Improving diabetes management with electronic medical records

M. Varroud-Vial

Department of Endocrinology, South Francilien Hospital, Corbeil-Essonnes, France

Abstract

Most primary-care physicians have adopted electronic medical records (EMRs) for the management of patients in ambulatory care. Observational trials suggest that the use of EMRs improves the achievement of the recommended standards of diabetes care and intermediate outcomes. A French group of general practitioners has shown, in a randomized controlled trial of diabetes care, the beneficial effects of a follow-up module integrated into an EMR. Electronic reminders, eHealth technology and e-mail messaging to patients integrated into the EMR have also been reported to have a beneficial effect on diabetes care. Some recommendations have been devised for the meaningful use of EMRs to improve the process and, possibly, intermediate outcomes of diabetes care as well. Another potential benefit to consider is the extraction and aggregation of data to create diabetes registers. Large regional and national diabetes registers have been set up in the US and Europe for various purposes, including patient recall, description of care patterns and outcomes, improvement of practices, drug safety, observational research and retrospective trials. In France, the government initiative towards an Internet-based personal health record (PHR) provides an appropriate framework for implementing and sharing the information needed to improve diabetes care, such as electronic summaries of health information, personalized health plans (PHPs), and standardized and structured hospital-discharge forms. All of these materials can be generated from EMRs. The widespread and optimized use of EMRs for diabetes care with links to the national diabetes register and the capacity to supply PHRs are major considerations. Achieving these goals requires a common initiative comprising primary-care and diabetes scientific societies in cooperation with diabetes patients' associations.

Keywords: Electronic medical record; Electronic reminders; eHealth technology; Diabetes register; Personal health record; Personalized health plan; Review

Résumé

Améliorer la prise en charge du diabète à l’aide du dossier médical électronique

La grande majorité des professionnels de santé exerçant en ambulatoire utilisent un dossier informatisé pour gérer la prise en charge de leurs patients. Plusieurs études observationnelles suggèrent que l’utilisation de ces dossiers améliore la prise en charge des patients diabétiques et les résultats intermédiaires de cette prise en charge. Une étude française contrôlée en soins primaires a montré que l’utilisation d’un tableau de bord de suivi intégré au logiciel médical améliorait les procédures de suivi des diabétiques. L’association de rappels électroniques et de certaines fonctionnalités Internet, dont l’envoi d’e-mail sécurisés aux patients, parait également améliorer cette prise en charge. Sur ces bases, des recommandations pour l’utilisation optimale de ces logiciels peuvent être formulées. Une autre potentialité de ces dossiers médicaux est de favoriser la constitution de registres informatisés par extraction automatisée de données: de grands registres régionaux et nationaux de diabétologie ont été établis aux États-Unis et en Europe, avec des fonctions de rappel des patients, d’évaluation et d’amélioration des pratiques de pharmaco-vigilance. Ces registres sont également utilisés pour réaliser des études observationnelles rétrospectives à grande échelle. En France la mise en place du Dossier Médical Personnel (DMP) pourrait être une opportunité de mettre à la disposition sécurisée des professionnels et des patients diabétiques des informations utiles à la prise en charge, tel un résumé médical de synthèse, des Plans Personnalisés de Santé et des compte-rendu hospitaliers structurés et standardisés. Tous ces éléments peuvent être issus d’un dossier médical informatisé. L’utilisation large et optimisée du dossier médical informatisé pour la prise en charge des diabétiques, en lien avec un registre national du diabète et approvisionnant le Dossier Médical Personnel sont des enjeux majeurs. Leur atteinte nécessite une initiative des sociétés savantes de diabétologie et de médecine générale, en lien avec les associations de patients diabétiques.

