

DebugIT

Detecting and Eliminating Bacteria Using Information Technology

The DebugIT project is developing an IT-framework to address the problem of antibiotic resistance. Routinely collected clinical data from hospital information systems enables the detection of patient safety related patterns and trends, as well as acquisition of new knowledge through advanced data mining. In a next step, this knowledge facilitates better decision-making on the optimal treatment of infectious diseases.

The target

After half a century of antibiotic use, re-emerging and new infectious diseases, partially caused by the rise of antimicrobial resistance, have become a major public health concern. **The misuse of antibiotics in humans and animals is one of the leading causes of rapid emergence of resistance among pathogens.** Antibiotic resistances lead to **escalating healthcare costs, increased morbidity and mortality** and the emergence of potentially untreatable conditions.

The DebugIT project (<http://www.debugit.eu/>), a consortium of leading European clinical, academic and industrial partners, aims at developing **an IT-framework to allow healthcare systems to better address these emergent problems and improve their management.**

The tools

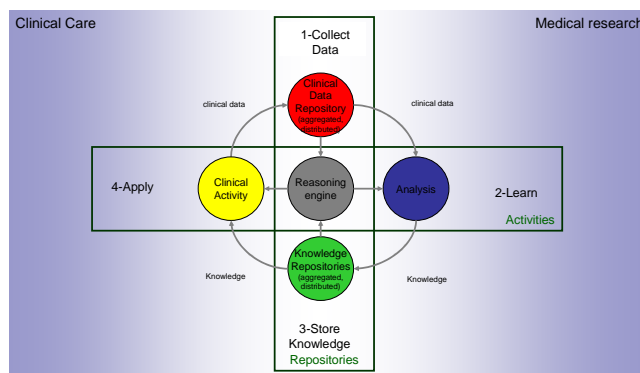
DebugIT draws from routinely collected information in participating hospitals' clinical information systems to detect patient safety related patterns and trends, exploit existing knowledge and acquire new knowledge through advanced data mining, and use this knowledge for better decision-making on the optimal treatment of acute infections or management of infectious threats.

DebugIT builds on a multi-stage framework of several distinct components:

- **Collecting Data:** Via a semantic interoperability platform, based on sparql technology, clinical data is aggregated from heterogeneous sources, across different hospitals, countries, languages and information models, to unified representations, standards and mapping

algorithms, organised in a virtualised, fully integrated Clinical Data Repository (CDR).

- **Learning:** Advanced data mining techniques are applied on multimodal, multi-source, structured and unstructured data to detect patterns relevant for patient safety and the better treatment of infectious diseases.
- **Storing Knowledge:** The gained knowledge is stored, validated, visualised and aggregated with pre-existing knowledge in a federated knowledge repository.
- **Applying Knowledge:** Appropriate software tools are integrated into available clinical and public health information systems. Decision support tools apply the newly generated knowledge and help the clinician to improve choice, dose and administration of antibiotics. The new knowledge is applied to monitoring ongoing care activities and outcomes and may help to predict future outcomes.



The output

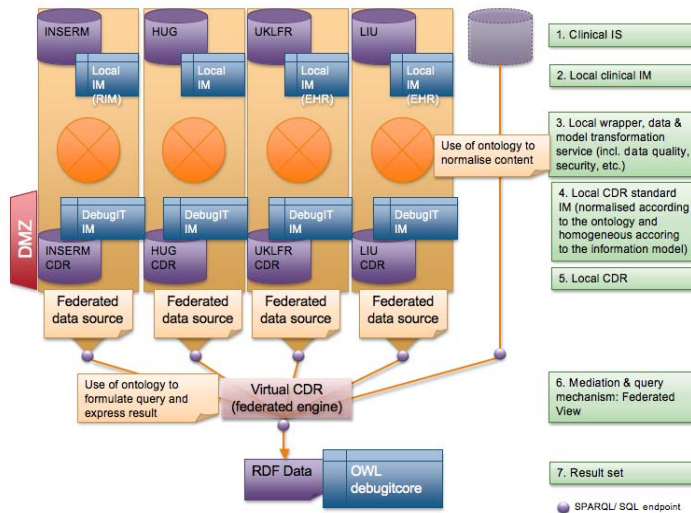
The learn-predict-prevent approach embodied in the knowledge base and the decision support system of DebugIT will **contribute to effective and automated risk prediction.** Further outcomes are:

- Clinical Information Systems (CIS) of participating European hospitals, industry and their clients updated with DebugIT tools, allowing **better monitoring of bacteria prevalence and resistance, and better decisions at the point of care.**
- **New opportunities for public health at a global level,** potentially through a European or global disease control centre or public authority.

