DebugIT

Detecting and Eliminating Bacteria Using Information Technology

The DebugIT project is developing an IT-framework to address the problem of antibiotic resistance. It uses routinely collected clinical data from hospital information systems to detect patient safety related patterns and trends, acquire new knowledge through advanced data mining, and use this knowledge for better decision-making on the optimal treatment of infectious diseases.

Improving the quality of healthcare and patient safety are priority health policy goals globally. Despite half a century of antibiotic use, re-emerging and new infectious diseases, partially caused by the rise of antimicrobial resistance, have become important problems. The misuse and overuse of antibiotics are believed to be important factors in rapid emergence of resistance among pathogens. This increasing prevalence of resistance results in escalating healthcare costs, increased morbidity and mortality and the (re-) emergence of potentially untreatable conditions.

Project Description

The DebugIT project is developing an IT-framework to allow healthcare systems to better address these emergent problems and improve their management. In the case of infectious diseases, DebugIT will use routinely collected information from participating hospitals' information systems and available expert knowledge to

- detect patient safety related patterns and trends
- acquire new knowledge through advanced data mining, and
- use this knowledge for better decision-making on the optimal treatment for infectious diseases
- thereby improving the quality of healthcare.

Methodology

DebugIT is adopting a multi-stage framework of several distinct steps:

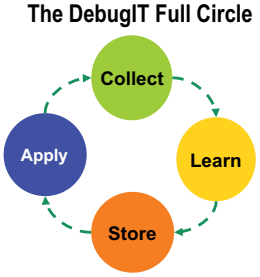
- **Collect Data:** Clinical data is aggregated from across different hospitals, countries, languages and information models, via advanced and commonly agreed data models, standards and mapping algorithms, organised in a virtualised, fully integrated Clinical Data Repository (CDR).
- **Learn:** Advanced 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.
- **Store Knowledge:** The gained knowledge is stored, validated, visualised and aggregated with pre-existing medical and biological guidelines and regulations in a federated knowledge repository.
- **Apply 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 can also be applied to the monitoring of ongoing care activities and outcomes and may help to predict future outcomes.

The learn-predict-prevent approach of DebugIT will contribute to effective and automated risk prediction.

Expected Outcomes

DebugIT will contribute to achieving world-leading levels of patient safety with fewer medical errors and optimised medical interventions. 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 expected outcomes are:

- **Clinical Information Systems** (CIS) of participating European hospitals, industry and their clients updated with DebugIT knowledge.
- **New knowledge made available** at a global level, preferably through a



A DEBUGIT USE CASE

The currently recommended chemoprophylactic antibiotics for Neisseria meningitidis are rifampin, ciprofloxacin, and ceftriaxone. All of these are equally effective, yet due to its simple regimen as well as its side effect profile, ciprofloxacin is preferred. However, in case of pregnancy and a proven indication of treatment of a disease caused by Neisseria meningitis, it is indicated to give a regimen of ceftriaxone, which is the only drug to be used in such a special situation. The DebugIT solution will provide appropriate decision support in this area as a function of patient characteristics and thereby restrain the development of resistance.

European or global Disease Control Centre/Public Authority, and/or through Open Source services.

- **New, advanced ICT applications and innovations** marketed in the following domains: virtualisation of Clinical Data Repository information, advanced multimodal data mining techniques on text, image and distributed storage, use of machine reasoning related to real, point of care patient data.
- 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.

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.

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- Freiburg University Medical Centre (Germany)
- University College London (United Kingdom)
- Linköping University (Sweden)
- empirica GmbH (Germany)
- IZIP, a.s. (Czech Republic)
- Technological Educational Institute of Lamia (Greece)
- Gama Sofia Ltd. (Bulgaria)
- AVERBIS GmbH (Germany)
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Antibiotic resistance, Data-mining, Decision-support, Patient safety