
11. #whehr

- To unify European activities by providing the means for efficient communication of medical records and knowledge so that these may be understood and compatible, thereby permitting the integration of health information systems
- To strengthen competitiveness by advancing the technical basis of products and services and commercialising European inventiveness in all scales of enterprise
- To improve the quality of life through improving diagnosis and treatment, increasing public awareness and knowledge of health care and widening access to improved services

Thus, from the earliest stages of the Programme, the harmonisation of electronic health care records was seen as of the highest strategic importance for health care development in Europe.

Under the outstanding leadership of Dr Niels Rossing, the AIM Programme was developed in key phases, as follows:

- **1988 - 90** Exploratory phase, 20 million ECU, 43 projects
- **1990 - 94** 110 million ECU, 38 projects; 12 concerted actions (eg. Medirec)
- **1994 - 98** 135 million ECU, ~60 projects

The first major Call for Proposals under the AIM Workplan was issued in 1989. A Key Action was to be research and development for an electronic health care record architecture. There was intense competition among rival consortia seeking funding to work on this challenge. Other Key Actions addressed clinical terminology and clinical care protocols and important work in these areas evolved in the early AIM Programme Projects (e.g. Galen, Games, Dilemma), and colleagues from these days work alongside us to this day.

The Good European Health Record (GEHR) Project Proposal

A Consortium was drawn together by Dr Alain Maskens and Dr Sam Heard to bid to work within AIM on electronic health record architecture. Alain, a Belgian oncologist, was running HDMP, a small software company specialising in electronic healthcare records for GPs. Sam, an Australian General Practitioner, was lecturer at the Medical College of St Bartholomew's Hospital in London and ran a practice in East London and had developed a general practice system supported by a cooperative of general practices. The two had met through Professor Mal Salkind, head of General Practice at St Bartholomew's, during the AIM exploratory phase and had begun to collaborate on the development of a generic EHR system.

The Consortium comprised seven professional, industrial and academic partners: St Bartholomew's Medical College (co-ordinating partner); HDMP; The French Red Cross Hospitals; The Association of Doctors and Dentists of Luxembourg; The General Practice Institute of Oporto, Portugal; France Telecom; Smithkline Beecham.

Professor David Ingram, Professor of Medical Informatics at St Bartholomew's Medical College, was invited to lead the Consortium, to prepare the proposal and, subsequently, as Project Director, to run the project. In this, he worked closely with Lesley Southgate, who had succeeded Mal Salkind as Head of Primary Care at St. Bartholomew's.

The project proposal was put together in three months in early 1991 and was given the title *The Good European Health Record* (GEHR); the name was proposed by Alain Maskens. After a final 72 hour, round the clock, weekend flurry of preparation, it was submitted just in time. It emerged as an unexpected but warmly endorsed winning proposal, in the adjudication that followed. Some rival consortia had worked for several years to position themselves for the work, so the result was controversial. Negotiations, led for GEHR by David Ingram, were completed with the Commission who were represented by the Project Officer, Jacques Lacombe, and Michael Wilson. The project commenced in January 1992.

Participants in the GEHR Project

In addition, to David and Sam, of those still closely involved in the continuing story of GEHR, Dr Dipak Kalra, who led the GEHR Clinical Task Group, and David Lloyd, a key contributor to the technical Task Group, joined the St. Bartholomew's team at the outset. Dr Jo Milan, Director of Information at the Royal Marsden Hospital, London, and Dr Stanley Sheppard, Chief Executive of Update, a UK general practice software company, joined as sub-contractors to St. Bartholomew's. Update had to withdraw from the Consortium in the early days of the project, but Stan maintained contact on a personal basis. Tom Beale was employed as a consultant to the Royal Marsden in 1993 and subsequently joined the St Bartholomew's GEHR team, as a consultant, to assist in the key modelling phase, leading to the first GEHR object model for the health care record. David Ingram was appointed Professor of Health informatics at UCL in London in 1995 and the team, moved there to establish the Centre for Health Informatics (CHIME). Marcia Jacks was the GEHR Project Administrator and is now co-ordinator of CHIME at UCL, where the St. Bartholomew's team moved.

