Improving continuity of care through the use of electronic records: a South African perspective

Mostert-Phipps N, NDip (IT), BTech (IT) (PET), MTech (IT), PGCHE, PhD (NMMU), Lecturer
Pottas D, BSc, BSc (Hons) (PU for CHE), MSc, PhD (RAU), Director of School
Korpela M, MSc (Engineering), DTech (Information Systems) (HUT), Honorary Professor
Institute for ICT Advancement, School of ICT, Faculty of Engineering, The Built Environment, and Information Technology Nelson Mandela Metropolitan University
Correspondence to: Nicky Mostert-Phipps, e-mail: nicky.mostert@nmmu.ac.za
Keywords: continuity of care, personal health records, electronic medical records, electronic health records, medical records

Abstract

The fragmented nature of modern healthcare provision makes it increasingly difficult to achieve continuity of care. As a result, strong emphasis is placed on the informational dimension of continuity of care. The importance of keeping medical records is noted. Paper-based methods of recordkeeping are inadequate with regard to supporting informational continuity of care. This has led to increased interest in electronic recordkeeping methods. This article describes the role that various electronic records, such as personal health records (PHRs), electronic medical records (EMRs) and electronic health records (EHRs), could play in improving informational continuity of care. A scalable approach, based on the adoption of standards-based PHRs and EMRs, with a standards-based health information exchange to enable the exchange of health information, is recommended for the South African healthcare sector. The possible impact of the envisaged National Health Insurance (NHI) on current, mostly paper-based recordkeeping systems, is also discussed. It is suggested that a start to the implementation of electronic records, is made at primary healthcare level. This is because the NHI will call on primary healthcare providers to act as gatekeepers to other levels of care. By ensuring that the bulk of patients' health records are stored in electronic format, it would then be possible to exchange health information with other healthcare providers once they also adopted electronic records at a later stage.

Ⓟ **Peer reviewed. (Submitted: 2011-08-14. Accepted: 2011-11-15.)** **S Afr Fam Pract 2012;54(4):326-331**

Introduction

In the past, continuity of care was predominantly based on the interpersonal relationship between a patient and a single healthcare provider, who would care for the patient for most of his or her life. Because of the fragmented nature of modern healthcare provision, it is highly unlikely that the same provider will provide a patient with care from the cradle to the grave.[1-2] Greater specialisation means that a patient is able to receive care from several doctors, specialists, pharmacists, dietitians, occupational therapists, and social workers.[3] To ensure that patients still receive efficient, high-quality care, it is increasingly necessary for the various healthcare providers to exchange patient data to one another.[4] As a result, it is important to look beyond the interpersonal dimension of continuity of care to ensure that some level of continuity is still achieved.

According to Saultz, continuity of care can best be defined as "a hierarchical concept, ranging from the basic availability of information about the patient's past, to a complex interpersonal relationship between physician and patient, characterised by trust and a sense of responsibility".[4] To ensure continuity of care between different healthcare providers in a fragmented healthcare system, it is necessary to focus on the informational dimension of continuity of care, which means that a strong emphasis is placed medical records continuity.[5]

While the primary purpose of a medical record is to support patient care, and to act as an *aide-memoire* for the healthcare professional treating the patient, secondary purposes include the following:[6-8]

- Communication with other healthcare providers who care for the patient
- Medico-legal purposes
- Quality-assurance activities
- Management and planning of healthcare facilities and services
- Resource allocation
- Performance monitoring
- Epidemiology
- Production of healthcare statistics

- Clinical auditing
- Medical research.

Medical records are generally loosely structured, handwritten documents used to record relevant medical information and facts about a patient. Despite rough guidelines on imposing some structure to these paper-based records, there are no rules that govern the organisation of these records, and typically, they vary in content by speciality.[9-10] These records are generally a combination of notes, test results and referral letters, bundled together in a folder with the patient's identification data on the cover.[8,11]

Chamisa and Zulu[9] conducted a study on the quality of medical records in a surgical department at a South African hospital, and concluded that "medical records are grossly inadequate in many respects", and that there is no reason to suspect that the problems that they encountered are not widespread in other surgical services that are offered throughout the country. Many of the problems associated with the quality of medical records can be traced back to the paper-based nature of these records.[12] Increased workloads make it increasingly difficult to use paper-based patient record systems efficiently, and this may contribute to human errors and a lack of documentation.

