

# Information Management in Distributed Healthcare Networks

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**Abstract.** Providing healthcare increasingly changes from isolated treatment episodes towards a continuous treatment process involving multiple healthcare professionals and various institutions. Information management plays a crucial role in this interdisciplinary process. By using information technology (IT) different goals are in the focus: To decrease overall costs for healthcare, to improve healthcare quality, and to consolidate patient-related information from different sources.

Consolidation of patient data is ultimately aimed at a lifetime patient record which serves as the basis for healthcare processes involving multiple healthcare professionals and different institutions. To enable seamless integration of various kinds of IT applications into a healthcare network, a commonly accepted framework is needed. Powerful standards and middleware technology are already at hand to develop a technical and syntactical infrastructure for such a framework. Yet, semantic heterogeneity is a limiting factor for system interoperability. Existing standards do support semantic interoperability of healthcare IT systems to some degree, but standards alone are not sufficient to support an evidence-based cooperative patient treatment process across organizational borders.

Medicine is a rapidly evolving scientific domain, and medical experts are developing and consenting new guidelines as new evidence occurs. Unfortunately, there is a gap between guideline development and guideline usage at the point of care. Medical treatment today is still characterized by a large diversity of different opinions and treatment plans. Medical pathways and reminder systems are an attempt to reduce the diversity in medical treatment and to bring evidence to the point of care. Developing such pathways, however, is primarily a process of achieving consensus between the participating healthcare professionals. IT support for pathways thus requires a responsive IT infrastructure enabling a demand-driven system evolution.

This article describes modern approaches for “integrated care” as well as the major challenges that are yet to be solved to adequately support distributed healthcare networks with IT services.

# 1 Introduction

Healthcare heavily depends on both information and knowledge. Thus, information management plays an important role in the patient treatment process. Numerous studies have demonstrated positive effects of the use of IT in healthcare. In particular, the preventability of adverse events in medicine has been in the focus of recent studies. Adverse events are defined as unintended injuries caused by medical management rather than the disease process [62]. It turned out that insufficient communication and missing information are among the major factors contributing to adverse events in medicine (cf. [9, 12, 13, 32, 64, 65]). IT has the potential to reduce the rate of adverse events by selectively providing accurate and timely information at the point of care (cf. [39]). Yet, there is a discrepancy between the potential and the actual usage of IT in healthcare. A recent IOM report even states that there is an “absence of real progress towards applying advances in information technology to improve administrative and clinical processes” [15]. To understand this discrepancy, both the potential of IT and the challenges to be solved should be seen.

One major challenge is certainly the increasingly distributed nature of the healthcare process. Healthcare changes from isolated treatment episodes towards a continuous treatment process involving multiple healthcare professionals and various institutions. This change imposes new demanding requirements for IT support. System integration and inter-institutional support of healthcare processes are needed [8]. Advanced concepts for data security must provide a solid basis for IT services.

IT support starts with electronic transmission of prescriptions, discharge letters and reports. Gathering such information is ultimately aimed at a lifetime patient record or “Electronic Health Record” (EHR), which is independent from specific healthcare facilities. The vision of a cooperative patient treatment process based on such a unified EHR involves the seamless integration of medical guidelines, pathways, telemedicine applications, and medical trials. The patient is expected to receive more and more responsibility and competence as she is provided with information from her patient record, and as she governs the use of her own healthcare data (patient empowerment).

One of the most frequently cited works in the context of healthcare telematics perspectives in Germany is a study by Roland Berger from 1997 [7]. It illustrates the vision of integrated care by exemplarily describing a hypothetical patient encounter:

“... The patient is called into the physicians consulting room. In agreement with the patient the physician views her EHR at his terminal. The EHR contains all previously collected reports from other physicians and other institutions. An automatic summary and evaluation of previous results is provided. Current literature on the patient’s problem and available guidelines are offered and can be accessed online. In addition, new medications and available services related to the patient’s case are selectively provided. The physicians system has been individually configured to ensure that he is only provided with relevant information he really wants to see. Based on the information contained in the EHR, the physician receives hints for suitable anamnesis questions. In any case, the physician can obtain additional information concerning differential diagnoses. By integrating different sources of information and knowledge from a world-wide healthcare