Notable contributions in GEHR were also made by:

Jeff Geboers, HDMP; Christian Aligne, French Red Cross; Olivier Baille, France Telecom; Daniel Mart, Association of Doctors and Dentists of Luxembourg; Jose Calado and Helder Machado, Institute of General Practice, Oporto; Mario Cortelezzi, Luxembourg; Penny Grub, Richard Dixon, University of Hull; Lesley Southgate, Jeanette Murphy and Sian Griffiths, St Bartholomew's Medical College; Ian Grey and John Shorter, SmithKline Beecham; Benoit Hap, C2V Paris; Gerhard Brenner, Carlos Salvador.

Lesley Southgate, is now President of the Royal College of General Practitioners of the UK and Daniel Mart is General Secretary of the Association of Doctors and Dentists of Luxembourg.

The Accomplishments of the GEHR Project

The work of the GEHR project is well documented in its many widely communicated project reports, publications and software, and described on the CHIME.ucl.ac.uk web site. The final AIM Conference Paper concluded the first stage of the story of GEHR. All public deliverables of the Project may be downloaded from the UCL, CHIME web site.

Working on the GEHR Project was an absorbing and unforgettable experience. It tackled an intrinsically difficult and contentious domain. Its results, which have continued to evolve in many projects and standards developments, have proved to be enduring accomplishments, from clinical, technical and organisational perspectives.

Key attributes of the project approach and accomplishment were:

1. Experienced, competent, committed and passionate multi-professional teamwork. The team worked very hard, disagreed and fought at times, but also evolved a culture of friendship, mutual support and loyalty, through some difficult challenges.
2. Development of an original, formal approach to electronic health record architecture, based on object modelling methods and founded on a comprehensive and systematic review of patient and clinical professional roles and requirements, across Europe, in relation to records.
3. An empirical and iterative prototyping approach to the evolution of the architecture, emphasising implementation and testing of concepts, practically, at each stage.
4. The decision of the partners, in the interests of effective dissemination of the work, to publish the project results openly, within the public domain. The EU Contract in principle vested IPR for the work with the Consortium.

Warmly supported as it was by Niels Rossing and the Commission and by its Project Officer, Jacques Lacombe, the Project proved from its very earliest stages and over time not to be short of powerful opponents, as well. Its results were provided, step by step as they were available and often before official publication, into all the stages of the formulation of EU pre-standards of CEN and further afield.

The Interface between the GEHR Project and Technical Committee TC/251-Medical Informatics of CEN

At about the same time that the AIM Programme was initiated, CEN established a standards initiative for medical informatics through its Technical Committee TC/251, led by Prof. Georges de Moor. The strategic co-ordination achieved between the AIM and CEN activities was sometimes disappointing and their goals and methods were very different. AIM was tackling the domain through extensive and well funded applied research and development in wide-ranging consortia such as GEHR. CEN, with much less resource, was tackling its role as a consensus building process, using task forces of experts to propose standards which were then voted on by national delegates. Of course, both empirical research and standards setting activities are needed to advance the field.

During the course of the GEHR Project, a Project Team was established under TC/251 of CEN, to propose a pre-standard health record architecture. Some early deliverables of GEHR, in formulating clinical requirements and proposing early formal models for the EHCR, were requested by and provided to the CEN project team, led by Petter Hurlen. This team, in which some members of GEHR participated, published the first CEN pre standard, ENV 12265. The extensive use and influence of GEHR project results and concepts available at that time are clear in the CEN publication. The GEHR project continued to develop and refine its approach after the pre-standard was published.

GEHR sought to work in a spirit of co-operation. Recognising its deficiencies and successively refining its results, in the public domain, was a key feature of its working method. Opposition and contrary perspectives provide an important and useful crucible for innovation. GEHR was quite radical in its approach and no doubt uncomfortable to have as a partner, as a result.

From GEHR to Synapses in Europe

The GEHR Project came to an end at the end of 1994 and two proposals to extend its work plan were not immediately successful. One of these was for a Support Action to maintain co-ordination in health record architecture work and the other for more extensive field trials of the architecture. GEHR had delivered a significant, but by no means completed, advance in the application of object modelling approaches to the electronic health care record (EHCR) and its evaluation against comprehensive clinical and ethical requirements as well as implementation experience. It was clear to the team that this first stage GEHR architecture, the first GEHR Object Model, would require continuing refinement in the light of implementation experience.

