Improving diabetes management with electronic health records and patients’ health records

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Abstract

The lack of patient engagement and clinical inertia both contribute to suboptimal diabetes care. However, both obstacles are amenable to informatics- and Internet-based interventions.

The use of electronic medical records (EMRs) is now established as being useful for improving diabetes care. Intelligent records that integrate computerized decision-support systems are now able to recommend care protocols tailored to risk levels. Web-based personal health record (PHR) systems, shared with healthcare providers, could also provide added value by promoting self-management of the behaviours related to diabetes. These Web-based programmes include patients’ access to EMRs, uploading of glucose monitoring results, a glucose diary, secure e-mail with providers, manual or automated feedback on blood glucose readings and other risk factors, an educational website, and an online diary for entering personal information on exercise, diet and medication. The integration of Web-based patients’ systems into the EMR used by physicians is the next frontier. In addition, the input from “smartphones” that are able to provide real-time support to patients could contribute to the reorganization of diabetes care.

Convincing data on HbA1c improvements with such systems are available for type 2 diabetes, but are still equivocal for type 1 diabetes. Obstacles include patients’ compliance with the technology, their ergonomic design and the need to reimburse providers for their care. Designing appropriate electronic tools and tailoring them to the conditions in France merits our attention.

Keywords: Diabetes care; Electronic health record; Patient health record; Internet; Web; Telemedicine; Review

Résumé

Améliorer la prise en charge du diabète à l’aide du dossier médical électronique et du dossier de santé tenu par le patient


Des données convaincantes sur l’HbA1c sont disponibles avec ces outils pour le diabète de type 2, elles sont encore équivoques pour le diabète de type 1. Les obstacles sont l’adhésion du patient à la technologie, l’ergonomie à parfaire, et la rétribution financière des soignants. La mise au point de tels outils adaptés au contexte français devrait être considérée avec attention.

Mots clés : Gestion du diabète ; Dossier médical informatisé ; Dossier de santé du patient ; Internet ; Web ; Télémédecine ; Revue générale

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1. Introduction

Despite the availability of international guidelines and major efforts towards improvements, the care of diabetic patients remains suboptimal. Two important barriers are the lack of patients’ engagement with therapeutic care plans (related to insufficient knowledge, motivation and decision-support help) and the lack of medication adjustment by physicians (related to clinical inertia) during clinical encounters. Both obstacles are believed to be amenable to informatics-based interventions and, especially, Internet-based strategies.

2. Electronic record-based clinical decision-support systems

From the physicians’ point of view, efforts have been made to allow electronic medical record (EMR) systems to provide adequate decision-making support for patients’ management. A recent survey conducted among 46 practices, involving 27,207 diabetic patients, established that the use of an electronic health record was associated with improved diabetes care compared with sites using paper records [1]. However, an appropriate computerized database cannot rely solely on basic features such as the collecting, managing and analyzing of information, and graphic representations of data. Instead, several reports have demonstrated that computerized decision-support systems integrated within the EMR can improve prescribing and quality of care. Indeed, some available systems can even provide patient-specific summaries and recommendations. The Joint Asia Diabetes Evaluation (JADE) Program is a Web-based programme incorporating a comprehensive risk engine, care protocols, and clinical-decision and self-management support to improve ambulatory diabetes care. Its risk engine predicts the 5 year probability of major clinical events based on parameters collected during annual assessments. Using risk stratification, the e-portal recommends a care protocol tailored to risk levels with decision support triggered by various risk factors. This e-portal also displays trends of risk-factor control at each visit to promote doctor-patient dialogues to empower both parties to make informed decisions [2].

3. Web-based shared systems for diabetes self-management

From the patients’ point of view, Web-based personal health record (PHR) systems, shared with healthcare providers, have been advocated as a means of improving diabetes care. A growing subset of PHRs has also opened up the possibility of engaging patients in their own care by promoting self-management of the complex behaviours related to their diabetes, such as glucose monitoring, insulin and other medication management, psychotherapy and social support, physical activity promotion and nutrition counselling.

The first such PHR systems introduced were Internet-based glucose monitoring systems (IBGMS). A Korean test conducted in patients with type 2 diabetes (T2D) demonstrated that the IBGMS, which provided frequent and responsive interactions between patients and their physicians online, was more effective than face-to-face diabetes follow-ups [3]. Long-term follow-up (30 months) also showed that IBGMS were superior to conventional care on HbA1c outcomes [4]. In addition, in a similar study, 104 T2D patients received a notebook computer, glucose and blood pressure monitoring devices, and access to a care management website. The website provided educational modules, accepted uploads from monitoring devices and had an internal messaging system for patients to communicate with their care manager. Significant improvements in HbA1c, blood pressure and lipid values were observed in the Web-based group over 12 months, with a correlation between a greater number of website data uploads and a greater decline in HbA1c [5].

There is now growing interest in the use of Web-based systems that allow patient-initiated glucometer uploads to facilitate treatment intensification by providers. The rationale for PHR development relies on the four key domains in Wagner’s chronic care model: self-management support for patients; delivery system design; clinical information systems; and clinical decision support. In patients who desire an active role in managing their own health and a collaborative relationship with their healthcare providers, this technology enables self-management support with online real-time delivery of automated, yet tailored, messages. Patients can access their information, input their data and receive support 24 h a day, as modern PHR systems are fitted with a virtual “coach” to provide individualized guidance and support according to available analyses and the patient’s characteristics. Empowering patients with essential information, online help in decision-making and communication support from their healthcare provider constitute the main rationale of these systems.

The main features of these Web-based programmes include patients’ access to EMRs, uploading of glucose monitoring results, a glucose diary, secure e-mail with providers, manual or automated feedback on blood glucose readings and other risk factors, an educational website, and an online diary for entering information on exercise, diet and medication.

