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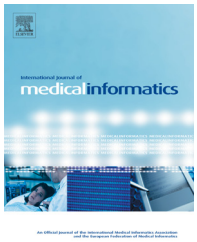

Review

Impacts of structuring the electronic health record: A systematic review protocol and results of previous reviews☆

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ABSTRACT

Purpose: This paper (1) presents the protocol of an on-going systematic literature review on the methods of structuring electronic health record (EHR) data and studying the impacts of implemented structures, thus laying basis for the analysis of the empirical articles (2) describes previous reviews published on the subject and retrieved during the search of bibliographic databases, and (3) presents a summary of the results of previous reviews.
Methods: Cochrane instructions were exploited to outline the review protocol – phases and search elements. Test searches were conducted to refine the search. The abstracts and/or full texts of review papers captured by the search were read by two of the team members independently, with disagreements first negotiated between them and if necessary eventually resolved in the team meetings. Additional review articles were picked from the reference lists of the reviews included in our search results. The elements defined in the search strategy and analytic framework were converted to a data extraction tool, which was tested by extracting data from the reviews captured by the search. Descriptive analysis of the extracted data was conducted.
Results: The 12-stage review protocol that we developed includes definition of the problem, the search strategy and search terms, testing the strategy, conducting the search, updating search from references found, removing duplicates, defining the inclusion and exclusion criteria, exclusion and inclusion of papers, definition of the analytic framework to extract data, extracting data and reporting results. Our searches in fifteen electronic bibliographic databases retrieved 27 reviews, of which 14 were included for full text analysis. Of these, 11 focused on medical and three on nursing record structures. The data structures included forms, ontologies, classifications and terminologies. Some evidence was found on data structure impact on information quality, process quality and efficiency, but not on patients or professionals.
Conclusions: The 12 step review protocol resulted in a variety of reviews of different ways to structure EHR data. None of them compared outcomes of different structuring methods; all had a narrower definition of the Intervention (a specific EHR structure) and Outcome (a specific impact category). Several reviews missed a clear connection between the data

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structures (interventions) and outcomes, indicating that the methods and applications for structuring patient data have rarely been viewed as independent variables. The review protocol should be defined in a manner that allows replication of the review. There are different ways of structuring patient data with varying impacts, which should be distinguished in further empirical studies, as well as reviews.

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1. Introduction

The primary purpose of electronic health record systems (EHR systems, see annex 1 for abbreviations used in this article) is to support efficient, high-quality integrated health care, independent of the place and time of health care delivery. It is estimated that information and communication technology (ICT) implementation can result in care that is safer, and more responsive to patients' needs and, at the same time, more efficient [1]. The range of possible ICT applications in the health care sector has increased exponentially, with a number of countries progressing from local towards regional or national level patient/health information exchange [2–7]. In many eHealth implementation strategies, the importance of defining standard structures for core patient information is crucial [7,8]. Structuring patient data is perceived to support clinical care processes, facilitate new technologies for increasing patient safety and care quality, enable quality monitoring of the health service processes and evidence-based management locally, regionally and nationally by enhancing collection of statistical information [7,9,10]. It is also assumed to enable easier participation of citizens in their care process. Evidence to support these assumptions is, however, yet scarce [11,12] while the balance between risks and benefits of free text vs. structured data in EHR documentation has long been identified as a fragile one [13–15].

In Finland, one of the leading countries in global eHealth [16,17], the national health information archive (KanTa) is being implemented step by step from 2009 to 2016. In addition to the document archiving service, the architecture supports National Health Information Exchange Services for both professionals and citizens. Both implemented and planned solutions depend heavily on the use of various classifications, the adoption of which has progressed rapidly [18,19]. The systematic review protocol and review of reviews outlined in this paper are part of a project intending to inform the evidence-based planning of the Finnish national health information system's evaluation and monitoring. The aims of this paper are:

(1) To present a protocol for a systematic literature review on methods of structuring electronic health record (EHR) data and studying their impacts, thus laying basis for search and analysis of the empirical articles,
(2) To describe previous reviews published on the subject and retrieved during the search of bibliographic databases, and
(3) To present a summary, using the analytical framework proposed for this review, of the results of the reviews analysed for this paper.

In accordance to good research practices, we describe in this paper the stages and rationale of the study protocol developed and applied for the systematic review. We present and discuss the results of analysing earlier reviews on the subject identified through our search of bibliographic databases and we report on the current state of progress in our review of empirical studies, the final results of which will be offered in forthcoming publications.

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