The project had, throughout, grappled with the issues of relational versus object database representations of clinical data. At the stage of evolution of database technology then pertaining, these concepts were in a state of considerable flux. Aspects of functionality were highly desirable, but they were hard to combine. Both camps argued their case, responding to the emerging needs of complex applications domains, of which the medical record was an obviously challenging example.

At the close of the project, the GEHR partners could see the potential requirement for a public domain foundation to take forward their work. It was resolved to leave this issue open until some future stage, when the rationale for how this might operate had become more apparent.

In summer 1995, the St Bartholomew's team moved with David Ingram, across London to UCL, when he was recruited to establish the new UCL Centre for Health Informatics and Multi-Professional

Education (CHIME). Sam Heard and Tom Beale, now both based in Australia, have remained in close touch with the UCL team have continued regular visits to and fro. David Ingram has made academic visits to Australian Universities and as participant and keynote lecturer at two national Health Informatics Conferences, in Melbourne and Hobart.

The GEHR approach remained alive in CHIME and its collaborating centres. Successive research results and implementations of record servers based on this are now making key contributions within the newly launched UK *Information for Health* Strategy. The GEHR approach was taken forward on a broader front, beyond the UK and Europe, especially by Sam Heard, Tom Beale and Peter Schloeffel and their colleagues in Australia.

Reactions against GEHR: When the GEHR project came to an end, a reaction set in against it. The first GEHR Object Model became a focus of concerted opposition within some groups working in the domain in the UK and within CEN standards bodies. The questioning of the assumptions and approaches of existing products and approaches had been inevitable, but did not make GEHR popular, although its approach always sought to be constructive. It was unfortunate that the work of GEHR came, apparently, to be perceived as a threat to other interests and ambitions, evidenced by the manner in which it was opposed, early, tentative and incomplete as its results were.

One important area of controversy arose in the confrontation between the record architecture paradigm and the paradigm of healthcare messages between systems, as typified by the EDIFACT initiatives and the HL7 consortium of suppliers, for interoperability between their products. The advocacy by GEHR and its successors of a record architecture to anchor information standards and services and their contexts within records was controversial and was, and still is, opposed. It did not help that most available clinical systems claiming to be clinical records systems did not meet the commonly agreed clinical understanding of what a clinical record is and the requirements it must meet.

It is interesting that, in facing the technical and clinical challenges of implementing real clinical record systems within real health care contexts, health care and international standards bodies have only recently begun to explore rigorously what the requirements for such systems are and how their performance may be assessed against these. This is inexorably drawing the issues raised by the GEHR project, over ten years ago, back into play. The need to focus efforts in this way, as we enter the post Human Genome Project era, is, if anything, more crucial today.

The objective of reverse engineering a health record information model from the legacy of an evolving messaging semantics, as typified by successive HL7 versions, is difficult! In GEHR, such messages were seen as being derivable straightforwardly from the GEHR object model underlying the record formalism, in a clinically comprehensive and ethically acceptable manner. However, without an accessible public domain implementation of such a record architecture, it is quite understandable that existing suppliers of systems, struggling to evolve their products to meet the requirements of patient centred and clinically more accountable care, view such an initiative with some concern.

Synapses: In 1995, David Ingram and the UCL team joined forces with Professor Jane Grimson of Trinity College Dublin in a new consortium aiming to propose a project to explore the legacy systems integration issues in progressing towards a federated electronic healthcare record. From the other GEHR participants, Daniel Mart of The Association of Doctors and Dentists of Luxembourg and Jo Milan of the Royal Marsden also joined this larger consortium of EU teams and industries, which included Siemens and Hiscom as major suppliers.

Reflecting on the results of the GEHR Project, and looking at the new challenges of implementation of a federated approach, Jo Milan and David Ingram developed and wrote the methodological section of the Synapses Project Proposal that proposed a new paradigm for implementation of the record, which divided the formal description of the architecture into a high level structural model (Synom) and a model of clinical content (Synod), implemented through a clinical object dictionary.

The Synapses project from 1995-98 succeeded in implementing several pilot record servers, built

according to the Synom/Synod principle, across Europe (see CHIME and TCD web sites). The user requirements and information modelling workpackage was led by Dipak Kalra, and the implementation workpackage by David Ingram.