While paper-based patient records were adequate in the past, they are not sufficient in the modern healthcare setting.[13] According to Mitchell, a few problems associated with manual paper-based patient records include the failure of healthcare providers to facilitate adequate follow-up for patients with chronic diseases, failure to prevent avoidable drug interactions, and inadequate provision of notes for litigation.[14] Paper-based records also aggravate the gap between what a healthcare provider actually knows about a patient, and what he or she should know about a patient, in order to make the correct diagnosis to provide the right treatment.[15] When a patient is referred between healthcare providers, often the referral letter does not contain adequate information, and discharge letters are either not sent at all, or not received in time for primary healthcare providers to provide informed follow-up care.[16-18] To maintain continuity of care, all healthcare providers caring for a patient should have relevant information that relates to that patient's diagnosis, progress, and management plan, when needed.[17,19]

It has been suggested that electronic records could play a role in improving informational continuity and quality of care, by ensuring that up-to-date information about a patient is available at the point of care when needed.[15,16,20-22] However, in South Africa, healthcare providers have rarely adopted the necessary technology that will enable them to store patient medical records electronically.[23] While various forms of information and communication technologies are used to perform financial and administrative functions, such as billing, the majority of South African healthcare providers still use paper-based methods to keep patients' medical records. Some providers have benefited from the advantages of electronic recordkeeping. A South African provider has cited the problems associated with the high volume of paper-based records, and the inability to monitor chronic conditions appropriately, as motivating factors for his move to an electronic medical record (EMR) system.[24]

While various barriers need to be addressed to encourage the adoption and meaningful use of electronic records, it is also necessary to create awareness and a deeper understanding of the value that technology, such as electronic records, could have in the South African healthcare sector. In this article, various forms of electronic records, and the role that they could play in improving informational continuity of care, are explored. The ways in which electronic records could be employed to improve informational continuity of care are explored, with a view to recommending a workable approach for the South African healthcare sector.

This article is based on a literature review that identified various types of electronic records that could be employed to improve continuity of care in the South African healthcare setting. Through argumentation, a technological model that employs several of these electronic record systems, and that is cognisant of the South African healthcare setting, was developed.

Electronic records

There are various types of electronic records, such as personal health records (PHRs), EMRs and electronic health records (EHRs). These records are explained in the following sections, and incorporated into a proposed standards-based approach to improve informational continuity of care.

Personal health records

A PHR is an electronic record that contains health-related information about an individual, for example, the patient, and has been gathered from many sources.[25] PHRs are typically owned, created, and managed by individuals, and provide a lifelong summary of all of their health information, in one convenient place.

Individuals keep their own PHRs. Various online tools are available that allow them to create and manage their PHRs. Typically, a PHR should contain information on past and current illnesses, allergies, immunisations, medication, procedures and tests results.[25-26] This is particularly useful for individuals who need to manage chronic conditions, such as diabetes and hypertension, or diseases such as

cancer, tuberculosis or human immunodeficiency virus/acquired immune deficiency syndrome.[27]

Electronic medical records

EMRs are electronic versions of the paper-based patient records created in most healthcare provider settings. Typically, they contain detailed encounter information, including encounter summaries, medical histories, and details of allergies.[28-29] EMRs are owned, created, gathered, managed and consulted by healthcare providers from a single organisation.[30] EMRs may also offer additional functionality, such as order entry, results management and decision support.[28]

Electronic health records

An EHR is a longitudinal collection of health information about an individual that has been aggregated from various data sources.[31] An EHR can ensure that a complete health record is available to an authorised healthcare provider at the point of care when needed. This record may contain information from various providers, such as family physicians, specialists, social workers, pharmacists, radiologists, dieticians, physiotherapists and nurses.[28] An EHR relies on the availability of standards-based EMRs to support the information exchange between healthcare providers. Therefore, the adoption of EMRs is an important step towards realising the EHR vision.[29-30,32-34]

In the next section, the role that PHRs, EMRs and EHRs could play in improving informational continuity of care is explained.

