Incompatible Medical Record Systems: challenges in cross-boundary information access

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Abstract

We conducted a field study at a nephrology practice involving three distributed medical clinics, four independent hospitals, and twenty dialysis centers located throughout a Midwestern state in the US. The information systems used in these medical organizations vary, and are not connected. This position paper highlights the challenges and complexity of the information access across the distributed organizations during patient care.

Author Keywords

Team-based collaboration, Electronic Medical Record, information access, cross-boundary.

Introduction and Background

Accessing information from a myriad of sources – such as medical records, lab results, pharmacy systems, and physician dictation systems – is integral to medical care. Despite their respective benefits, a variety of communication challenges have been identified in both the analog and the digital medical record systems.

Traditionally, paper medical records are considered beneficial for their inexpensiveness, portability, familiar format, and flexibility to healthcare providers [2]. However, they can be overwhelming and complex [1]. In particular, paper medical records were often found to be illegible, misfiled, easily lost, inaccessible to the provider, or inaccurate [5].

Therefore, Electronic Medical Record (EMR) systems are increasingly being deployed in medical organizations, although the use of paper forms significantly increases after the introduction of an EMR [6]. As a result, many medical organizations continue to maintain a hybrid

environment in varying degrees, such as the double medical record systems used for achieving awareness and coordination in a Denmark hospital [3].

Yet, previous research mostly focused on the medical record system within a single organization, rather than multiple non-integrated medical record systems across organizations. To examine cross-boundary medical record systems, we conducted a field study in a local nephrology practice that offered a great opportunity to investigate the challenges faced by clinicians in the use of multiple, disconnected, and distributed medical record systems.

Nephrology is a branch of the medical sciences that encompass the diagnosis and treatment of kidney disease, chronic kidney disease (CKD), and hypertension. CKD affects 26 million Americans [4]. While nephrologists are the physicians responsible for the treatment and diagnosis of kidney disease, they also take care of those patients that may need renal replacement therapy or renal transplantation.

Kidney disease patients are required to have frequent laboratory work, vitals testing, and physical exams with their nephrologists in order to prevent related disease and/or slow down its progression.

In addition to handling clinic visits, nephrologists also take care of patients requiring renal replacement therapy. Hemodialysis patients receive outpatient treatment at a dialysis center. There are other patients who like home modalities of renal replacement therapy, including home hemodialysis or peritoneal dialysis. The nephrologists are required to follow their patients at an outpatient clinic at least once per month.

The nephrologists are also responsible for providing care to their patients, or to new patients in hospitals. Their expertise is called upon on a daily basis for the diagnosis and treatment of any kidney diseases, electrolyte abnormality, hypertension, renal replacement therapy, or renal transplantation. Therefore, it is not surprising that nephrologists need to access patient medical information residing in a number of different medical information systems across different medical settings.

Methodology

We conducted a field study in a multi-clinic, multi-hospital, multi-dialysis-center nephrology practice to investigate the complexity of the information access process, and the inherent challenges encountered in their team-based medical care.

Research Setting. Our study nephrology practice is operated by six nephrologists seeing patients in three medical clinics located in three different cities in the Midwestern US. The practice also attends to patients in four hospitals and twenty dialysis centers, geographically distributed in a number of cities within the same state.

Methods. Non-intrusive observations, contextual interviews, participant shadowing, and document reviews were conducted over thirteen-month period at the study sites. The collected data are being thematically analyzed by open coding, and flow diagramming is also being used to examine the use of both digital and paper medical record systems for achieving the collaborative work.

Participants. Participants included four nephrologists working in the practice, the office manager, three medical assistants, and twelve employees with various

Figure 1: Paper medical records at a clinic of the study practice.

roles, including three medical assistants, a medical record coordinator, the scheduler, and two billers.

Complexity and challenges of information access across distributed organizations

Information use in nephrology practices is inherently associated with a high degree of complexity due to the specific nature of the specialty. Each nephrologist is required to see patients attending different clinics, hospitals, and dialysis centers. These medical organizations have their own medical record systems that are not connected with each other, thus accessing information across organizations is often problematic.

Each hospital has its own EMR system that is not networked with the EMR system in the nephrology clinics. Likewise, the dialysis centers also use their own EMR system, which cannot be accessed from the nephrology clinics or the hospitals. Accessing information across the medical organizations is achieved by telephone or fax machine.