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Mots clés : Dossier médical informatisé ; Rappels informatiques ; Technologie Internet ; Registre du diabète ; Dossier Médical Personnel ; Plan personnalisé de santé ; Revue générale

Correspondence.
E-mail: m.varroud-vial@wanadoo.fr (M. Varroud-Vial).
1. Introduction

Health information technology is assumed to enable providers to improve quality of care and target interventions to patients, especially those with chronic conditions. For this reason, the use of electronic medical records (EMRs) has been encouraged in the management of diabetic patients according to the Saint-Vincent Declaration for quality assurance in diabetes in 1991. Since then, the widespread use of EMRs for the follow-up of patients has become a fact in all developed countries.

The present development and future perspectives of EMRs can be considered from several points of view: the provider’s point of view whereby such records are used daily at various points in the care and management of patients; the public healthcare point of view in which a concrete expression of their value is the national or regional registers established in several countries; and the patient’s point of view in which the current issue is the shared use of medical data by different health professionals.

2. Utilization of EMRs at the point of care

In France, hospital diabetes departments introduced electronic diabetes databases for inpatients as early as in 1985 [1]. Their goals were to structure the clinical management of diabetic patients, improve communication with general practitioners and promote regular quality-assurance processes. While hospitals with automated notes, records, order entry and clinical-decision support systems probably have fewer complications and lower costs [2], the true impact of these EMRs in French hospitals has not been evaluated.

In fact, most primary-care physicians have adopted EMRs for the management of patients in ambulatory care, which has made it possible to record patients’ demographics, histories, details of recent care and up-to-date problems, and active medication lists, as well as to prescribe medications. These functions have important implications for the management of chronic diseases such as diabetes. Indeed, several randomized trials of evidence-based electronic reminders integrated into EMRs have reported beneficial effects compared with the usual care, with increasing rates of recommended care for diabetes [3], but the impact of individual reminders is variable.

Reminders for annual cholesterol examinations, antiplatelet use and foot examinations have generally been reported to have significant positive effects [4,5], and electronic reminders are simple procedures to use. However, one caveat is that their efficiency appears to be less important than performance feedback and also appears to deteriorate with time [6].

Using a more global approach, a French group of 50 general practitioners recruited 2715 diabetic patients into a randomized controlled trial to test the effects of a follow-up module implemented through EMRs vs follow-up with only EMRs. The module was based on guidelines and generated an alarm if the recommended procedures were not recorded by the planned date. The adjusted difference between groups was statistically significant for recording body mass index (BMI), foot and fundus examinations, and electrocardiography, whereas there were no differences in HbA1c, lipid and microalbuminuria tests [7]. Other groups of physicians working in ‘multidisciplinary practices’ have adopted similar approaches to improve the quality and safety of diabetes care, including allowing access of all members of the care team (physicians, nurses, pharmacists) to EMRs [8]. Also, instead of using follow-up modules dedicated to a given disease, some teams have preferred to define and implement only key items in the EMR that have been selected according to the patient’s disease.

EMRs can incorporate a variety of decision-support facilities related to eHealth technologies, such as electronically returning the results of laboratory tests, archiving radiological reports and referrals, and accessing expert systems. E-mail messaging to patients also appears to be a meaningful use of the EMR: in a study of 35,423 patients with diabetes, hypertension or both, the use of secure patient-physician e-mails over a 2 month period was associated with a statistically significant improvement in effectiveness of care [9]. In addition, there is growing interest in giving patients a direct link to their EMRs via the Internet. One randomized controlled study of 244 patients allowed the pre-visit use of online personal health records (PHRs) linked to EMRs, enabling patients to author a “diabetes care plan” for electronic submission to their physician: although the intervention increased rates of diabetes-related medication adjustments, low rates of online patients’ registration limited the intervention’s impact on overall risk-factor control [10]. However, a review found little evidence that eHealth technologies integrated within EMRs had any positive impact on the quality and safety of care [11].