Improving informational continuity of care

Figure 1 illustrates a technological model that implements EMRs and PHRs, in order to promote informational continuity of care in the South African healthcare setting.

The model is based on a standards-based health information exchange (HIE) to ensure the successful electronic exchange of health information between the various components of the proposed model. Where appropriate and authorised, an HIE provides the capability and associated systems to securely and effectively exchange health information electronically between various stakeholders.[35-37] These stakeholders could include patients, the primary provider, other providers, pharmacies, laboratories, radiology facilities, medical aids, and government departments. The primary data source for the standards-based HIE, represented in the model above, is information from various healthcare providers' standards-based EMR systems. A secondary, and optional, data source to the standards-based HIE, is information from an individual's standards-based PHR.

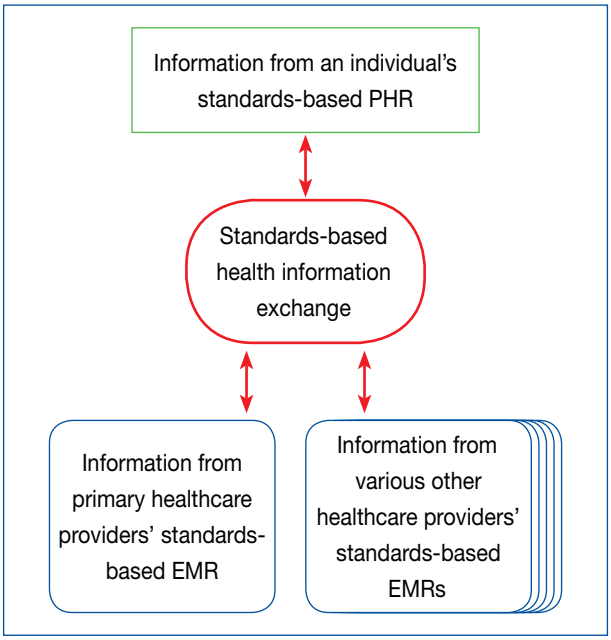

Figure 1: Technological model to improve informational continuity of care in the South African healthcare setting

The EMR contains the patient information that is kept electronically by a single provider, such as a clinic, hospital, or general practitioner.[32,38-39] Pathology, radiology or laboratory test results can be uploaded into the EMR, if the functionality is available. If healthcare providers make use of EMRs instead of paper-based patient records, the EMRs from various healthcare providers can act as data sources for the HIE. Data exchange in an HIE can occur in one of two ways: data can be pushed to the HIE, or pulled from the HIE.[40-44] When data are pushed to the HIE, transmission is initiated solely by the sender. When pulling data from the HIE, the recipient solicits data from one, or more, sources, and in turn, receives the data.

An example of pushing data to an HIE is when a general practitioner (GP) refers a patient to a specialist, and then pushes relevant data from the patient's medical record in his or her EMR system, to that of the specialist. This will ensure that the specialist has relevant data about the patient to hand, when he or she sees the patient for the first time. Another example is when blood test results for a patient are pushed from the pathologist's laboratory to the patient's medical record in the GP's EMR system.

An example of pulling data from an HIE, is when a specialist sees a patient for the first time and realises that more detailed information about the patient is needed, in order to deliver appropriate care. The specialist will request data from the patient's GP through the HIE, and once the data are released, it can be pulled into the patient's medical record in the specialist's EMR system.

Providers are not the only ones to make use of EMR systems, and to benefit from the push-pull technology employed by HIEs.[40,43,45] An HIE can also make a web-based portal available for a provider to search for information on a certain patient, and print, e-mail, or fax it. Pushing information can also take place by printing, e-mailing or faxing the information, when an EMR system is not in use.

Information will only be securely pushed and pulled between stakeholders in instances when it is appropriate and authorised.

