



Project of the Month

Health-e-Child

European Commission
Information Society and Media



Health-e-Child: a grid powered, integrated e-Healthcare platform for Europe and the World

Health-e-Child (HeC) is working to produce a universal biomedical knowledge repository and communication conduit for the future, a common vehicle by which all clinicians will access, analyse, evaluate, enhance and exchange biomedical data of all forms. Fashioned around three paediatric diseases (right ventricular overload and cardiomyopathies, juvenile idiopathic arthritis [JIA], and brain tumours), it will seamlessly integrate traditional and emerging sources of biomedical information – from genetic data to medical imaging data. It will be accessible at any time, from any where; it will offer a friendly, multi-modal and efficient interaction environment. Pivotal to these outcomes are the achievements in personalised medicine which HeC is making through its work on integrated disease models, database-guided decision support systems, cross modality information fusion and data mining for knowledge discovery.

A New Clinical Partner for HeC

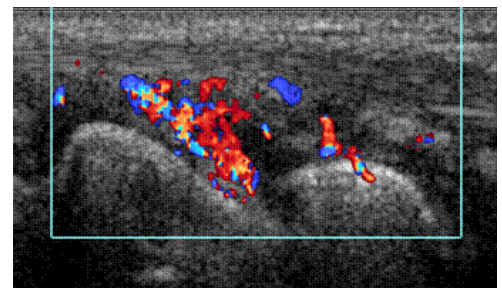
To achieve its goals of creating integrated models, of developing ontologies and of mobilising knowledge discovery in the medical conditions that it is tackling, the HeC Consortium knows the more data the project has the more accurate its models will be. An important step will be taken in 2008 when the HeC Consortium will soon (*the final agreement is ongoing*) welcome one of the world's leading paediatric hospitals, the Ospedale Pediatrico Bambino Gesù (OPBG), as a new clinical partner. Located in Rome, OPBG will join HeC as an unfunded member, committing itself to providing full data sets for the cardiology and rheumatology arms of the study.

HeC started with three clinical partners (the Necker Hospital in Paris, the Great Ormond Street Hospital in London, and the Giannina Gaslini Institute, IGG, in Genoa) and has hopes of recruiting as many as 25 new clinical partners in the future. And its ambitions are not confined to Europe: HeC's expansion plans already include the Paediatric Cardiology Department of the Johns Hopkins University Hospital in Baltimore Maryland, USA. This is exciting, not just for the potential addition of another world famous hospital, but also for the future of pan-Atlantic research and development in paediatric medicine.

Rheumatology & Knowledge Discovery – A Paediatric Breakthrough

While internationally validated radiographic scoring systems are already available, standardised, validated, and feasible MRI and ultrasonographic scoring systems for children with JIA are not.

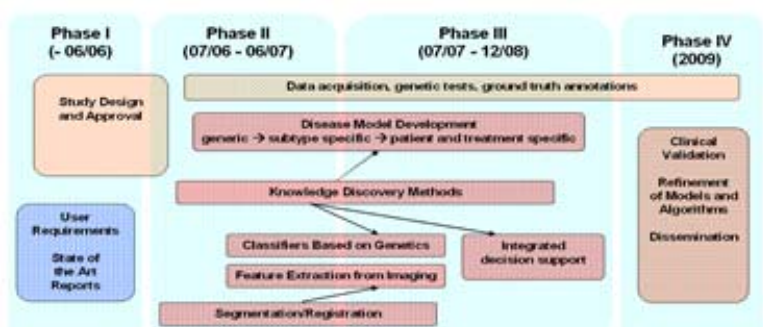
A new MRI-based scoring system for rheumatology has been developed by HeC which measures the synovial membrane



volume and bone erosion from MRIs. Variational methods for foreground/background separation in image processing, and segmentation were investigated using machine learning techniques. Image annotation tools were also developed and tested for establishing the ground truths for learning.

The process of validation of these semi-quantitative scoring systems is still ongoing, so far the MRI erosion scoring system has been tested on 44 patients enrolled at IGG. Inter-observer reliability was assessed for all of the images by two different observers. Intra-observer reliability was based on a subset of 20 randomly selected patients, whose MRI scans were read a second time in a blinded manner by 2 observers 6 weeks after the previous review. Inter and intra-observer agreements for the MRI score were analysed by computing the intra-class correlation coefficient.

