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[www.health-e-child.org](http://www.health-e-child.org)

Health-e-child is an eHealth project funded under the FP6 program  
Timetable: 01-Jan-06 to 31-Dec-09  
Total cost: 16.7 Mio. €  
EC funding: 12.2 Mio. €  
Instrument: IP  
Project Identifier: IST-2004-027749

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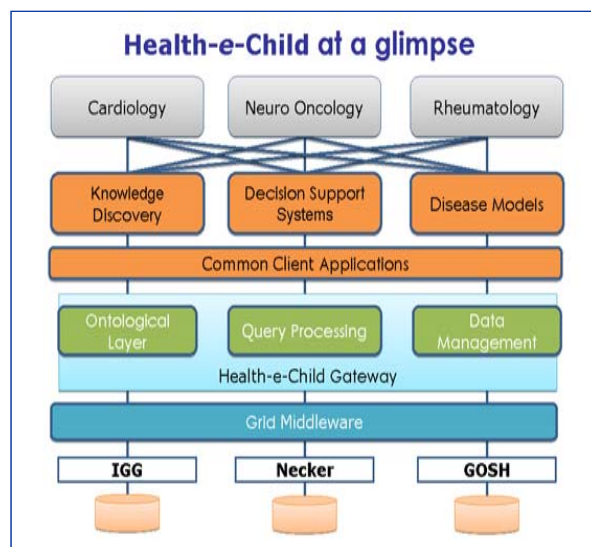
## An integrated platform for European paediatrics based on a Grid-enabled network of leading clinical centres

### Objectives of the project

- To gain a comprehensive view of a child's health by vertically integrating biomedical data, information, and knowledge, that spans the entire spectrum from genetic to clinical to epidemiological.
- To develop a biomedical information platform, supported by sophisticated and robust search, optimisation, and matching techniques for heterogeneous information, empowered by the Grid.
- To build enabling tools and services on top of the Health-e-Child platform, that will lead to innovative and better healthcare solutions in Europe.

Fashioned around three paediatric diseases with at least partly unknown causes, classification and/or treatment outcomes - heart diseases (right ventricular overload [RVO], cardiomyopathies), inflammatory diseases (juvenile idiopathic arthritis [JIA]), and brain tumours (gliomas), Health-e-Child is building the enabling tools and services that improve the quality of care and reduce its cost by increasing efficiency, through:

Integrated disease models, Database-guided decision support systems, Cross modality information fusion and data mining for knowledge discovery.



Key to the Health-e-Child system is the establishment of multi-site, vertical, and longitudinal integration of biomedical data, information and knowledge delivered via a Grid-based platform, supported by robust tools for search, optimisation and matching processes.

The core of Health-e-Child revolves around its efforts dedicated to meeting the challenges entailed in biomedical information analysis.

Central to these are Health-e-Child's research activities centring on the tasks of integrated disease modelling, decision support and knowledge discovery for the advancement of personalised medicine.

The following are a few telling examples of Health-e-Child's ongoing research activity in each of the three tasks.

### Disease Modelling in Cardiology

Health-e-Child is currently addressing the main tasks of developing learning 3D+t segmentations of the right ventricle, and electromechanical and physiological models of RVO + CM. The project's research goals concentrate on:

- identifying significant parameters for subtypes of cardiomyopathies that could lead to indications for additional genetic tests,
- adapting generic models to clinical data to extract patient-specific high-level discriminative features for decision support and knowledge discovery,
- validating new measurements for diagnosis.
- indicate the capacity of drugs to stop/slow down disease evolution (automatic suggestion of drug prescriptions)
- analysing the correlation between genomic, proteomic, clinical and image data, with images mapped to (few) quantitative parameters and establishing a candidate gene set (responsible for bone remodelling) for study.

### Knowledge Discovery in Brain Tumours

Priority research goals of Health-e-Child in this area address actions to develop applications to:

- verify the diagnosis/categorization of low-grade gliomas
- correlate clinical, imaging, and genomic data
- correlate prognosis with tumour origin site
- define prognosis (e.g., correlations with spectroscopy)
- suggest treatment strategies
- predict outcome
- provide more precise classification of diseases
- detect correlations between age and outcome and between genetics and outcome
- elaborate meta-analyses of published findings.

### Decision Support in Cardiology

The project is currently developing tools that will enable:

- the monitoring of right ventricular overload and decision support based on similar cases (similarity search based on specified features and association rules extraction for the given case)
- the prediction of whether atrial septal defect (ASD) will close by itself or will become larger, thereby precluding trans-catheterisation
- the prediction of "high-risk" ASD patients in whom erosion/rupture after trans-catheterisation is likely.

### Knowledge Discovery in Rheumatology

Applied to juvenile idiopathic arthritis (JIA), Health-e-Child focuses on the specific research goals of

- identifying gene variant combinations (haplotypes) correlated with particular diseases (bones/joints erosion)
- comparing the presence of different proteins in fluid at different stages of the disease to discover behaviour of cells close to fluid
- improving the current classification of JIA subtypes, and identifying homogeneous groups of clinical features
- elaborating explicit criteria for the early prediction of disease outcome/evolution
- developing image-based methods which rapidly indicate the capacity of drugs to stop/slow down disease evolution (automatic suggestion of drug prescriptions)
- analysing the correlation between genomic, proteomic, clinical and image data, with images mapped to (few) quantitative parameters and establishing a candidate gene set (responsible for bone remodelling) for study.