Controversy still dogged the formal methods to be adopted and the principles and detail of the Synom and Synod were difficult and contentious matters within the Synapses consortium. Legacy environments in the demonstrator sites inhibited freedom to design *de novo* and reconciling those who wished to restrict implementation to the concepts of the earlier CEN pre-standard model and those who favoured further evolution, utilising the later results of GEHR and moving forward from there was also difficult. Synapses proved another burning crucible of endeavour, where staying power was challenged to the full!

Synapses reached a compromise to extend the fundamental concepts of Env 12265, with new aggregation structures to accommodate the requirements analysed and provided for within the GEHR Object Model (GOM) in the later stages of the GEHR project. The low-level Synom/Synod approach, as further developed by the UCL team, proved a robust foundation of implementation, avoiding some of the implementation difficulties associated with the fine granularity of the single level architecture of the original GOM. Progress at UCL with the concept of the object dictionary and tools to support it was encouraging.

Australia awakens the world electronic health care records community to the approach of GEHR

Aware of the anti-GEHR sentiments in the UK and in CEN in Europe, Sam Heard and Tom Beale joined forces again in Australia, in 1996, to work together to refine the GEHR Object Model through implementation. This also led to a two level modelling approach - the health record architecture itself and the clinical models or standards required for automatic processing of information. The latter has become known as the GEHR archetype system.

The SynOD and Archetype approaches were subsequently discovered to be largely the same and have been progressively harmonized within a common *open*EHR architecture. Peter Schloeffel had met David Ingram with Michael Britton, at UCL, in 1996 Michael and David Newble obtained British Council support to invite him to contribute key lectures at a symposium in Adelaide in August 1998, with Sam Heard, and there he met Peter again, as a local systems supplier.

Following this event, Peter subsequently met Stan Sheppard and started to develop a business partnership. In these partnerships began the renewed Australian focus on developing the results of the original GEHR project which has had a considerable influence, internationally in the ISO, HL7, CEN and, more importantly in many Net discussion groups and in meetings about the EHCR in the USA. In Australia, the team achieved considerable success in moving to the centre of the national development programme for the EHCR. They worked with systems R&D teams at DSTC on implementation of a GEHR server or kernel, based on the archetype model for content within a higher level information model close to the higher levels of the original GEHR object model.

Implementation, Implementation, implementation!

- from GEHR and Synapses to Synex, Medicate and 6-winit in CHIME and UCL

The behaviour of standards communities in these times, spending much time, money and energy disputing and seemingly seeking above all else to dominate one another’s agendas, was scientifically extremely questionable, yet seemed to brook no questioning. It is not sufficient justification that standards for health information management are deemed crucially needed, that a crude consensus and legislative process be adopted for their definition, when the underpinning empirical foundations for organising and modelling information in the domain are still in process of evolution through empirical

research. Monolithic modelling of healthcare information domains is clearly a fascinating exercise but, if devoid of empirical and practical context, clear domain definitions and verifiable objectives, has little if any meaning. Such models are in any case inevitably non-identifiable or non-unique formulations, incapable of purposive application within implementable and clinically viable systems.

This may all sound rather obvious but a review of much work from many bodies, especially governmental and inter-governmental bodies over recent decades, will show that information standardisation has frequently proceeded devoid of empirical testing and validation and that many costly failures have resulted therefrom. This matters to patients and has been disastrous in the quest to use information technology to support cost-effective health care services!

Given this flow of events, the UCL team concluded that three immediate things now mattered more than any other. These were implementation, implementation and implementation!

The team thus put its head down to get on with developing its new research, alongside new graduate and educational programmes. In developing its ideas, post GEHR, it started a prolonged period of intensive software implementation and evaluation of the record architecture and object dictionary, led by Dipak Kalra with Tony Austin, David Lloyd and Alexis O'Connor, and Vivienne Griffith. This work was conducted throughout the EU Synapses project, then in the EU Synex, Medicate and now the 6-WINIT and CLEF projects, and with David Patterson as an invaluable clinical sponsor as head of the Whittington Hospital Cardiology services. In these projects, the underlying concepts evolved beyond GEHR were widely tested for implementation in cardiology, cancer and respiratory medicine domains, in hospital, telecare and now in mobile systems contexts. In the Synex Project a wider grouping of record architecture, terminology (GALEN) and protocols (Proforma) formalisms were drawn into the Consortium. This six-year trial by implementation rather than trial by standardisation committee has borne much fruit in implemented practical clinical exemplars of the record architecture and object dictionary at work.