In addition to the important role that EMRs play in improving informational continuity of care, PHRs can also make a significant contribution. PHRs can aid in improving informational continuity of care by enabling patients to provide their healthcare provider with a detailed summary of their medical history from their PHR, as well as providing their healthcare provider with often-missing information, for example, the medication that they are actually taking.[27] Data from PHRs can be uploaded to a provider's EMR, and vice versa. Despite the failure of some PHR offerings, such as Google Health, there is still a belief that PHRs can play a valuable role, especially with the continued development of mobile health tools, and the concept of feeding data from various EMRs into a PHR.[46-48] By populating an individual's PHRs from his or her various healthcare providers' EMRs, the ability of the PHR to provide a reliable and accurate reflection of the individual's health history is ensured.

Once National Health Insurance (NHI) is implemented in South Africa, primary healthcare services will be re-engineered to focus mainly on health promotion and preventative care.[49] PHRs can play a significant role in achieving these goals, by enabling patients to better manage their care.[50] PHRs could be utilised to further educate patients about their medical conditions, improve adherence to medical and lifestyle changes, and engage patients in medical decision-making. These features of a PHR are particularly valuable to patients who need to manage chronic conditions.[51]

While EMRs were included in the model, EHRs were excluded. There are various reasons for doing this. The first relates to the fact that EHRs rely on the existence of EMRs to function, and as EMR adoption is currently low in the South African healthcare landscape, EHRs are not viable currently. While EHRs could prove to be valuable in the long term, standards-based interoperable EMRs are a viable solution to the immediate need to improve informational continuity of care in the South African healthcare setting.[51] It has also been shown that HIEs that allow stakeholders to maintain control over their own EMR, are more successful than HIEs that rely on centralised government databases, such as EHRs.[52] As long as these distributed EMRs are based on relevant standards, healthcare providers who have adopted EMRs, would still be able to exchange data through the HIE. While the model currently excludes EHRs, the model does support the future adoption of EHRs through the standards-based nature of the proposed components. EHRs ensure that aggregated data from various sources are always available, without having to rely on the push-pull technologies described above, to obtain relevant data at the point of care. While push-pull technologies are still used to populate the EHR, the EHR typically contains up-to-date patient information that is conveniently available from one central system at all times.

Despite the benefits associated with electronic records, much of the South African healthcare sector still relies on paper-based patient records, leading to extreme data fragmentation.[12] In the next section, the importance of improved informational continuity, through the adoption of electronic records by the South African healthcare sector, is discussed.

Informational continuity in the South African healthcare sector

In 2006, a study into the attitudes of South African patients towards using paper-based and electronic records was developed by Accenture, and executed by AC Nielsen.[12] The findings of the Accenture study clearly indicated that South Africans view electronic records as a more reliable alternative to traditional paper-based medical records. Some of the results of the Accenture study are described in the paragraph below.

The problems associated with inadequate informational continuity of care were highlighted by the Accenture study, in which 51% of respondents indicated that they had to recount their medical histories repeatedly when visiting different healthcare providers. Apart from the time wasted, the fact that many patients are unable to recount their full medical histories accurately, and in sufficient detail, is a major problem.

According to the Accenture study, South African patients see electronic records as a solution to many of the problems associated with paper-based health records. Interestingly, 50% of respondents with medical aid indicated that they would be willing to pay between R20-100 extra per month to have their health records maintained electronically. Concerns relating to the use of paper-based health records included the issue of privacy and confidentiality, and a healthcare provider not having vital medical information available at the point of care. The overall perception among South African patients is that electronic records would improve the quality of health care that they receive. The

results of the Accenture study demonstrate the importance of finding a solution to the problems associated with paper-based recordkeeping techniques in the South African healthcare industry. Fifty-four percent of respondents were "very" to "extremely concerned" about the fact that their various healthcare providers do not have their full medical records. Therefore, the problem of inadequate informational continuity of care is an issue that should be addressed in South Africa.

Notably, the envisaged NHI will lead to an increased need for improved informational continuity of care. While a policy document on the NHI is not yet available in the public domain, it is understood that the NHI will provide a comprehensive package of services contracted to both public and private healthcare providers.[53-54] Patients will thus increasingly move between the public and private healthcare sectors, necessitating improved sharing of health-related information between these healthcare providers. It is also understood that primary healthcare providers will act as gatekeepers in terms of referrals to other levels of care.[53] Patients will be expected to follow the appropriate referral route, and will only be able to access secondary or tertiary services based on a referral from their primary healthcare provider.[53-55] This makes the primary care level particularly appropriate for the adoption of EMRs, because it is at this level that the bulk of a patient's health data will be generated. In terms of the proposed approach depicted in Figure 1, the adoption of standards-based EMRs by primary healthcare providers will ensure that at least the bulk of a patient's health information is in a format that can be shared through an HIE. Once other healthcare providers adopt EMRs, it will be feasible to work towards the vision of an EHR to improve informational continuity of care in South Africa.

