Conference paper

Information systems and the electronic health record in primary health care

Milica Katić MD PhD
Associate Professor
Dragan Soldo MD
Research Fellow
Zlata Ozvačić MD
Research Fellow
Sanja Blažeković-Milaković MD PhD
Senior Lecturer
Mladenka Vrčić-Keglević MD PhD
Assistant Professor
Biserka Bergman-Marković MD PhD
Assistant Professor
Hrvoje Tiljak MD PhD
Assistant Professor
Djurdjica Lazić MD MSc
Lecturer
Venija Cerovečki Nekić MD
Lecturer
Goranka Petriček MD
Research Fellow

Department of Family Medicine, Andrija Stampar School of Public Health, University of Zagreb, Croatia

ABSTRACT

The implementation of information systems into primary health care opened the possibilities of providing integrated and co-ordinated health care, improved in quality and focused on the healthcare user. The healthcare system, researchers, physicians, and patients have recognised the benefits offered by informatics, but also raised questions that have yet to be answered.

Keywords: computers, electronic health record, medical informatics, primary care
Introduction

Advances in technology have allowed implementation of information systems into the healthcare system, opening a number of possibilities in providing integrated and co-ordinated health care, improved in quality and focused on the healthcare user. The greatest benefit offered by an integrated information system is reflected in the rationalisation of healthcare costs provided by insurers, and using the collected data in the system management and the creation of health policy.

The implementation of modern technologies raises the question of data availability and protection. The problem has been recognised not only by the representatives of the medical profession, but also by healthcare users. Complex technological solutions have been developed, offering several levels of data protection; however, it has not been fully clarified yet whether these solutions completely eliminate the possibility of data abuse.

The application of informatics to primary health care (PHC) and the implementation of electronic health records (EHRs) offers the possibility of establishing an enormous research database, which might encourage physicians to analyse their own professional performance, but would also enable global investigations aimed at improving patient-oriented care, healthcare system functioning and rational management of health resources.

The EHR and the healthcare system

The main reasons for the implementation of the EHR in the PHC setting are: improvement in quality of patient-oriented care; rationalisation of healthcare service consumption; and improvement in the effectiveness of system management and adaptability. Improvement of patient-oriented care can occur on several levels. Firstly, information systems relieve both physicians and nurses of a number of administrative obligations, subsequently allowing them to spend more time with their patients. Data concerning physicians’ work, such as data on the number of prescriptions issued and referrals made, prescription drug expenditure, expenditure related to a particular patient group, the number of preventive health checks, and so on, are easily accessible at the point of care, establishing solid grounds for improving professional performance and quality of the health care provided.

Systems of this kind offer a number of possibilities regarding healthcare improvement, such as the integration of preventive care into a series of messages warning the physician of the need for carrying out preventive health checks, or the launch of programs that help physicians in making clinical decisions. Unfortunately, the applications used in PHC in the Republic of Croatia still do not offer these functionalities.

In addition, the quality of health care is substantially affected by the possibility of implementing various guidelines on particular clinical conditions, as well as aiding physicians in prescribing medications and avoiding undesirable interactions, or providing warnings of drug allergies. In the applications used in the PHC offices situated across Croatia, these possibilities are still not exploited to a satisfactory level. One of the most important options offered by all applications currently in use in PHC in the Republic of Croatia is round-the-clock (24 hours) active connection to the internet, which has proved useful in patient-oriented care; a physician in doubt may easily access the information required. To take advantage of these functionalities, and to improve the quality of health care, it is necessary to provide ongoing education on informatics targeted at physicians.

When it comes to rationalising healthcare expenditure, the EHR offers a substantial reduction in administrative costs. Moreover, collection of routine data and preparation of various reports requires no additional resources. In some countries, monitoring of drug prescriptions, promotion of cheap generic drugs, and compliance with the guidelines for laboratory diagnostics, have led to a substantial reduction in expenditure. Furthermore, research on the EHR revealed it to be of maximal efficiency with preventive activities undertaken in PHC; from a long-term perspective, this will lead to a substantial reduction in overall expenditure on medical care.

EHR applications observed in the Republic of Croatia are primarily oriented towards administrative improvements, and less towards those in patient-oriented care.

The EHR brings a revolution in healthcare system management if it is adapted to the needs of that system, since all the data of relevance for the decision-making process would ideally be available at the point of care. Compared with previous ways of working, this represents a huge step forward, cutting out the administrative delays in presenting data of relevance to the establishment of health policy. As part of the project aimed at computerising the PHC system (IPHCS) in the Republic of Croatia, data collected within the central information system were intended to be used to establish connections between all parts of the system (physicians’ offices, the Ministry, the Croatian Institute of Health Insurance [CIHI], and the Croatian Institute of Public Health [CIPH]) of relevance for...
The EHR and data protection

The implementation of modern technologies into clinical medicine has raised a number of questions regarding the protection of data from unauthorised access. The position taken by the profession is that the physicians engaged within primary care should be the only ones able to gain a complete insight into the EHRs of their patients and to use them for analyses and evaluations. As for the physical protection of electronic data and the use of novel internet-based technologies, as well as the application of high-level security standards, we can freely claim that electronic data are far better protected than paper records, especially in cases of theft, fire, and natural catastrophe. Because of the clear need for data protection within the realm of healthcare planning, and ensuring the continuation of the computerisation of healthcare systems in modern states, the highest-level standards of data quality and security have been employed.

