

Postprint Version	1.0
Journal website	
Pubmed link	http://www.ncbi.nlm.nih.gov/pubmed/23781762
DOI	

This is a NIVEL certified Post Print, more info at <http://www.nivel.eu>

Understanding health care providers' reluctance to adopt a national electronic patient record: an empirical and legal analysis

M. ZWAANSWIJK^{A,§}, M.C. PLOEM^B, F.J. WIESMAN^C, R.A. VERHEIJ^A, R.D. FRIELE^{A,D}, J.K.M. GEVERS^B

^a NIVEL, Netherlands Institute for Health Services Research, Utrecht, the Netherlands

^b University of Amsterdam/Academic Medical Centre, Department of Health Law, Amsterdam, the Netherlands

^c University of Amsterdam/Academic Medical Centre, Department of Medical Informatics, Amsterdam, the Netherlands

^d Tilburg University, Faculty of Social and Behavioural Sciences, Tilburg, the Netherlands

[§] Corresponding author: NIVEL, Netherlands Institute for Health Services Research, P.O. Box 1568, 3500 BN Utrecht, the Netherlands, m.zwaanswijk@nivel.nl; tel.: +31 30 2729791

ABSTRACT

Background: Several countries are implementing a national electronic patient record (n-EPR). Despite the assumed positive effects of n-EPRs on the efficiency, continuity, safety and quality of care, their overall adoption remains low and meets resistance from involved parties. The implementation of the Dutch n-EPR also raised considerable controversy, which eventually caused the Dutch government to stop her contribution to the national infrastructure.

Aim: To explain Dutch health care providers' reluctance in adopting the n-EPR, we investigated their perceptions of problems associated with the n-EPR and their legal position in the n-EPR. We hereby aim to provide suggestions about approaches to promote successful implementation.

Methods: The study consisted of two parts. The empirical part of the study was conducted in three health care settings: acute care, diabetes care, and ambulatory mental health care. Two health care organisations were included per setting. Between January and June 2010, 17 stakeholders working in these organisations were interviewed to investigate health care providers' perceptions of problems associated with the n-EPR. In the legal part of the study, legal documents were analysed to study health care providers' legal position in the n-EPR and any associated problems.

Results: The respondents expressed concerns about the confidentiality and safety of information exchange and the reliability and quality of patient data in the n-EPR, and indicated that their liability in case of medical errors was not

sufficiently clear. The perceived problems could partly be attributed to legal uncertainties.

Conclusions: It is recommended to start the implementation of an n-EPR in limited geographical areas. This will allow health care providers to experience benefits of electronic information exchange before being asked to participate in information exchange at a larger scale. The problems that health care providers perceive in the n-EPR should be minimised. Legislation underlying the n-EPR should provide sufficient clarity about health care professionals' responsibilities and liabilities.

INTRODUCTION

New information and communication technologies are rapidly being implemented in health care. A major technological innovation in this respect is the national electronic patient record (n-EPR), which is currently being implemented in several countries worldwide (e.g. the UK, Canada, the US, Australia and France) [1,2]. An n-EPR allows health care providers to electronically exchange patient data at a national level. It is meant to improve health care providers' access to relevant patient data, under the assumption that this will lead to improvements in the efficiency, continuity, safety and quality of care [2,3].

The Dutch government has been preparing to implement a national system for the electronic exchange of patient information for several years (see Box 1 for a description of the characteristics the Dutch system). Although somewhat misleading because patient data would not be stored in a central database (see Box 1), the Dutch system was named the 'national electronic patient record' and will be referred to as such in this paper.

[BOX 1]

The Dutch n-EPR was planned to be implemented gradually, starting with electronic information exchange between general practitioners (GPs) and out-of-hours services and the exchange of medication data between GPs, medical specialists and pharmacists, possibly followed by implementation in other segments of health care (e.g. in emergency care or in the exchange of laboratory data).

