A Framework for Integration of Data from new Technologies into the Clinical Workplace

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Abstract and Objective

New technological developments, methods, and therapy procedures in health care lead to an overwhelming flood of individualized data. This huge amount of data needs to be faced at each encounter. A framework was developed to analyze the effects of the multilayer aspects of the information overload from new technologies even before these will be applied in practice to the patient physician communication in shared decision making processes. This framework is visually integrated into the hospital information system at the University Medical Center Goettingen.

Keywords:

Data display, Information management, Medical informatics applications, Decision support system

Methods

First, the hospital information system which is currently in use at the University Medical Center Goettingen has been analyzed. The analysis aimed at the possibility of integrating new data sources into this system. To identify the potentially new data sources that will support the shared decision making, a literature review has been conducted. Then, for each identified data source a market analysis has been performed. Based on these results a framework for a fast and easy integration of these identified sources into the current clinical information system has been developed. In order to allow a flexible composition of different data types, the architecture was built in a way that retrieving data and presenting data are independent from each other.

Results

As a result of the research a framework was implemented and four technology areas were identified which are currently spreading or emerging. The framework for longitudinal interactive networked data Access (LINDA-1) features a modular setup that visually integrates data from new technologies via plug-ins. For each new source system, a pair of plug-ins enables the framework to import data and store it in a database, as well as display the data within hospital information systems that are familiar to physicians.

Source plug-ins allow data to be imported from new source systems into the internal database. Presentation plug-ins display the data in an appropriate manner within the hospital information system. Both plug-ins are registered within the framework, which handles the communication between the plug-in pairs as well as between the different modules and the hospital information system. To keep the system flexible, the internal database is designed to provide own tables for each set of source plug-in and presentation plug-in.

The identified potentially new technologies, which will be part of future shared decision-making processes, are: (1) Ambient assisted living technologies (e.g. systems of sensors or other assistive technologies that help the elderly or disabled citizens to live more independently), (2) new developments in telemonitoring applications (i.e. home monitoring applications), (3) robotics (e.g. Paro[1] which has five different types of sensors for tactile, light, audio, temperature, and posture signals), and (4) new imaging approaches (e.g. molecular imaging). Therefore plug-in pairs for these four areas were implemented. Additionally, a plug-in pair that pools heterogeneous data types into a longitudinal visualization was tested.

Conclusion

The framework for visual integration of data into the familiar clinical software environment enables fast and flexible integration of new technologies in respect to the high amount of data in shared decision-making processes. It builds the basis for wide spread evaluations from different perspective as well as other disciplines. Additionally, it facilitates reviewing clinical findings together with the patient from different perspectives. The framework will also be used to design, implement, and test new evaluation methods. In contrast there are other projects like the IBM 3D Avatar[2], which aims to provide information on the patient to the physician.

To support the communication between the patient and the health professional through visualization, the data has to be presented in a more abstract way [1]. It must be comprehensible for the physician and the patient and has to be suitable in the context of for example understanding the effects of a medication [2] or applied technologies.

References

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