An observational study of 22,207 patients with diabetes compared clinical practices using EMRs with those using paper-based records, and examined the independent association of EMR use with achievement of quality standards of care. After adjusting for covariables, the achievement of composite standards for diabetes care was 35.1% higher at EMR vs paper-based sites (P<0.001), while the achievement of composite standards for intermediate outcomes [HbA1c<8%, blood pressure (BP)<140/80 mmHg, low-density lipoprotein (LDL) cholesterol <100 mg/dL or statin use, BMI<30 kg/m², non-smoker] was 15.2% higher (P = 0.005) [12].

Although resistance to change negatively affects physicians’ adoption of EMRs, there is widespread professional agreement over their use [13]. The main factors that influence the acceptance of EMR use by physicians are their user-friendliness, demonstrability of results, system compatibility with the practice and benefits for everyday practices [14].

To summarize, some recommendations can be drawn for the meaningful use of EMRs to improve the process and possibly the intermediate outcomes of diabetes care as well (Table 1). Another potential benefit to consider is the extraction and aggregation of data from EMRs to build diabetes registers.
The Veterans Health Administration (VHA) has developed a number of electronic medical records (EMRs) in diabetes care. These EMRs record patient demographic data, vital signs and medical history, maintaining active medication list and active medication allergy list, prescribing medication using a medical dictionary, recording smoking status, recording diabetes status and complications, maintaining an up-to-date list of current problems, incorporating laboratory test results as structured data, implementing and using electronic reminders, generating lists of patients to include in medical interventions, education or research, generating forms for patient recall and follow-up care, generating forms for other professional communications and information, providing patients with electronic access to their health information, implementing indicators for clinical-practice improvements, reporting clinical quality measures to insurance companies, and exporting data to diabetes registers.

3. Implementation of national and regional registers

Earlier registers served as central registers based on structured datasets completed on paper forms and laboratory reports. Examples of such registers are DREAM and DIALOG, which were established at a district level to establish the structured recall of patients [15], and to prompt an annual review of diabetes across both primary and secondary care [16]. Increases in the proportion of patients achieving the recommended processes of care and intermediate-outcome treatment targets were reported [17], but these benefits were achieved at the cost of having to make requests of specific staff members to enter these data, a cost that has limited the use of the data over time.

As a consequence, these registers evolved into electronic data exchanges involving EMRs and other databases, a transition that made it easier to identify benchmarks [18]: the first step involved describing the clinical practices and their temporal trends in large groups of patients, then evaluating the differences between recommendations and everyday practices and, finally, improving the quality of patients’ management. Some registers address specific topics: the Finnish Registry includes patients who underwent coronary revascularization. On comparing the pathways of diabetic patients leading to surgery between 1998 and 2007 with the pathways of patients without diabetes, it was found that fewer operations were performed during the first coronary heart disease (CHD) hospitalization of diabetic patients, and that they also experienced more emergency hospital admissions [19].

More recent datasets, such as the Swedish [20] and Danish [21] Diabetes National Registers, aim to gather data from all diabetic patients across the nation on a yearly basis. Data are collected from actual patients’ visits to primary healthcare and from those who attend hospital outpatients clinics. The Swedish register (1996–2011) includes 24 variables and covers up to 70% of the population with diabetes. The Veterans Health Administration (VHA) has developed a sophisticated electronic system of medical records combined with a quality measurement approach for the management of common chronic conditions. It has been suggested that this system is behind the better management of diabetic patients observed in the VHA compared with a nationwide sample of patients with diabetes [22]. Beginning in the early 1990s, Kaiser Permanente, the largest managed-care organization in the US, established the HealthConnect EMR platform, which has more than 8.6 million users, including physicians, nurses and pharmacists [23]; this was followed, in many community-health centres, by the development of shared and integrated EMR systems [24]. In the UK, a large national database of routine general practices, the General Practice Research Database (GPRD), was established in 1987 and contains data derived from the computerized records of around five million patients [25].