As described in Box 1, the legal framework of the Dutch n-EPR was laid down in the proposed Act on electronic health information exchange. This act obliged health care providers to connect their electronic information system to the national infrastructure. While awaiting approval of this act by the Dutch Senate, health care providers and organisations could voluntarily connect their electronic information system to the national infrastructure and exchange patient information through this system. In September 2010, 14% of Dutch general practices and 54% of out-of-hours services were connected to the national infrastructure [4].

Prior to the implementation of the n-EPR, many Dutch health care providers already exchanged patient data by means of local or regional electronic information systems. Still, the implementation of the Dutch n-EPR raised considerable controversy.

Patients and health care providers expressed concerns about the confidentiality of medical information in the n-EPR and one third of Dutch health care providers showed reluctance to accept the n-EPR as proposed by the Dutch government [5]. In April 2011, the controversy about the n-EPR caused the Dutch Senate to reject the proposed Act on electronic health information exchange. The Dutch government stopped her financial and organisational contribution to the development and maintenance of the national infrastructure.

Similar developments have taken place in other countries implementing an n-EPR. Despite their assumed positive effects, the overall adoption of n-EPRs remains relatively low and meets resistance from several involved parties [2].

In this paper, we aim to provide insight into factors that may have contributed to the problems in the implementation of the Dutch n-EPR. We thereby aim to provide suggestions about strategies that can contribute to a successful implementation, which can be useful for other countries currently developing an n-EPR.

Since health care providers are the main users of an n-EPR and their attitude towards adopting the n-EPR is crucial for a successful implementation [6], it is important to gain insight into factors underlying their reluctance. This attitude may be influenced by their perceptions of problems associated with the n-EPR as well as by the legal framework underlying the n-EPR. The question is whether the technical and legal design of the Dutch n-EPR (Box 1) provided sufficient safeguards for health care providers to trust it and to be willing to adopt it. In investigating this question, we will address perceived problems and legal issues of the Dutch n-EPR, regarding (1) the security of electronic information exchange and the confidentiality of patient data, (2) the reliability and quality of patient information, and (3) health care providers' liability.

METHODS

The study consisted of two parts: an empirical and a legal part. The empirical part of the study was conducted in three health care settings that are particularly demanding with respect to the exchange of patient information. First, the acute care setting was selected because of its requirements for the completeness of information and the speed of information exchange. Secondly, diabetes care was included because the multidisciplinary character of this kind of care causes information exchange between the various involved health care providers to be crucial. Thirdly, ambulatory mental health care was selected because privacy issues are likely to play an important role in this setting.

To obtain a broad picture of health care providers' perceptions, we aimed to include two health care organisations in each setting that differed in the extent to which electronic information exchange was being used. To this aim, several stakeholders within the health care sector were contacted to obtain information about the degree of implementation of electronic information exchange in health care organisations. This information was used to select health care organisations, which were asked to participate in the study. In each of the three settings, two health care organisations were included, leading to six case studies.

The aim of including in each setting two health care organisations that differed in the extent to which electronic information exchange was being used was not met for

ambulatory mental health care. Although several mental health care organisations with fairly low degrees of implementation of electronic information exchange were approached, none of them agreed to participate. Therefore, two mental health care organisations with relatively high degrees of the use of electronic information exchange were included.

Contact details of relevant stakeholders whom we could ask to participate in an interview were requested. In total, 21 stakeholders were asked to participate. They received written information about the study. Four of them declined because of a lack of time. In each health care organisation, two or three stakeholders consented to be interviewed, resulting in a total number of 17 interviews. Characteristics of the participating stakeholders are presented in Table I. Data collection took place between January and June 2010.

[TABLE 1]

Respondents' perceptions of the n-EPR were investigated using a predetermined topic list. For each health care setting, a scenario describing a patient's contact with the health care organisation was constructed. Based on these scenarios, we investigated how information was being exchanged in the organisation and which problems were encountered. For a more detailed description of the topic list, see Zwaanswijk et al [7].