David Lloyd, co-ordinating the EHCR-SupA project, put a great deal of effort into continuing inputs to the next CEN team established to take record architecture forward and also into a concerted action within the Framework Programme, to look at synthesis among the different modelling approaches to the EHCR.

*open*EHR

In 1998, at the conclusion of the Synapses Project, David Ingram circulated a paper about the need for a clinically focused Foundation to own the content domain around standards for clinical information management. It attracted interested comment and it was left with UCL to take it forward. In late 1999, a joint meeting of the Australian and UCL teams, in London, considered the forward pathway for the work of their two teams, in this context. They feared that some divergencies in their respective implementation pathway, architecture and content models were emerging and wished to work towards convergence again, if possible. The meeting decided to work to establish an open source foundation to take forward harmonisation in the field, from patient and clinical perspectives. The name *open*EHR, proposed by David Ingram, was adopted. Membership, it was felt, should be open to all signing up to a set of principles guiding the Foundation's activities, which emphasised constructive, inclusive and empirically based evolution of rigorously defined software and systems, organised around the two level strategy of the UCL object dictionary and the Australian archetype methodology. It was agreed to allow implementation to proceed in parallel over a further period of about a year before meeting to seek to reconcile a common achievable way forward.

David Lloyd undertook the task of drawing together the threads from the meeting and developing an *open*EHR web site. David Ingram was given a brief as chairman of the initiative to seek early funding of an umbrella to hold together the concept of a three-time zone foundation with component groups in Europe, Australia and the USA. Peter Schloeffel was asked to pursue a role as ambassador for *open*EHR, to press ahead with Sam and Tom to establish the Australian chapter as the first step and to

seek to find a USA partner.

First Ideas for the *open*EHR Foundation

A draft "manifesto" was prepared for discussion with interested parties, as follows.

The *open*EHR Foundation is an international, on-line community whose aim is to promote and facilitate progress towards electronic healthcare records of high quality, to support the needs of patients and clinicians everywhere. It will publish the theoretical foundations and evaluations of its work in the public domain and make available relevant EHCR source programs and datasets under an OpenSource license. This continues the tradition of the GEHR project, from which *open*EHR has emerged, of placing results in the public domain. We recognise that there is a certain initiative fatigue in the field and we would not propose a new initiative were we not sure that something radically different is now essential. So many systems describe themselves as electronic healthcare records and yet share little common concept of what such an entity is and what it is for.

The research and development in this field has followed a chaotic and tortuous evolution, influenced inevitably by commercial, political and academic pressures and rivalries and also by severe inertia because of the need to continue to accommodate legacy systems. Confused and confusing arguments have persisted about esoteric models of ill-defined clinical terminology, processes and communications. Continuing reinvention of wheels at these levels of abstraction has inhibited progress. There is an urgent need for more empirical study of the implementation and comparative evaluation of a diverse range of approaches to the provision of high quality electronic healthcare records, informed by and informing international consensus about the requirements to be met. It is especially encouraging that the ISO has now adopted work which will elevate formally defined clinical requirements to the highest level in the standards process for electronic healthcare records.

*open*EHR directs its efforts towards:

- well-formulated clinical requirements, offered as a contribution towards international consensus
- rigorous development, implemention and evaluation methodology for systems
- common information model for the record, where clinical requirements dictate that this is necessary and where the relationship between model and requirements is made explicit
- diversity of information models and implementations, where these will enrich experience of a variety of approaches and systems and thereby promote the evolution towards high quality and cost-effective EHR solutions offered
- empirical evaluation of systems performance against clinical requirements

*open*EHR recognises that achieving its aims is extremely complex on many levels and certainly beyond the co-ordination powers of any one group. It believes that progress can be enhanced by interested groups coming together to promote and facilitate implementation and evaluation of systems using a co-ordinated methodology, and working openly within the public domain. It has not proved possible for the power of commercial and political organisations to devise and mandate solutions which demonstrate that they provide good quality EHCRs. An open developmental process is proposed in an effort to break this damaging impasse. *open*EHR has started a process of bringing together like-minded conceptual thinkers and systems implementers, prepared to offer their work to the EHR community in this way.

