



Review

Impacts of second-generation electronic prescriptions on the medication management process in primary care: A systematic review

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ABSTRACT

Objective: To describe second-generation electronic prescription (eRx) technologies and identify their impacts on the medication management process in primary care. Second-generation eRx technologies have focused on networking various stakeholders so that they can communicate electronically.

Method: Using key words, a search was conducted of the relevant databases up to January 2011. A manual search was conducted of the bibliographies of the studies as well as the prior systematic reviews found. The tables of contents of the major periodicals in the field were also searched. This included studies of the impacts of eRx technologies that allow electronic circulation of information between prescription sites and dispensing sites, independent of the methodology used. A structured form was used to extract the data. The studies' impacts were classified by stage in the medication management process (prescription, transmission of the prescription, execution of the prescription and use of the medication).

Results: Nineteen observational studies were included in this review. Most of them (10/19) have evaluated users' perceptions using interviews, focus groups or questionnaires. Two technology models stand out: the push model, under which the prescriber directs the prescription toward a specific pharmacy, and the pull model, under which any authorized pharmacy can download a given prescription into its system. The push model is the most widely used, particularly in the United States. Communication between prescribers and dispensers is usually unidirectional, and communications standards have to be refined. The only demonstrated impacts of second-generation eRx technologies were found at two levels: positive impacts on the quality of the pharmacological profile available to professionals, and negative impacts on the execution of prescriptions in pharmacies. Stakeholders' perceptions were mixed and reflected considerable differences according to context, the type of technology used, the intensity of its use and its maturity. Electronic transmission of prescriptions provides a new way to monitor patient compliance.

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Conclusion: There is little empirical data demonstrating benefits to second-generation eRx technologies, even if it is a highly promoted model for improving primary care quality. More research is required, with studies that measure the impacts of second-generation technologies using empirical data and conducted in the context of actual use. Future studies should also employ the same terminology and provide full descriptions of context, type of technology and intensity of use.

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1. Introduction

Electronic prescription (eRx) technologies promise to improve quality of medication use [1–3], which makes them particularly attractive. There are many problems related to the (mis)use of medications in primary care since the number of molecules continues to increase and more and more patients are polymedicated. Major investments have therefore been made over the last decade to increase use of eRx in primary care.

Electronic prescription technologies are used in different ways. By definition, eRx refers to any computerized system used to enter, modify, review and communicate information on medication prescriptions [4]. The technology may be used on its own or linked to an electronic health record. There have been two generations of eRx technologies: those used to “enter, modify and review” and those used to “communicate.” The first is focused on decision support for physicians and generates a printed prescription, with a paper copy given to the patient. This is a stand-alone technology that uses local electronic information (e.g., the physician’s patient record or medication databases) to improve prescription quality. The second and latest generation has focused on networking various stakeholders so that they can communicate electronically. It is designed to give physicians access to up-to-date pharmacological profiles on their patients as prescriptions are being written, based on the medications that patients have actually purchased at their pharmacies. In addition,

second-generation eRx technologies allow prescriptions to be transmitted electronically to the dispensing pharmacy. This type of technology presents new challenges compared to the first-generation technologies, since coordination is required between different organizations. The coordination is managed by a primary care management structure: private organizations and local or national authorities. In some cases the communications networks are relatively limited (encompassing just a few organizations), but in other cases the networks are designed to include all the organizations involved in a country’s medication management.

Despite the existence of many systematic reviews of eRx technologies [5–7], little is known about the impacts of second-generation technologies, even if a network health information exchange model is highly promoted from a policy perspective. First, few researchers had so far made a distinction between the two generations, comparing the impacts of very different technologies. Furthermore, several systematic reviews have compared the impacts of technologies used in hospitals with those used in primary care as if they were the same thing (e.g., the systematic review by Ammenwerth et al. [5]). Nevertheless the medication management process is very different: in hospitals, prescriptions are entered into systems at the same place that they are filled, whereas in ambulatory care, the information is fragmented across several sites, in particular because a patient may consult several prescribers (general practitioners, specialists). All this information is anchored in either the insurer or the pharmacist, depending

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