Reuse of EHRs to Support Clinical Research in a Hospital of Reference

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Abstract. Most hospitals have already implemented information systems and Electronic Health Records (EHRs), but the reuse of such data for research is still infrequent. We present a pilot project on the exploitation of clinical information from a Spanish hospital database in the context of the European Medical Information Framework project (EMIF). Specific use cases such as patients with diabetes mellitus type 2, obesity and dementia were assessed, by exploiting EHR data integrated from several separated clinical databases. The possibility to analyse the features of specific groups of patients based on their diagnosis codes can provide new data about relationships between different conditions that can contribute for decision-making, healthcare and research.

Keywords. Electronic health records, clinical research, hospitals, information systems

Introduction

Most hospitals have already implemented information systems and Electronic Health Records (EHRs), but the reuse of such data for research is still infrequent [1, 2]. We present a pilot project on the exploitation of clinical information from a Spanish hospital database in the context of the European project “European Medical Information Framework” (EMIF website: http://www.emif.eu). The EMIF project aims to develop a common information framework of patient-level data linking up diverse medical data sources. The hospital information system is named IMASIS, which first applications were designed and implemented in 1984 [3].

We focus on three case studies, two in the area of metabolic conditions (i.e. diabetes mellitus type 2 and obesity) and one neurological condition (i.e. dementia), to show the potential of this approach. The hospital is a publicly owned reference hospital encompassing an area of 320,000 inhabitants of the city of Barcelona in Catalonia (Spain).

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1. Methods

After an anonymization process, all the patients with at least one recorded diagnosis in the hospital Parc Salut MAR (PSMAR) EHRs system database, were included for analysis. Based on the International Classification of Diseases-Clinical Modification (ICD9-CM) codes and a particular period of time as selection criteria (between January 1990 and June 2013), several subsets of patients were chosen for specific analysis. In particular, patients with diabetes mellitus type 2, obesity (based on their Body Mass Index (BMI) values) and dementia were selected for analysis.

Based on the use of Jerboa© [4], a custom-built software tool developed to analyze data from EHRs, several features of this population, such as the age, year of birth, years of follow-up, date of entrance in the system and diseases prevalence were analyzed.

2. Results

A number of 638,555 patients were registered in the EHR system of the hospital in the period of time considered from different care facilities (admissions and major ambulatory surgical unit) with a follow-up mean of 4.75 years. From these patients, 290,738 had at least one diagnosis code in ICD9-CM. Figure 1 shows the most prevalent diagnosis in the EHRs of the hospital including, for instance, diabetes mellitus type 2.

![Figure 1. Most frequent diagnoses in ICD9-CM codes format in the EHR of the hospital Parc de Salut Mar, Barcelona (Spain).](image-url)
The number of patients included in each case was 26,480 with diabetes mellitus type 2, 3,560 with obesity and 7,155 patients with different types of dementia such as Alzheimer’s disease, senile dementia or vascular dementia.

3. Discussion

The huge amount of information available in EHRs requires the use of powerful tools to manage it for biomedical research [1, 5]. In this work we present the potential of reusing clinical information for research in a first stage of development, based on the diagnosis codes registered in the EHRs system of a general hospital.

The possibility to analyse the features of specific groups of patients based on their different diagnosis and clinical data by integrating the information from several separated clinical databases such as admissions and major ambulatory surgical unit in a unified electronic system, can provide new data about relationships between biomedical entities and prescriptions that will contribute for decision-making, quality management, healthcare and research [6, 7]. The EHR information system of the hospital is in the process of integrating and linking data of the emergency room, outpatients and drug prescriptions databases.

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References