As part of the IPHCS project in the Republic of Croatia in 2002, the solution for the central information system was entrusted to the Ericsson Nikola Tesla company, while contracts to provide applications for the PHC offices were awarded to five additional companies (ABA Informatics, AME Consortium, IPT, IN2, and MCS Group). All data entered in an electronic form are coded and filed into the central information system via the internet; therefore, these data are protected from theft and the consequences of local device failure. In order to be able to access the software, each healthcare professional has a Smart Card protected by a personal identification number (PIN), which allows him/her to prove his/her identity, code the data, and put an electronic signature on medical records. An additional method of protecting the confidentiality of the data entrusted to the system is an access authorisation issued for each user; each of the users is assigned strictly-defined privileges to access specific parts of the electronic data entry system.

The entire IPHCS project is based on Health Level 7 (HL7), which represents an assembly of the most influential and advanced standards and norms applicable to medical informatics. However, it is important to emphasise that the system currently lacks a definition of EHR data to which the CIHI and the CIPH are entitled, as well as a description of the manner in which the data in the Chronic Patients’ Registry are protected. In order to ensure patient protection, data to be communicated to the CIHI should be restricted to those on the patient’s age and gender, and the procedures listed in the part of the EHR referring to preventive and curative activities undertaken, while the CIPH should be entitled solely to data on the patient’s age, gender, and established diagnoses, subsequently used for regular morbidity tracking. Therefore, apart from existing laws and regulations applicable to the computerisation of health care, there is a need to enact clearly-defined regulations stipulating the rules for accessing the patient’s EHR, and the access levels that can be permitted to parties other than the elected PHC physician.

The EHR and physicians

The possibility offered by the EHR of integrating information on the patient is of utmost importance for general practitioners (GPs). At the same time, the increased availability of data has made the issue of protection from unauthorised access more important. According to experience gained so far, the persons entitled to access the data, and the rules to be obeyed, should be clearly defined. Access to the entire EHR should be allowed only to the professionals engaged within the primary care setting, that is GPs, paediatricians, gynaecologists, school medicine practitioners and dentists. The content of EHRs created by professionals of different backgrounds should be generally uniform, but still partly different, in relation to specific needs of the users and patients. Adequate patient-oriented care requires keeping a record with data on age, gender, drugs taken by the patient, drug-induced allergies, vaccinations and a list of medical issues coded by the International Classification of Diseases (ICD), which should be available to all treating physicians. These selected data should be stored on a mobile Smart Card and carried around by the patient at all times, with the confidentiality of overall data collected on the patient not being compromised.

A substantial change introduced by the EHR is coding of the data. Although certain difficulties related to data coding procedure have emerged, it has been demonstrated to be sufficiently accurate and acceptable for the purpose of reporting on disease prevalence, drug prescription and referrals. At the current developmental stage of information systems and data management, there is no satisfactory alternative to data coding. On the other hand, as regards the continuum of patient-oriented care, entries in the form of free text better reflect the complex content of consultations taking place in the general practice setting. The quality of coding may be improved by educating the physicians; however, the EHR must also...
offer some room for free text entries, which serve as a powerful reminder used by the physician, and are important in providing quality continuous health care.1,25–27

Unlike GPs in other European countries, GPs in Croatia are already bound by an obligation to communicate morbidity data coded by the ICD to the CIHI, and process-of-care data classified according to the specification in the List of Diagnostic and Therapeutic Procedures (that is, the ‘Blue Book’), to the CIPH.28 Such a method of dual data recording carries a number of disadvantages and is deemed inappropriate for primary care purposes. The new data standard selected to be used with the information systems employed in PHC in the Republic of Croatia is the International Classification of Primary Care (ICPC), which offers a possibility of using unique codes to report on the reason for encounter, morbidity and medical procedure.28,29

According to the currently-enforced Croatian model of information and communication technology, all data originating from primary care are available to state institutions included in the healthcare system.12 Viewed from the data protection standpoint, this cannot be deemed acceptable.8,9 Data to be communicated to the CIIPH for the purpose of morbidity registration should be limited to those on the patient’s age, gender and established diagnoses. Likewise, data to be communicated to the CIHI should be limited to those on patient’s age and gender, and the list of undertaken procedures registered in the preventive and curative part of the EHR. In order to be able to use these data for expert and scientific purposes, PHC physicians should be entitled access to summarised data collected by the CIHI and the CIPH at the local community level (that is, the area covered by each health centre).

