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Saleh, Kutaiba; Saleh, Kutaiba; Stucke, Stephan; Uciteli, Alexandr;
Faulbrück-Röhr, Sebastian; Neumann, Juliane; Tahar, Kais; Ammon, Danny;
Schmidt, Tobias; Neumuth, Thomas; Besting, Andreas; Portheine, Frank;
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Using fast healthcare interoperability resources (FHIR) for the integration of risk minimization systems in hospitals

Using Fast Healthcare Interoperability Resources (FHIR) for the Integration of Risk Minimization Systems in Hospitals

Kutaiba Saleh[a], Stephan Stucke[b], Alexandr Uciteli[c], Sebastian Faulbrück-Röhr[b], Juliane Neumann[d], Kais Tahar[c], Danny Ammon[a], Tobias Schmidt[a], Thomas Neumuth[d], Andreas Besting[e], Frank Portheine[e], Heinrich Herre[c], André Kaeding[b] and Martin Specht[a]

[a] Jena University Hospital, Jena, Germany,
[b] GMC Systems mbH, Ilmenau, Germany
[c] Institute for Medical Informatics, Statistics and Epidemiology (IMISE), University of Leipzig, Leipzig, Germany
[d] Innovation Center Computer Assisted Surgery (ICCAS), University of Leipzig, Leipzig, Germany
[e] SurgiTAIX AG, Herzogenrath, Germany

Abstract

With the growing strain of medical staff and complexity of patient care, the risk of medical errors increases. In this work we present the use of Fast Healthcare Interoperability Resources (FHIR) as communication standard for the integration of an ontology- and agent-based system to identify risks across medical processes in a clinical environment.

Keywords:

Standards; Decision Support Systems, Clinical; Harm Reduction

Introduction

Current studies provide an estimation of more than 400,000 lethal harms due to preventable medical errors during hospital treatment per year, with 10- to 20-fold serious harms occuring [1]. Clinical decision support systems (CDSS) can assist in preventing such errors, but have not yet integrated the new messaging standard Fast Healthcare Interoperability Resources (HL7 FHIR [2]). In the research project "OntoMedRisk", we developed an agent-based system to identify risks based on a special ontology [3]. This system aims at supporting medical staff with risk detection and error prevention. A requirement for practical demonstration is the integration of this system into an existing hospital IT infrastructure, which was carried out at Jena University Hospital (JUH).

Methods

Cochlear Implantation (CI) has been chosen as a first exemplary clinical treatment process. To detect risks during CI treatment, relevant medical information from clinical subsystems must be extracted and processed by the system. In our concept, we combined the data retrieval agent of the DSS with a FHIR server to extract data either directly from the clinical subsystems or via communication server to systems which do not yet support FHIR.

Results

We implemented a FHIR server at JUH for medical data collection for risk detection in the CI treatment process, where singular data is extracted and processed in a timely manner.

For communication and storage, certain clinical data key performance indicators relevant for risk detection like age of the patient, cranial thickness, or duration of deafness, were modeled using FHIR resources like "patient", "observation", "encounter" and processed by the agent system. Through the use of an ontology, alerts are generated during treatment as a support to the clinical staff. Since FHIR is a new standard, many relevant clinical systems might not be providing a correspondent interface. In these cases, the use of a communication server is a transitional solution.

Conclusions

We obtained as findings that CDSS can collect medical data from existing clinical information systems through the use of modern communication standards like FHIR. The "OntoMedRisk" system relies on real-time access to discrete data generated in different subsystems, and we could provide these as FHIR resources for risk detection and presentation of the results to clinical staff. Further investigation on the usability of this software at JUH is planned. In the future, we plan to extend system functions to other treatment processes.

Acknowledgements

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Address for correspondence

Kutaiba Saleh - kutaiba.saleh@med.uni-jena.de.