HelmholtzZentrum münchen
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Concept of knowledge-based self-management pathways for the empowerment of diabetes patients

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Figure 1 – Self-Management Pathway Scheme

Introduction

Within the EMPOWER project a modular and standard-based patient empowerment framework is being developed which will facilitate the self-management [1] for diabetes type 1 and 2 patients. Research and development efforts focus on knowledge-based self-management pathways [2] for diabetes patients who are at the center of the EMPOWER system, that is giving support through the combined use of the following services:

- **Monitoring** of vital, physical and mental parameters as well as physical and lifestyle activities.
- **Generating patient-specific recommendations** that is based on the monitored health parameters and on expert knowledge (e.g. diabetes guidelines).
- **Definition of goals and corresponding actions** by the patient to fulfill the recommendations.
- **Provision of intelligent and user-friendly information** that supports the patients' self-dependent execution of actions and facilitates changes of behavior.
- **Standard-based integration of relevant data** originating from Electronic Medical Records (EMR) [3] of participating health care institutions, Personal Health Records (PHR) and Personal Health Applications (PHA) e.g. in form of Mobile Apps.

The framework will be implemented in two pilot deployments: on the national eHealth platform "Saglik-Net" of the Turkish Ministry of Health [4] and within the regional doctors' network GOIN in Germany [5]. Pilot specific differences regarding the technical setup of integrated data sources exist and are addressed in the concept.

Technical Integration of Data Sources

Data originating from health care institutions is integrated using country specific approaches. Within the German pilot a regional or national EHR for accessing aggregated health data is not available (Figure 2).

Therefore the participants' EMRs must be interfaced one by one.

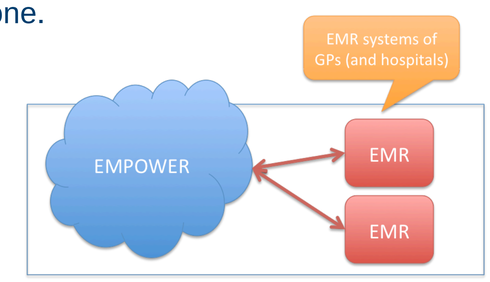


Figure 2 – One by One Integration of Health Care Institutions in Germany

As primarily general practitioners and certain specialists (e.g. Ophthalmologists and Neurologists) are treating diabetes patients, their referring practice information systems must be interconnected with the EMPOWER services. The systems used by general practitioners offer limited integration capabilities [6] due to proprietary interfaces. To address this an alternative, archetype-based approach was defined [7] and implemented in cooperation with an exemplary vendor.

In Turkey a nation-wide EHR is available that serves aggregated data from treating health care institutions and which supports common interoperability standards (Figure 3).

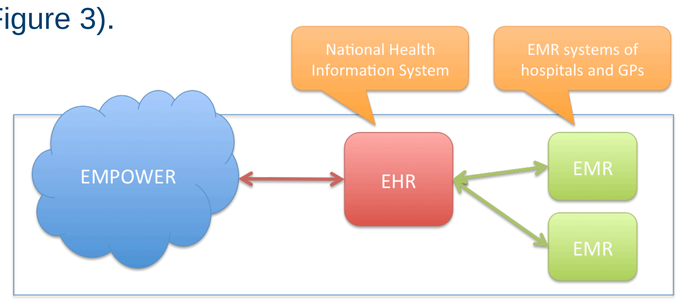


Figure 3 – Nation-wide EHR of Health Care Institutions in Turkey

To ensure interoperable data exchange within both pilots IHE [8] profiles like Patient Care Coordination Technical Framework are applied that are commonly used in regional and national EHR projects.

Self-monitoring data from the patients will be collected via the integrated Personal Health Record (PHR) of EMPOWER (Figure 4). It is considered that patients may use a PHR of an external provider and that they may use a PHA to monitor personal health data. Furthermore, it will be possible to import biometrical measurements directly from medical devices (e.g. blood glucose meters) or via PHAs that are already paired with the device. Technical interoperability will be based on the IHE profile XPHR.

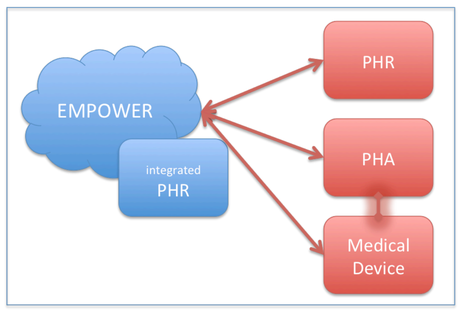


Figure 4 - Common approach to import data provided by patients

Semantic Integration of Data

Data collected by the patient (e.g. observations of daily living like weight and mood) and by health professionals (e.g. diagnoses and medication) must be consolidated for mutual information sharing to enable a seamless, cross-sectoral electronic exchange of patient data.

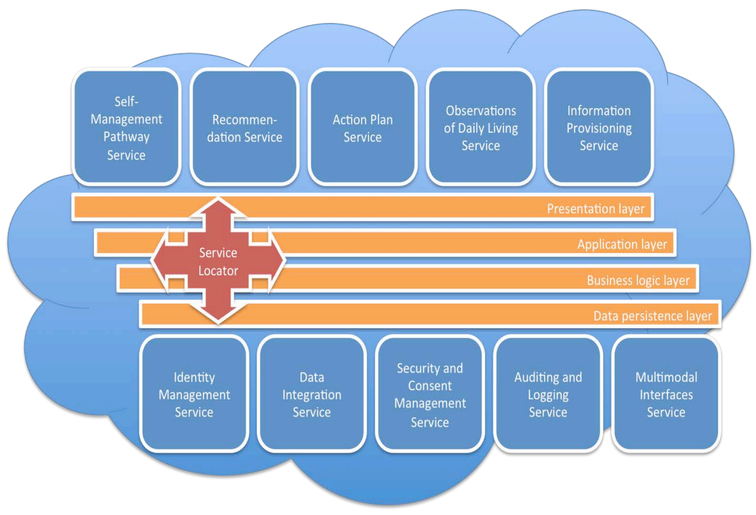
The prevalent lack of implemented standards impede the transfer of detailed healthcare information in a way that supports full integration of that data within the receiving systems [9]. In order to process EHR data safely, semantic interoperability is required, meaning that computational services are enabled to reliably interpret clinical data that has been integrated from various sources [10].

EMPOWER utilizes appropriate standards from HL7 and IHE (like XPHR and XDS-Medical Summaries), as well as openEHR information models [11] to enable semantic interoperable data exchange.

Observations of daily living [12] were specified as openEHR archetypes to be used within PHR systems and PHAs in a patient-centric approach. Archetype based data modeling (including data schemas and corresponding rules) is an open and flexible approach that avoids application lock-in, as the knowledge models are made publicly available [13].

Standard Terminologies will be used for semantic binding (mapping to terminology codes) and for value binding (specific value sets). A central transformation service will be provided that converts data to a common format thus facilitating the import of data from legacy systems and medical devices.

Service Oriented Architecture (SOA)



The modular EMPOWER system follows a service-oriented architecture. Beside providing the primary EMPOWER functionalities as described in the introduction, additional services are required to ensure consistent data privacy and security, continuous auditing and logging mechanisms, seamless integration of heterogeneous data sources and end-user delivery of services to multiple platforms like smartphones, tablets and desktop computers.

The EMPOWER concept is presently implemented. A first prototype is available and pilot testing will start within this year.

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