The EHR and patients

The implementation of computerisation has raised the issue of adoption of computer technology by primary care users, as well as that of the potential impact of these technologies on the physician–patient relationship. Early studies indicated that patients were troubled by data protection issues and the possibility of patient depersonalisation.3,5 Further investigations have demonstrated that the use of computers did not result in the reduction of patient satisfaction as regards the physician taking an interest in the patient’s psychological, emotional and social issues, and did not have a negative impact on the physician’s active listening.30–32 On this point, the level of computing skills acquired by the physician played a critical role.32 Patients recognised numerous advantages of the implementation of information systems in primary care, and perceived the physicians who used computers in their everyday practice as up-to-date professionals, likely to apply contemporary ideas also within the frame of diagnostics and therapy.4,6

At the same time, patients expressed their worries about the security of personal data which might, due to their availability to a number of employees working within the system, be abused by insurance companies or employers, or be discussed among undesirable parties, or even worse, be used in blackmail. This is especially a concern about data on delicate matters such as the existence of mental diseases, HIV infections, and so forth.6 Such a perception might affect the truth of data reporting and the level of confidence each patient has towards his/her treating physician.3,4,6 Pringle concluded that patients should be provided with guarantees on the protection of their personal data, otherwise, patient’s distrust would have a negative impact on the healthcare process and compromise the benefits gained by the computerisation of a healthcare system.2 The GP should be the only person entitled to gain access to the entire EHR, while authorisation for other parties involved in the system should be strictly limited to the data required for defined purposes and released upon patient’s consent, or based on the provisions of the applicable laws and regulations.3

The EHR and research in PHC settings

The computerisation of the primary care setting and the implementation of the EHR offer the availability of an enormous database, which could only have been established earlier by labour-intensive extraction of raw data from patients’ medical records. On that account, research-related costs have been substantially reduced. The information system can be exploited for numerous scientific and expert studies, which may potentially lead to significant improvement in performance of the physicians involved in PHC, and encourage them to conduct their own research. A high-quality database allows for the conduct of a series of investigations aimed at improving patient-oriented care, the functioning of the system and rational health resource management. The advantage offered by the EHR is its interactivity and the fact that all the information can be found at the point of care.11 Due to the organisation of primary care, and delays in administration of the data, researchers involved in primary care are in a far less favourable position than their counterparts involved in basic sciences or hospital
work. The advantages of computerisation exploited within the frame of research conducted in PHC reflects also in the fact that, apart from being able to access the information gathered at a local and national level, researchers are offered a possibility of establishing both regional and international collaboration and publishing their contributions in prestigious journals, which is of great importance for the academic advancement of young researchers. Such large national databases in primary care are capable of meeting the needs of large scientific projects supported by the Ministry of Health and Social Welfare, or the Ministry of Science, Education and Sports. Despite all the advantages emerging from the use of large databases exploited in a variety of investigations, the quality of the data obtained is sometimes hard to verify; therefore, while entering data into the EHR, strictly-defined standards should be observed. Unfortunately, the applications for primary care EHRs established in Croatia are more administration-oriented and targeted towards the reduction of expenditure rather than research purposes.

Conclusions

The implementation of information systems into PHC opened the possibilities of providing integrated and co-ordinated health care, improved in quality and focused on the healthcare user. At the same time, physicians and other professionals in the healthcare system have to deal with issues concerning data access and protection. The standpoint taken by the medical profession is that only the physicians involved in primary care should be entitled to have complete access to patient data in the EHR, and to use them for the analysis of their own professional performance and for research. Access to the data collected at the local and state level is of utmost importance, since it allows researchers in primary care to initiate state-level research projects and young researchers to advance their academic careers. In this context, the critical issue to be covered is the protection of data confidentiality, which can be accomplished by authorisation of access (the Smart Card and the PIN), and the authorisation of the user’s identity.

Adequate patient-oriented care requires accessibility of data on the identity, age and gender of the patient, as well as on his/her allergies, vaccinations, list of medical issues (chronic diseases, health risks, important past acute diseases, surgeries performed, and so forth) to other physicians engaged within health care. The implementation of an EHR offers access to an enormous research database; however, applications used in the office setting should be adjusted to meet researchers’ needs. At present, ICD coding is mandatory in Croatia; some of the applications have the possibility of ICPC coding, but it is not yet in use, since it is not permitted by CIHI and because most of the GPs are not familiar with it. Adequate organisation and the application of standardised norms open the possibility of conducting global research aimed at improving patient-oriented care, functioning of the healthcare system and rational management of healthcare resources. For such purposes an international coding system such as SNOMED-CT should be considered in the future.

In addition to existing laws and regulations applicable to computerisation of health care, it is mandatory to adopt strictly-defined rules which are to be obeyed when accessing the patient’s EHR, as well as rules stipulating the access levels to be granted to parties other than the primary care physician involved in health care. It should be particularly emphasised that the CIHI and the CIPH should be entitled only to a strictly-defined and very limited access to patient data, since the abuse of such data and breaches of confidentiality as regards patients’ identities may have a profoundly negative impact on the entire system.

An integrated information system designed to meet the requirements of the research community, and the highest ethical standards, as well as the recommendations and requirements of the medical profession, allows for the rationalisation of healthcare expenditure and use of the collected data in system management and the creation of health policy.

REFERENCES

10 Sujansky WV. The benefits and challenges of an electronic medical record: much more than a ‘word-processed’


