International Journal of Medical Informatics 93 (2016) 14–25

Contents lists available at ScienceDirect

International Journal of Medical Informatics

journal homepage: www.ijmijournal.com

The national e-medication approaches in Germany, Switzerland and Austria: A structured comparison

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ARTICLE INFO

Article history:
Received 9 November 2015
Received in revised form 30 May 2016
Accepted 31 May 2016

Keywords:
eHealth
e-Prescription
Drug therapy safety
Medication safety
Patient safety
Medication reconciliation

ABSTRACT

Background: Recent studies show that many patients are harmed due to missing or erroneous information on prescribed and taken medication. Many countries are thus introducing eHealth solutions to improve the availability of this medication information on a national scale (often called "e-medication"). The objective of this study is to analyse and compare the national e-medication solutions just being introduced in Germany, Switzerland and Austria.
Methods: Information on the situation in the three countries was collected within an expert group and complemented by an analysis of recent literature and legislation in each country.
Results: All three countries formulate comparable goals for the national eHealth solutions, focusing on improving medication safety. All three countries do not have a national e-prescription system. In all three countries, the implementation process was slower than expected and e-medication is not yet fully available. Differences of the three countries exist regarding chosen architectures, used standards, offered functionalities, and degree of voluntariness of participation.
Conclusion: Nationwide e-medication systems and cross-border harmonization are acknowledged as important goals towards medication safety, but they develop slowly mainly due to privacy and security requirements, the need for law amendments and last but not least political interests.

1. Introduction

The medication process is an important sub-process of medical care. It consists of several consecutive activities: diagnostics and treatment planning, prescribing and transcribing, dispensing and distributing, patient information and motivation, taking and administering the drug, and monitoring and assessing the drug effects [1]. Errors in the medication process (e.g. overdosing, allergies, contraindication, drug-drug interactions, and omitted doses) can lead to adverse drug events and patient harm.

In the recent years, the use of information technology has been propagated to reduce the danger of medication errors and associated patient harm [2]. Recommended systems comprise, among others, drug information systems, computerized physician order entry systems (CPOE) with integrated decision-support functionality, automatic dispensing and commissioning systems, barcode systems, electronic medication administration records, smart pumps, mHealth systems for adherence management, and critical incident reporting systems.

Studies indeed showed a significant reduction of medication errors after introduction of computerized physician order entry systems (CPOE) both in inpatient and outpatient areas [3,4,5].

However, a challenge in many countries is the distribution of information on prescribed and dispensed medication among several IT systems. For example, a patient may get prescriptions from his general practitioner, by his cardiologist, and by his psychiatrist. When admitted to a hospital, he may get a different medication. In addition, the patient may also buy some drug directly at the pharmacy (so-called over-the-counter drugs) and in some countries even in supermarkets. All these prescriptions and dispensings

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http://dx.doi.org/10.1016/j.ijmedinf.2016.05.009
1386-5056/

are typically documented in different health IT systems (e.g. the GP system, the cardiologist system, the hospital CPOE system, the pharmacy system). Due to this fragmentation of medication information, it is extremely difficult to get a medication list for all drugs that have been prescribed for a patient and that this patient is taking at the moment. This increases, for instance, the danger of overlooking potentially dangerous drug-drug interactions.

To address this challenge, health care professionals have been advised to establish a medication history and medication reconciliation processes for their patients [6,7]. However, this process is time-consuming. In addition, patients are often not able to give adequate information on medication they are taking at the moment [8,9].

The problem of incomplete medication lists will increase in the next years, as demographic changes will lead to a higher number of elderly patients taking more medication [10,11,12]. Elderly patients also suffer more often from clinical consequences of medication errors and especially drug-drug interactions [13,14].

Many countries are therefore trying to establish national eHealth strategies, aiming at providing an accurate and up-to-date list of all prescribed and dispensed medication of a given patient. The first sources of information for such a national medication list are the prescriptions issued for a given patient. Several countries are on the way of establishing national e-prescription systems [15]. Such a system replaces the paper-based prescription with electronic prescriptions that are sent from the prescribing physician to a pharmacy. This prescribing information is made available through a national e-prescription database and can form the basis of a medication history of a patient.