Conclusion

It is a common occurrence that, during their lifetime, patients move between various healthcare providers, due to the fragmented nature of modern healthcare provision. This makes the informational dimension of continuity of care increasingly important to ensure that some level of continuity is still achieved among healthcare providers. Paper-based methods of recordkeeping are inadequate in supporting informational continuity of care, making the adoption of electronic methods of recordkeeping progressively more important. This article described the role that various electronic records such as PHRs, EMRs and EHRs, could play in improving informational continuity of care. A workable approach, based on the adoption of standards-based electronic records, is recommended for the South African healthcare sector. The suggested approach promotes a phased adoption of electronic records, constituting a more feasible approach, considering the nature of South Africa's healthcare setting. This setting includes both a public and private sector, each comprising various levels of healthcare provision. Once the South African government's proposed NHI is adopted, there will be an increased need for these sectors to share patient data, not just between sectors, but between healthcare provision levels, as well. The nature of paper-based records will make it difficult to efficiently share this data, and this should lead to increasing interest in electronic recordkeeping methods. The primary healthcare level would be the most appropriate level at which to start the implementation of electronic records, as the NHI is likely to call on primary healthcare providers to act as gatekeepers to other levels of care. By ensuring that the bulk of a patient's health records is stored in an electronic format, it would be possible to exchange health information with other healthcare providers, once they also adopted electronic recordkeeping. Once healthcare providers are able to exchange health information electronically, it should lead to an improvement in informational continuity of care, which should improve the quality of care that a patient receives, and may also lead to various cost savings.

Future research must focus on identifying ways to encourage the adoption and meaningful use of electronic record systems in the South African context, as well as issues related to privacy, confidentiality, ownership of the data contained in medical records, and specific standards and infrastructure requirements needed to implement the proposed model.

Declaration

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Acknowledgement

The financial assistance towards this research, given by the National Research Foundation (NRF), is hereby acknowledged. Opinions expressed, and conclusions arrived at, are those of the author, and should not be attributed to the NRF.

References

1. Sturmberg JP. Continuity of care: towards a definition based on experiences of practising GPs. S Afr Fam Pract. 2000;17(1):16-20.
2. Freeman GK, Olesen F, Hjortdahl P. Continuity of care: an essential element of modern general practice? S Afr Fam Pract. 2003;20(6):623-637.
3. Anderson MA. Continuity of care [homepage on the Internet]. c2011. Available from: http://www.merckmanuals.com/home/sec26/ch320/ch320b.html
4. Saultz JW. Defining and measuring interpersonal continuity of care. Ann Fam Med. 2003;1(3):134-143.
5. Norden AL, Marincowitz GJO, Fehrsen GS. Patient's thoughts on patient-retained medical records. S Afr Fam Pract. 2004;46(7):30-33.

