Early detection of infection chains & outbreaks: Use Case Infection Control

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The HiGHmed-Project is funded by the Federal Ministry of Education and Research (BMBF) under the “Medical Informatics” funding scheme. HiGHmed aims to develop and use innovative information infrastructures to increase the efficiency of clinical research and to swiftly translate research results into validated improvements of patient care. These aims are connected with challenges to integrate and further develop solutions of innovative, internationally interoperable data integration and methods, targeting to demonstrate added value for health research and patient care. The concepts must be designed in a way that will help to develop sustainable structures and with the perspective for an easy roll-out to other hospitals. To ensure semantic interoperability and traceability, HiGHmed follows the openEHR (electronic health records) approach for clinical information modelling.

Outbreaks of infections are rare events and present a major health challenge today. To determine the source or location of the outbreak, the Use Case Infection Control was initiated as part of the HiGHmed project. Therefore the use case wants to establish the Smart Infection control system (SmICS).

Goals of SmICS

The overall goal is to develop SmICS as an open source solution, providing the tool to the public.

Goals for researchers:
- Facilitating the tracking of transmission dynamics
- Gaining new insights into risk factors, sources, and species- clonal-specific differences allowing to define the urgently needed evidence for prevention measures
- Identification of pathogen specific contact events and transmission pathways, incubation periods and date of infection
- Generation of hypotheses about clusters and outbreaks
- Application of algorithms to detect patient cluster and pathogen outbreaks

Goals for the hospitals:
- Reduction of outbreaks by an effective and efficient infection control
- Improvement of patient care quality
- Shortening of stays and save costs by lean processes

Approach of SmICS

- In cooperation with the domain experts, a minimal data set was created. This includes patient and case data, such as gender or age, as well as patient microbiological data and movement data.
- The data will be transmitted anonymously to the visualization team of the TU-Darmstadt, so that a conclusion on the respective patient is excluded.

Scientific and technical details

- The SmICS will be implemented as a HiGHmed application. Therefore the data stewards of all project partners will create archetypes and terminology bindings.
- From a technical point of view, SmICS will be designed as a distributed system. It consists of local nodes, which are used at each clinical site.
- The visualization will be a dashboard-like component with a reporting function and will be implemented in cooperation with our partner TU-Darmstadt.

Fig. 1: Interactive dashboard and reporting for microbiological and movement data (demo version)

Further steps

- Design extension
  - Presentation of longer periods
  - Presentation of longer patient length of stay
  - Presentation of connection between time, contact, location and movement
- Modelling of Archetypes for data collection
- Data integration in local repositories and establishment of interfaces to SmICS
- Evaluation regarding to contact points and transmission routes of pathogen- or patient-specific incubation and infection times


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