In fact, e-prescription is a top priority of the European eHealth activities. Guidelines on electronic prescriptions were submitted for approval by the eHealth Network in November 2014 [16]. Some member states took part in the European Patients Smart Open Services project (epSOS) [17] which ended in June 2014. This voluntary project tested and validated the interoperability of EHR data and electronic prescription data [18]. It reflects Article 11 of the Directive on the rights of patients in cross-border care (2011/24/EU) [19] of the Action Plan for a European eHealth Area that states that interoperability between all member countries systems has to be implemented.

In the European Union, countries such as Denmark [20], Estonia [21], Iceland and Sweden [22] first started to implement national e-prescription systems. Besides these pioneers, some countries have reached a high percentage of e-prescriptions recently, e.g. Croatia [23]. Similar approaches can be found outside Europe too. In Turkey, for example, in 2013 80% of prescriptions were transferred electronically [24]. In the United States, the Medicare Improvements for Patients and Providers Act and the Medicare and Medicaid Electronic Health Record Incentive Programs lead to an increase in the number of physicians e-prescribing via EHR from 7% in 2008 to 70% in 2014. All states were using e-prescription at this time [25].

When comparing the different national approaches towards e-prescription, significant differences can be observed:

- Some countries establish regional e-prescription systems, e.g. in Italy [16], Poland [26] and Portugal [27], while others establish nationwide e-prescription systems, e.g. Sweden [22].
- Some countries only focus on the primary care systems, others only on secondary and tertiary care, and others on both, e.g. Great Britain [28].
- Some countries make participation in e-prescription mandatory, e.g. France, Finland [29], Greece [30]; in other countries, participation is voluntary, e.g. in Czech Republic [16].
- Some countries chose centralized architectures, e.g. Finland [29], Northern Ireland [31]; other countries establish decentralized e-prescription architectures (e.g. in Spain different models are used in the regions [15]).
- Some countries use international standards (e.g. HL7 and SNOMED CT), e.g. in Latvia [32], Estonia [21].
- Some countries offer incentives for participation, e.g. planned in Belgium [33].
- In some countries, the acceptance of e-prescription is quite high, e.g. the feedback from physicians, pharmacists and patients is very good in Croatia [23]; in others, the acceptance is quite low, e.g. the acceptance by physicians and pharmacists of the first e-prescription pilot in Belgium [33].

Besides these differences in the approaches, most are operated by public institutions or state-owned companies to guarantee reliable systems [29].

Although many countries are on the way towards national e-prescription systems, this is not sufficient to build up a national medication history. In order to achieve this, information on *dispensing* in pharmacies (and physicians' offices) is needed also. First, not all prescriptions are dispensed and given to the patient. Dispensing information shows which drugs are really taken home by the patient. Second, patients may buy over-the-counter drugs in pharmacies. Therefore, dispensing information also has to be gathered on a national scale to contribute to a national medication list.

Although a national e-prescription system is a good basis for a comprehensive medication history, not all countries take this path. Germany, Switzerland and Austria are all countries that do not yet have a national e-prescription system. Still, all three countries have a national eHealth strategy, and all three countries plan to establish a national system for the availability of the medication history in the near future. In this paper, we will describe the individual path that each country is planning to take.

The authors of this paper are part of a group of experts from Austria, Germany and Switzerland which has met several times in the last years to discuss opportunities and challenges of using information technology to improve medication safety. The group has already launched several publications (e.g. [1,34]). In two recent workshops (May 2015 in Vienna/AT, June 2014 in Biel/CH), the group discussed and compared national approaches of e-medication, to allow learning from each other. The discussions in these workshops motivated this paper.

2. Objective

To analyse and compare the approaches chosen by Germany, Switzerland and Austria to establish a national medication list without having a national e-prescription system.

3. Methods

Information from public sources (official project web sites, scientific papers) as well as personal knowledge of the authors who are all involved in the eHealth project in their respective country were used to collect information. Information was collected between December 2014 and July 2015. Each author was responsible to collect information from one specific country. All authors have been involved in the eHealth and e-medication projects in their countries and were thus able to access and collect most recent information and reports. To validate the collected information, each author contacted up to three other national domain experts. The information from each country was then compared with the information from the other two countries to identify gaps and open questions. Open questions were resolved by the authors by discussion. The categories to describe the information were developed inductively,