Clinical and Application Roadmap

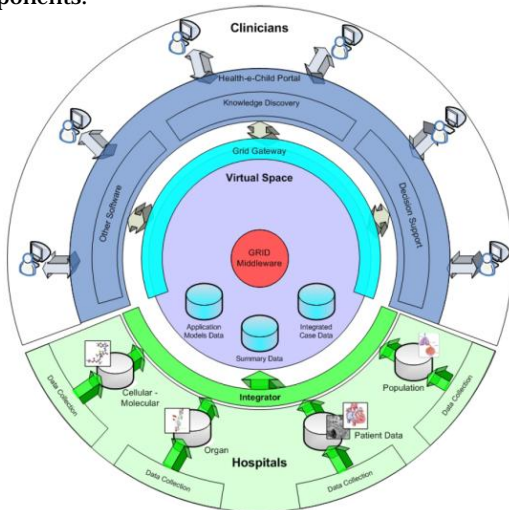


The very high inter-observer and intra-observer intraclass correlation coefficients were obtained and yielded preliminary evidence that HeC's MRI erosion score provides a reliable tool for assessing bone damage in JIA.

HeC's Grid platform and integrated applications

The HeC development team demonstrated its latest achievements at the [Third EGEE Users Forum in Clermont-Ferrand](#) in France in February 2008, where it was the only demonstration to be awarded the "best live demo" title. The demonstration of the HeC platform and gLite-based grid infrastructure simulated a clinician logging in to the system and analysing patient data. Immediately after authentication, the so-called Peer-to-Peer Patient Privacy network is established within the LAN, which enables users to store and share private patient information outside of the grid and to map it to deidentified records inside the grid. The clinician can enhance the patient data by anonymously attaching new records.

This application is the stepping stone for the HeC decision support applications, which constituted the second stage of the demonstration, namely the CaseReasoner, together with its visualization components.



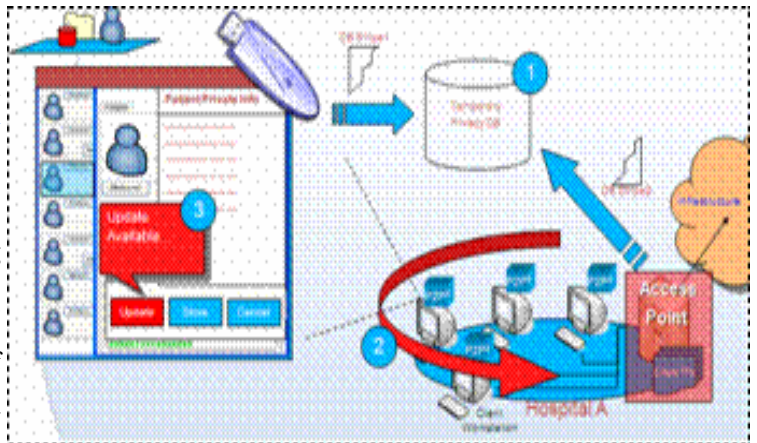
Links:

- Project website: Health-e-Child www.health-e-child.org
- Project overview: http://ec.europa.eu/information_society/activities/health/docs/publications/fp6upd2007/health-e-child2007.pdf
- Project newsletter: <http://www.health-e-child.org/newslettertheme.2006-11-15.1226303527>
- Health Policy Relevance: http://ec.europa.eu/information_society/activities/policy_link/brochures/documents/health.pdf

For further information:

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The CaseReasoner interacts with the Gateway to extract the necessary patient data from the underlying grid database. It provides clinicians with a flexible tool for operations such as data filtering and similarity search. Other innovative techniques for patient similarity visualisation are combined distance/heatmaps, treemaps



and neighbourhood graphs. Similar cases are detectable both in the whole integrated case database, and in some subsets of interest (e.g., high-grade tumours, females, etc), defined in the form of a simple filter. In combination with basic statistics, class distribution histograms and scatter plots for the case base under study, this will be a universal tool for grid based decision support for the diseases studied in HeC. An additional feature is the 3D Registration Tool for brain MR scans developed by HeC partner INRIA. This application enables the clinician/user to visualise the evolution of brain tumours by selecting two MR scans of a given patient in the case database, the clinician retrieves a series of graphical tools to compare the two data sets to understand how the disease evolves. Various graphical approaches are available from fading to grid-mapping which highlight differences found between images.

HeC aims at filling the gap between what is current practice and the needs for modern health provision and research

HeC aims to bridge the gap between what is current practice and what the needs for modern health provision and research will be. Ultimately, with the Health-e-Child system, information will have no conceptual, logical, physical, temporal or personal borders or barriers. It will be available to all professionals who are interested and have the appropriate level of clearance.