6. Mann R, Williams J. Standards in medical record keeping. Clin Med. 2003;39(4):329-332.
7. Nair BKR. Clinical examination: a problem based approach. London, UK: World Scientific Publishing, 2011.
8. World Health Organization. Medical records manual: a guide for developing countries. Western Pacific Region: World Health Organization, 2006.
9. Chamisa I, Zulu BMW. Setting the records straight: a prospective audit of the quality of case notes in a surgical department. SA J Sci. 2007;45(3):92-95.
10. Ferranti JM, Musser RC, Kawamoto K, Hammond WE. The clinical document architecture and the continuity of care record: a critical analysis. J Am Med Inform Assoc. 2006;13(3):245-252.
11. Schoenberg R, Safran C. Internet based repository of medical records that retains patient confidentiality. BMJ. 2000;321(7270):1199-1203.
12. Accenture. Achieving high performance in health care: insights into the introduction of electronic health records in South Africa. South Africa: Accenture, 2006.
13. President's Information Technology Advisory Committee. Revolutionizing health care through information technology. Arlington: National Coordination Office for Information Technology Research and Development, 2004.
14. Mitchell E, McConnachie A, Sullivan F. Consultation computer use to improve management of chronic disease in general practice: a before and after study. Inform Prim Care. 2003;11(2):61-68.
15. Foreword. In: Lehmann HP, Abbott PA, Roderer NK, editors. 2nd ed. Aspects of electronic health record systems. United States: Springer, 2006; p. vii-viii.
16. Pirnejad H, Bal R, Stoop AP, Berg M. Inter-organisational communication networks in healthcare: centralized versus decentralized approaches. Int J Integr Care. 2007;7:e14 [homepage on the Internet]. c2011. Available from: http://www.ijic.org/index.php/ijic/article/view/185/369
17. Smith S, Khutoane G. Why doctors do not answer referral letters? S Afr Fam Pract. 2009;51(1):64-67.
18. Schabetsberger T, Ammenwerth E, Andreatta S, et al. From paper-based transmission of discharge summaries to electronic communication in health care regions. Int J Med Inform. 2006;75(3-4):209-215.
19. Pillai A, Thomas SS, Garg M. The electronic immediate discharge document: experience from the South West of Scotland. Inform Prim Care. 2004;12(2):67-73.
20. Kaushal R, Blumenthal D, Poon EG, et al. The costs of a national health information network. Ann Intern Med. 2005;143(3):165-173.
21. Hellesø R, Lorensen M. Inter-organizational continuity of care and the electronic patient record: a concept development. Int J Nurs Stud. 2005;42(7):807-822.
22. Managing health service information systems: an introduction. In: Sheaff R, Peel V, editors. Buckingham: Open University Press, 1995.
23. Cochrane S, Ramokolo R. Will South Africa switch to EHR? [homepage on the Internet]. c2011. Available from: http://www.frost.com/prod/servlet/market-insight-print.pag?docid=98807293
24. O'Mahony D. Implementing an electronic medical record system in a rural general practice. S Afr Fam Pract. 2009;51(4):346-347.
25. Tang PC, Ash JS, Bates DW, et al. Personal health records: definitions, benefits, and strategies for overcoming barriers to adoption. J Am Med Inform Assoc. 2006;13(2):121-126.
26. Neal H. EHR vs EMR: what's the difference? [homepage on the Internet]. c2011. Available from: http://www.softwareadvice.com/articles/medical/ehr-vs-emr-whats-the-difference/
27. Working group on policies for electronic information sharing between doctors and patients: connecting Americans to their healthcare. New York: Markle Foundation, 2004.
28. Ludwick DA, Doucette J. Adopting electronic medical records in primary care: lessons learned from health information systems implementation experience in seven countries. Int J Med Inf. 2009;78(1):22-31.
29. Hartley CP, Jones ED. EHR implementation: a step-by-step guide for the medical practice. Chicago, IL: American Medical Association, 2005.
30. Garets D, Davis M. Electronic medical records vs electronic health records: yes, there is a difference. Chicago, IL: HIMSS Analytics, 2006.
31. Gunter TD, Terry NP. The emergence of national electronic health record architectures in the United States and Australia: models, costs, and questions. J Med Internet Res. 2005;7(1):e3.
32. Waegemann CP. EHR vs. CPR vs. EMR. Healthcare Informatics Online [homepage on the Internet]. c2011. Available from: http://www.providersedge.com/ehdocs/ehr_articles/EHR_vs_CPR_vs_EMR.pdf