Two authors (MZ and FJW) performed the interviews. To ensure comparability in the way the interviews were performed, five interviews (distributed over the total period of data collection) were performed by the two authors together. The remaining interviews were performed by one of the interviewers separately (8 by MZ; 4 by FJW). Non-directive interview techniques were used to minimise the risk of biasing respondents' answers. Interviews lasted 85 minutes on average.

Interviews were audio taped and transcribed, and identifying details of respondents were removed from the transcripts. Relevant themes were deduced by the first author by means of thematic qualitative analysis. The resulting coding scheme was discussed within the research team. Disagreements were discussed until consensus was achieved. Several data verification procedures were used, including concurrent data collection and analysis, and idea reconfirmation during the process.

The inclusion of respondents was discontinued when theme saturation was observed. Theme saturation was determined by analysing the data of thirteen interviews. Subsequently, data from four additional interviews were analysed, which revealed no new themes.

In the second part of the study, legal documents and current jurisprudence relevant to the Dutch n-EPR were analysed by the second author to study health care providers' legal position associated with electronic information exchange through the n-EPR and any associated problems. The legal documents included national regulations, such as the Dutch Data Protection Act (2000), the Medical Treatment Contract Act (1994), and the proposed Act on electronic health information exchange, as well as relevant standards developed by the European Union and the Council of Europe (e.g. Art. 8 of the European Convention of Human Rights, the Convention relating to the automatic processing of personal data and the Working Document on the processing

of personal data related to health in electronic health records of the Article 29 Data Protection Working Party).

To validate the results of the empirical and legal analyses, they were discussed within the research team and within an advisory group of national and international experts in the fields of health care and health care legislation. The researchers were not in any way involved in the implementation of the n-EPR. It is therefore unlikely that the results have been biased in this respect.

RESULTS

Health care providers perceived various problems associated with the n-EPR, which may have contributed to their reluctance to adopt the n-EPR. The analysis of legal documents revealed some legal uncertainties surrounding the n-EPR, which may have added to this reluctance. In this section, the problems of the n-EPR as perceived by the participating health care providers will be described, followed by relevant legal issues associated with each of these problems, which resulted from the legal analysis.

Perceived problems regarding the security of information exchange and confidentiality of patient data

Respondents from the three included health care settings expressed concerns about the safety of electronic information exchange and the protection of patients' privacy in the n-EPR. They were concerned that unauthorised persons would have access to electronic patient data, either because people could hack the system, or as a result of health care providers' carelessness (e.g. leaving their computer screen unattended or not using their personal chip card with adequate caution). They also indicated that health care providers could misuse their access to patient records to browse through the information of other patients. The respondents perceived the amount of data being available through the n-EPR and the number of included health care providers to increase the risk of unauthorised access.

In the Dutch n-EPR, access to patient records would be restricted to health care providers who are directly involved in the care for a particular patient. Respondents indicated that it is unclear how this concept would be operationalised and who would be responsible for evaluating whether health care providers rightfully accessed patient records. They also reported that evaluating the legitimacy of health care providers' access to patient data would cause problems. They indicated that when all accesses to patient records are logged, the amount of logging data produced each day makes it almost impossible to evaluate the data on a regular basis. In their opinion, this creates the risk that logging data are evaluated only when unauthorised access is suspected.

Legal issues associated with the security of information exchange and confidentiality of patient data

In an n-EPR, health information will predominantly be 'pulled' from a source record by health care professionals rather than being 'pushed' by one professional to another. In such a case, the confidentiality of the information and the security of the system through which it is exchanged should be of the highest level. One of the main

safeguards in that respect is that only health care professionals who are presently involved in the patient's treatment are allowed to have access and that all access is being monitored. However, the legal analysis revealed that the security measures included in the Dutch n-EPR may not have protected sufficiently against unauthorised access. Firstly, although the Act on electronic health information exchange legally restricted access to patient records to health care providers who were directly involved in the patient's treatment, it was technically possible for health care providers to access the system even when they were not directly involved in the patient's treatment [8].