Besides their value for quality control and benchmarking, these databases have other potential functions (Table 2). For observational research in primary-care settings, cohorts including thousands of patients can be generated retrospectively and followed for 4 to 5 years. If necessary, data can be linked with other information issuing from insurance-company claims and hospital-discharge registers. Based on these databases, an increasing number of retrospective observational trials have been published in recent years. The question of the true value of these trials is still pending, however, because they are known to be subject to bias and confounding factors, and to have a potential for high rates of patients lost to follow-up. On the other hand, the sampled populations are representative of those seen in routine clinical practice, and clearly reflect the outcomes of treatments and management in “real-world” healthcare. Nevertheless, their results must be interpreted with caution and with respect to the characteristics of the selected populations.

In France, the implementation of these registers has been limited to a few localized experiences, such as diabetic patients treated with insulin pumps [32]. A few private databases have been supplied by volunteer primary-care physicians remunerated by free use of the EMRs, but they still provide only partial data on the management of patients and do not easily allow researchers to perform longitudinal trials. The ENTRED (Échantillon National Témoin Représentatif des Personnes Diabétiques; Representative National Sample of the Diabetic Population) study, which described the management of representative samples of diabetic patients in 2003 and 2007,

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relied mainly on French national health insurance claims, which has some limitations related to the estimation of outcomes and the effects of non-reimbursed medical procedures such as foot examinations [33]. In this case, it is likely that a link with a national register based on automatic extractions from EMRs would have improved the study’s results. In addition, it has been shown in the US that relying on insurance claims rather than on EMRs has the potential to underestimate the quality of care, particularly as regards cholesterol screening, influenza vaccination, nephropathy screening and HbA$_1c$ testing [34]; such underestimation is also likely to arise in France because many diabetic patients have a follow-up in public hospitals with no detailed reports of insurance claims.

All these facts suggest that creating the conditions allowing a National Diabetes Register to be set up in France is of primary importance. The first condition would be to ensure the gathering of data through simple electronic extraction from both primary- and secondary-care EMRs. The second condition would be to promote agreement concerning a scientific standard reference for assessing follow-ups and treatment performance; the annual review designed and tested by diabetes networks could provide the basis for such a consensus [35]. The third condition would be to determine which functions should be a priority for this register, as that would be a determining factor for the type of financial support needed.

4. Secure transmission and shared use of medical data: the PHR system

In France, the government initiative toward an Internet PHR system provides the appropriate framework for implementing and sharing the information needed to improve diabetes care. The objective of the PHR is to gather together all medical information to help in the management of patients and coordination of their care, and to provide secure access to this information. A central goal of the online PHR system is to provide patients with access to their health information to improve their interactions with healthcare professionals.

Towards these ends, structured documents can be stored in the PHR. Some of these documents can be generated from the EMR, with one of the most important of these being an electronic form of health information that summarizes the patient’s medical history, medication list, medication allergies, and all current and active diagnoses. This form should be made available to patients, physicians and hospital teams.

Another important stored document is the patient’s personalized health plan (PHP), which can be regularly updated by the general practitioner to deal with the patient’s current problems, with or without the help of a health network. The plan includes any scheduled medical, educational and social interventions, the names of the persons responsible for these interventions and the scheduled deadline for their implementation. The PHP can be sent to patients and healthcare professionals via secure e-mail messages. Standardized and structured hospital-discharge forms and instructions can also be sent to general practitioners through secure e-mails.

5. Conclusion

The modern application of information technology to medical records has the potential to improve the quality, safety and outcomes of diabetes care. The cornerstone of these improvements is the widespread use of EMRs in primary care, with appropriate features for the management of chronic diseases. These EMRs could also be linked to a national register to supply Internet-based PHRs with key information. Achieving these goals will require a common initiative among primary-care and diabetes scientific societies in cooperation with diabetes patients’ associations.

Conflicts of interest statement

The author has no conflict of interest to disclose regarding the subject of this paper.

References


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