33. Sujansky WV, Overhage JM, Chang S, et al. The development of a highly constrained Health Level 7 implementation guide to facilitate electronic laboratory reporting to ambulatory electronic health record systems. J Am Med Inform Assoc. 2009;16(3):285-290.
34. Tang PC. Key capabilities of an electronic health record system. Washington, DC: National Academy Press, 2003.
35. Christopherson GA. Healthy people: person-centered, outcomes-driven, virtual health systems. In: Demetriades JE, Kolodner RM, Christopherson GA, editors. Person-centered health records: toward healthepeople. USA: Springer; 2005; p. 21–38.
36. Deloitte. Health information exchange (HIE) business models. USA: Deloitte Center for Health Solutions, 2006.
37. Simon SR, Evans JS, Benjamin A, et al. Patients' attitudes towards electronic health information exchange: qualitative study. J Med Internet Res. 2009;11(3):e30 [homepage on the Internet]. c2011. Available from: http://www.jmir.org/2009/3/e30
38. Waegemann PC. The era of EMRs [homepage on the Internet]. c2011. Available from: http://southfloridahospitalnews.com/page/The_Era_of_EMRs/870/1/
39. Barrett MJ, Holmes BJ, McAulay SE. Electronic medical records: a buyer's guide for small physician practices. Oakland, CA: California Healthcare Foundation, 2003.
40. HIMSS. Defining health information exchange [homepage on the Internet]. c2011. Available from: http://www.himss.org/content/files/2009DefiningHIE.pdf
41. HIMSS. HIE implementations in meaningful use: Stage 1 requirements [homepage on the Internet]. c2011. Available from: http://www.himss.org/content/files/HIE_MU_Matrix033110.pdf
42. Loonsk JW. Not all health information exchange is created equal [homepage on the Internet]. c2011. Available from: http://www.collaborativegov.org/not-all-health-information-exchange-is-created-equal/
43. Massengill S. Can portals deliver? ADVANCE for health information executives [homepage on the Internet]. c2009. Available from: http://www.axolotl.com/pdf/Can%20Portals%20Deliver.pdf
44. Memorial Healthcare System. EMR-HIE integration toolkit [homepage on the Internet]. c2011. Available from: http://atlanticcoasthie.com/pdf/EMR%20-%20HIE%20Integration%20Toolkit %20v1.pdf
45. Marchand D. Health information exchanges: strategies and point of view [homepage on the Internet]. c2011. Available from: http://i.dell.com/sites/content/public/solutions/healthcare/en/Documents/health-information-exchanges-strategies-and-point-of-view.pdf
46. Charette R. Google Health to shut down 1 January 2012 [homepage on the Internet]. c2011. Available from: http://spectrum.ieee.org/riskfactor/computing/it/google-health-to-shut-down-1st-of-january-2012
47. CIOinsight. Demise of Google Health won't stop personal health record growth [homepage on the Internet]. c2011. Available from: http://www.cioinsight.com/c/a/Latest-News/Personal-Health-Records-to-Thrive-Despite-the-Demise-of-Google-Health-Report-542798/
48. Horowitz BT. Personal health record to thrive despite the demise of Google Health: report [homepage on the Internet]. c2011. Available from: http://www.eweek.com/c/a/Midmarket/Personal-Health-Records-to-Thrive-Despite-the-Demise-of-Google-Health-Report-542798/
49. Department of Health. National Health Act (61/2003): policy on National Health Insurance. *Government Gazette*, 2011;554(34523).
50. Sprague L. Personal health records: the people's choice? National Health Policy Forum. Issue Brief Number 820, 2006 [homepage on the Internet]. c2011. Available from: http://www.nhpf.org/library/issue-briefs/IB820_PHRs_11-30-06.pdf
51. President's Information Technology Advisory Committee. Revolutionizing health care through information technology. USA: National Coordination Office for Information technology and Research Development, 2004.
52. Shapiro JS, Kannry J, Lipton M, et al. Approaches to patient health information exchange and their impact on emergency medicine. Ann Emerg Med. 2006;48(4):426-432.
53. McIntyre D. National Health Insurance: providing a vocabulary for public engagement. In: Fonn S, Padarath A, editors. South African Health Review, 2010. Durban: Health Systems Trust, 2010; p. 145-156.
54. Van den Heever A. A financial feasibility review of NHI proposals for South Africa. In: Fonn S, Padarath A, editors. South African Health Review, 2010. Durban: Health Systems Trust; 2010; p. 157-170.
55. Ramjee S, McLeod H. Private sector perspectives on National Health Insurance. In: Fonn S, Padarath A, editors. South African Health Review, 2010. Durban: Health Systems Trust, 2010; p. 179-194.