- A **distributed Medical Knowledge Repository (MKR)** integrated with domain knowledge coming from external sources such as guidelines and scientific evidence.
- Innovative and user friendly knowledge representation paradigms for both clinicians and IT experts.

Achievements include:

- DebugIT Core Ontology and Operational Ontologies: 800+ classes, 160 properties.
- The interoperability platform, with basic functionality implemented and able to federate queries and merge result sets, based on sparql.
- Clinical Data Repositories with sparql endpoints.
 - A data mining infrastructure with sophisticated post-processing capabilities (temporal and causal mapping) and yielding medical results.
 - Image mining based on segmentation of chest x-rays.
 - A running knowledge repository able to store queries and accept data mining results.
 - An interactive knowledge authoring tool for building queries and reviewing results.
 - A decision support and monitoring service, formalising bayesian belief networks and fuzzy cognitive maps, ran by the same engine.
 - Graphical User Interfaces for decision support prototypes and the knowledge authoring tool.

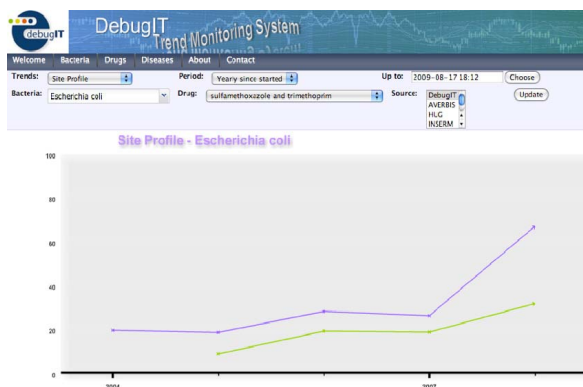


First evaluation results are being analysed and will be available towards the beginning of 2011.

Already at this stage, the value of the project achievements have been acknowledged by leading experts in the field of infectious diseases, who are members of the DebugIT clinical Advisory Board. Furthermore, the European Centre for Disease Control (ECDC) has expressed interest in a close cooperation, also beyond the project lifetime.

Partners:

Les Hôpitaux universitaires de Genève (UNIGE), Université De Genève (HUG), Haute Ecole Specialisee de Suisse Occidentale / Haute Ecole de Gestion (HES-SO / HEG) Switzerland; Linköpings Universitet (LUI), Sweden; empirica Communication and Technology research, Universitätsklinikum Freiburg (UKLFR), AVERBIS, Germany; University College London (UCL), UK; Institut National de la Santé et de la Recherche Médicale (INSERM), France; Technologiko Ekpedeftiko Idrama Lamias (TEILAM), Greece; IZIP, a.s., MD Access, a.s., Czech Republic; Gama/Sofia Ltd., Bulgaria



Progress and results

In a nutshell, the global evolution of the project is divided in 4 phases:

- Year 1: Planning, organising, investigation, proof of concept.
- Year 2: Establishing of the full collect-learn-store-apply circle (end to end process).
- Year 3: More coverage, more data, deployment.
- Year 4: Framework running and implemented; clinical results, socio-economic and clinical impact assessment.

With the IT-framework established, the current focus of work is on implementation and fine-tuning of the DebugIT tools and components.

Timetable:	from 01/2008 – to 08/2011
Total cost:	8.364.796 €
EC funding:	6.414.915 €
Instrument:	STREP
Project Identifier:	FP7-ICT-2007-217139

Important Links:

Project website: [http:// www.debugit.eu](http://www.debugit.eu)
 ICT for Health website: http://ec.europa.eu/information_society/ehealth

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