Indeed, one of the first of such PHR approaches raised some interesting findings. Patients were enrolled in a diabetes care module that included access to their EMRs, secure e-mail with healthcare providers, ability to upload blood glucose readings, feedback on glucose readings, an educational website with endorsed content, and an interactive online diary for entering exercise, diet and medication. From a qualitative analysis of this pilot trial, six themes emerged: feeling that non-acute concerns are uniquely valued; enhanced sense of security regarding health and healthcare; frustration with unmet expectations; feeling more able to manage; valuing feedback; and difficulty fitting the programme into activities of daily life [6].
This Web-based programme was tested later in Seattle, WA, in a 12 month randomized trial of 83 T2D patients with baseline HbA1c ≥ 7%. This trial showed a 0.7% benefit in HbA1c levels in the Web group [7]. Interestingly, however, a similar trial run by the same team involving 77 type 1 diabetes (T1D) patients with baseline HbA1c at 8% failed to demonstrate the superiority of Web follow-up [8].

Nevertheless, two other similar Web-based diabetes management applications (MyCareTeam and ALR Technologies) were tested in Boston, MA, and Vancouver, Canada, in T2D patients, and showed significant improvements in HbA1c [9,10]. The latter system allows data to be presented in table and graph formats according to the time of day, and automatic calculations are done to show the average, standard deviation and range for the specific time period. The ALR system also allows the patient to input medications, set alarms, view a summary of readings and send messages to the endocrinologist, who then views the readings and sends the patient back some comments or recommendations. The endocrinologist’s feedback may include changes to insulin dosage, suggestions on testing frequency and compliments on the patient’s behaviour [10]. It is worth noting that patient–healthcare provider interactions and, in particular, those that are more personalized will increase the patient’s frequency of blood glucose monitoring [11].

At present, the trend is for PHR systems to extend their features beyond glucose-monitoring data management, and other clinical and biological data collection, to take full advantage of the technology in the field of education reinforcement. In the more recent systems, called “patient-oriented education management systems”, or POEMs, the patient’s educational materials, medication data and laboratory test results are reorganized in such a way that information is easily accessed on the Web by the patient or his relatives. These systems can provide reminders for the next face-to-face follow-up with e-mails and short messages via a cell phone. A randomized trial of 274 T2D patients with an 8 month follow-up showed that users of such a system had significant improvements in HbA1c and lipid values, with an average number of system log-ins of 8 per month [12].

When patients who were users of such Web portals were asked to rate the features they favoured the most, the top-ranking features were the online calculator for estimating blood glucose control (characterized as “very useful” by 74% of patients), appointment reminder systems (74%), e-mail access to the healthcare team (74%), personal tracking logs (69%) and online scheduling (69%) [13].

Most of the studies of diabetes patients’ health-record systems have been carried out in North America. However, a multicentre trial (TELEDIAB-3) testing a Web-based portal (MEOS) and allowing T1D patients to download glucose monitoring data, HbA1c results, secure e-mail access to the diabetes team, prescription renewal, and warning thresholds for glucose and HbA1c, is currently ongoing in France.

4. Integration of patients’ electronic health and healthcare records

The coexistence of two electronic information systems, one managed by the patient and the other by the healthcare provider, raises several practical issues. Few Web-based patients’ systems are linked directly to the EMRs used by physicians. The integration of both records into what some call the “patient Web portal” (PWP) has been associated with better patient outcomes in some reports. In one study, a diabetes-specific PHR that imports clinical and medication data, provides patient-tailored decision support and enables the patient to author a “diabetes care plan” for electronic submission to his physician prior to any upcoming appointments, was linked directly to the EMR system of a large academic medical centre (Partners HealthCare System, Boston, MA) via secure Internet access. This PWP, dubbed “Patient Gateway”, allows patients to interact directly with their EMR. In fact, a specific diabetes interface was designed to maximize patients’ engagement by importing their current clinical data in an educational format [14].

Other similar systems have also been reported. In one, at each patient visit, the system automatically downloads the patient’s medical services record, prescriptions, laboratory test results and patient educational materials, and organizes them into a series of case folders based on the patient’s medical service history in hospital. The system can also send patients reminders of when to return to hospital for further treatment under specified conditions, such as 1 week before an appointment or during the period of their HbA1c test if it is more than 3 months away, and make emergency calls if an anomaly in a laboratory result is found [15]. The University of Pittsburgh’s HealthTrak, based in the physician’s office, connects the patient, physician and EMR, and provides secure electronic communication with the physician’s office, along with preventative healthcare reminders and disease-specific tools and information, as well as remote access to laboratory test results [16].

5. Conclusion

Electronic health-record technology using Internet-based strategies is believed to improve diabetes patient outcomes through enhanced education and patient support, and reduced clinical inertia on the part of the healthcare provider. So far, however, no HbA1c improvement with such an approach has been reported in large series of T1D patients. It appears that such improvement is more likely to occur in T2D patients. Major obstacles to the wider implementation of these technologies include patients’ computer skills, compliance with the technology, their structural and technical design, and the need to reimburse providers for their care. However, integration of the records of both patients and healthcare providers, as well as the input of mobile smartphone tools, such as providing real-time support to patients, may bring a new paradigm of the way diabetes care is organized and
delivered in the near future. The convergence of all these electronic tools involving various healthcare professionals is also likely to be critical for the success of telemedicine in the field of diabetes. Finally, the data appear to be sufficiently convincing to call for the use of both EMRs and PHRs for diabetes care in France.

Conflicts of interest statement

The author declares having perceived some fees from Sanofi for his participation to a scientific board dedicated to new technologies and telemedicine.

References