Parallel medical record systems in nephrology clinics
Both digital and paper (Figure 1) medical record systems are used in the three nephrology clinics. The two sets of records are kept in parallel as much as possible, a task performed manually by the medical assistants and individual nephrologists. Although they were not designed for such, the two systems serve different purposes in practice. Only paper charts are used during patient consultations, in which clinicians jot down brief notes in the patient chart for later documentation in the EMR (e.g., during breaks or at the end of the day). However, sometimes these notes may only be entered into the EMR weeks later. Thus, the EMR system primarily serves for record keeping, instead of real-time information access, and information capture during patient appointments. Although the EMR may be reviewed when needed, the unintentional inconsistency between the two record systems in practice often creates difficulties. For example, diagnostic results that are electronically accessible in a patient's EMR may not be available in the paper records used during patient consultations, which could negatively impact patient care, especially if the nephrologist is unaware of the test results, and the patient does not remind the nephrologist of the test.

In addition, since patients may choose any of the three medical clinics for follow up visits, the paper charts may need to be physically transported to another medical clinic prior to patient visits. Thus, it is not surprising that a patient's chart may not be available at the time of the visit, which is a common problem found in analog medical record systems. With the dual record systems used in the medical clinics, the nephrologists can potentially review the patient's EMR before conducting consultations. However, the consultation rooms in the medical clinics are not equipped with any computing devices for real-time EMR access.
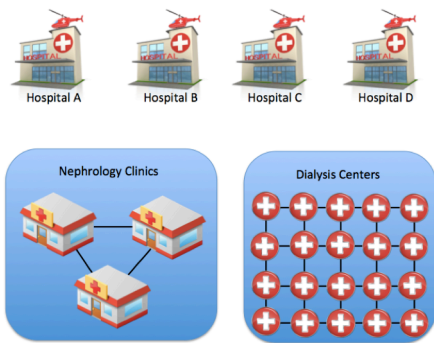
Figure 2: The key healthcare settings involved in the study nephrology practice where EMR access is not possible across settings. For the four hospitals, each uses a standalone EMR system. The three nephrology clinics use the same EMR system, in parallel with a paper medical record system that is used during patient visits. The twenty dialysis centers use the same EMR system.

Incompatible EMR systems in different settings

The four hospitals that the nephrology practice serves use different EMR systems, and none of them are networked with the EMR system in the nephrology clinics or dialysis centers (Figure 2). Therefore, challenges abound when the nephrologists must access information residing in another setting/organization. For example, when a nephrologist does patient rounding in a hospital and needs information for a patient attending a particular dialysis center, s/he will have to call the dialysis center for the necessary information. It would, however, be impossible if the dialysis center were closed. Alternatively, patients who have been hospitalized may not have their hospitalization records available when they make follow-up visits in the nephrology clinic. The lack of such information undoubtedly poses challenges in providing effective and efficient patient care.

Moreover, given the team-based nature of the practice, patients admitted to a hospital will be seen daily by an on-call nephrologist at the hospital. That means a patient may not be the on-call nephrologist's own patient. This makes it more necessary for the nephrologist to review the patient's medical records in the nephrology clinics. Therefore, the nephrologist may access the EMR system in the clinics using their mobile device or call the medical assistants to retrieve the needed information during clinic hours. Problems arise when the needed information is not available – for instance, when the clinic is closed – or has not been documented digitally in the EMR.

Similar challenges exist with the dialysis patients who are seen weekly by a nurse practitioner in their designated dialysis center, and monthly by a nephrologist. These patients may need to visit a nephrologist in the clinic or be admitted to a hospital when their medical condition entails. Since the dialysis centers keep their own medical records, which are not accessible from the clinics or the hospitals, such a disconnect creates barriers in the patient care, which could thus lead to adverse patient health outcomes.

Since the nephrologists work in all the different settings to see patients with different needs and schedules, the disconnect in the medical record systems pose varying challenges to the practitioners in the provision of adequate medical care.

Summary

This position paper presents preliminary results on the complexity and challenges of information access identified in a field study conducted in a multi-site, multi-system practice. More detailed results will be presented and discussed at the workshop.

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