In pursuing its aims, *open*EHR will:

- be open to all who sign up to its objectives and methods of work
- have free individual membership
- charge membership fees for official bodies, on a not-for-profit basis
- help to define and support a common process of specification of clinical requirements, specification

and implementation of systems and evaluation of the electronic healthcare records provided (Note: this will be termed the GEHR (Good Electronic Healthcare Record) methodology, since it will rest initially very heavily on the methods set out and followed for the first time in the GEHR project from 1989. This 7-country R&D project developed concepts, object model and early prototypes and tools for a common European Health Record Architecture and has been drawn on in subsequent partnerships and projects across the world. The work was placed by the partners in the public domain and fed into and adopted by standards bodies)

- publish the work of projects and systems conducted within the *open*EHR community and adopting the GEHR methodology.
- offer the sources of such GEHR-based systems, in which IPR will be assigned to *open*EHR, under an open-source license within the community. Individuals or companies assigning IPR to the Foundation may where necessary and appropriate be remunerated under contract or through license fees.
- offer all its work openly in a spirit of a public enterprise, believing that this is the best and perhaps only way that appropriate high quality and interoperable systems are likely to emerge, worldwide.
- seek constructive relationships with groups and communities focusing on other aspects of clinical information management such as messages, terminology, knowledge-management and decision-support.

***open*EHR will not:**

- campaign against or obstruct others working on electronic healthcare records. On the contrary, it will welcome and endorse their success in meeting the aims and objectives of *open*EHR.

Whehr now?

Until implementations have been conclusively demonstrated and a pathway of development of the Foundation is clear, no-one will listen very much or take risks in what *open*EHR is advocating - that is to start basing national strategies on the approach we are advocating. Governments in every country are receiving such contradictory advice from people who say either that HL7 already solves everything or that EHCRs are easy/too difficult and don't need/cannot have a common approach to the record architecture!

A presentation was made to The Provost of UCL and he enthusiastically gave his support to UCL providing co-ordination of *open*EHR, through its team in CHIME.

This presentation was also introduced to The Wellcome Trust, NHS Executive and to the UK NHS Information Authority and Policy Unit.

Following the UK CSR2000 public spending review, in which David Ingram participated on the national research councils' informatics committee, substantial investment is planned in the UK and Europe into GRID demonstrator projects. An opportunity arises to link bio-informatics and health informatics research and development here. The UCL team linked with Alan Rector in Manchester, with Don Detmar in Cambridge, and with other colleagues in Sheffield and Brighton to bid successfully for the CLEF project.

Through the NHS National Plan, the opportunity arises to take forward demonstrators for the EHR in e-health incubator projects. Dipak Kalra has established excellent links with Oracle and the NHS project delivering an EHR for the national Cardiovascular disease service framework, building on the now very strong collaborative work at the Whittington Hospital.

A week long meeting of the embryonic *open*EHR international co-ordination group was held in London in February 2001, to review progress. It was attended by Sam, Tom, Peter, Mary, Dipak, David L and chaired by David I.

The clinical and technical motivations for the Australian work on GEHR since 1997 and its focus on splitting the original GEHR approach into a two level architecture, centred on user defined clinical archetypes, was closely studied, alongside the implementations of the UCL *open*EHR server incorporating the two level object model and object dictionary concept, evolved by UCL through its post GEHR projects. These systems are now seen, in the light of implementation experience of both teams over the year, to have been largely identical. UCL, now freed from the constraints of working within the compromises of Synapses and Synex in Europe, has reverted to its earlier GEHR approaches, to deliver clinical prototypes of its own EHCR record server, which is now termed an *open*EHR server. This has been adopted, with Oracle Corporation as the basis of middleware for the South West Region of the NHS ERDIP project on electronic records for cardiovascular disease.

Now that the outcomes of the two streams of work are drawing together again in renewed collaboration, the differences appear small and the benefits of aligning them completely are compelling. At the meeting, the Australian and UCL teams worked intensively to define a convergence pathway for their work, within the emerging *open*EHR Foundation.

In the mean time, the Australian team has succeeded wonderfully well in creating the Australia and Far East *open*EHR Foundation as a pilot initiative towards the vision of three such Foundations in Australia, Europe and the USA.

We need to focus on these opportunities for cross-governmental funding for *open*EHR, perhaps splitting the main open source and content standardisation roles of the foundation from a trading arm, owned by the Foundation, to develop revenue streams to support the goals of the Foundation.

At the same time, we have to remain firmly focused on our continuing pathway of keeping our teams together, expanding our partnerships and delivering the results needed to win the day!