Secondly, the legitimacy of access could only be evaluated by means of logging data. As the respondents rightfully indicated, the amount of logging data makes their regular evaluation almost impossible. Moreover, since logging data can only be used to evaluate the legitimacy of access *after* possible unauthorised access has occurred, they do not sufficiently protect patients' privacy.

Thirdly, the legal analysis showed that it was unclear whether the two Dutch supervisory authorities - the Health Inspectorate and the Data Protection Authority - were sufficiently equipped to verify the legitimacy of health care providers' access to patient data [8,9].

Perceived problems regarding the reliability and quality of patient information

The reliability of patient data constitutes an important aspect of every information exchanging system, but it is crucial for the functioning of an n-EPR. Important conditions in the latter respect are that the risk of the system breaking down is minimal, that patients' medical data are complete (according to relevant professional standards), recorded in a systematic way, and up to date.

The respondents emphasised that electronic information exchange increases the quality requirements imposed on patient records. These records previously served merely as a personal mnemonic device for health care providers. In an n-EPR, an increasing number of health care providers have to be able to use and understand the recorded information. Good quality records are therefore crucial. However, the respondents reported several factors that negatively affect the quality and completeness of electronic patient records.

Firstly, respondents from the three included health care settings reported that patient data are not always recorded adequately, which may cause essential information to be missed or misunderstood. For instance, respondents working in diabetes care and acute care indicated that some health care providers do not use diagnostic codes, or use them inadequately (e.g. not recording recurrent episodes of the same diagnosis under the same diagnostic code), which may prevent other health care providers from getting a coherent picture of patients' problems. Respondents from ambulatory mental health care reported that the recording of patient data in electronic records takes a lot of time, which limits the amount of detail in patients' records and may thereby negatively affect the quality of the information.

Secondly, some respondents indicated that their recording behaviour was likely to change in case of an n-EPR. The larger number of persons having access to patient records in a national system would cause them to become more cautious in recording sensitive patient information.

Thirdly, because of interoperability problems between electronic information systems, patient information is not always recorded adequately in the information system of the receiving health care provider. Information is sometimes placed in wrong parts of the system or can be missing all together. Health care providers may not be aware that relevant information is missing from their records.

The respondents mentioned two other problems associated with the reliability and quality of patient records. Firstly, in the n-EPR, health care providers would have access to an increasing amount of information about each patient. They feared that this could lead to an information overload, which would make it difficult to find the information that is essential for the provision of high quality care.

Secondly, health care providers have to be able to value the quality of the patient information that they receive from their colleagues. In the n-EPR, much of this information would come from health care providers with whom the recipient is not personally acquainted. Respondents from the three included health care settings perceived this unfamiliarity as a problem of the n-EPR. They indicated that they had more trust in the information they received from health care providers they already knew, since previous experiences gave them an indication of the quality and reliability of the received information. They also indicated that it would be easier to contact familiar health care providers when they had questions concerning the received information.

Legal issues associated with the reliability and quality of patient information

Legally, health care providers are responsible for the accuracy of the information they provide to others. The Act on electronic health information exchange obliged these professionals to keep patient information up to date and make relevant selections of patient data available for consultation through the n-EPR.

Relevant Dutch court decisions make clear that it is a physician's duty both to request relevant information from a colleague if needed, and to provide it if requested. On the basis of jurisprudence, information obtained from colleagues should not be used without further inquiry or verification if – taking into account the source of the information or other circumstances – there is any reason to doubt the quality or completeness of that information. Compliance with the latter obligation seems difficult in the context of the n-EPR in which it is less likely that professionals are familiar with each other and know whether they can rely on the information they find in the n-EPR .

Another legal issue refers to the fact that in the n-EPR, patients would have the right to conceal or delete their records or parts of it. Exercising these rights means that information about patients may be incomplete. This raises the question whether the health care professional who is consulting the n-EPR should be made aware of the fact that patient information is deleted or not accessible for him. The Dutch government proposed to insert in such case the message 'data incomplete' in the n-EPR. However, on advice of the Dutch Data Protection Authority it was decided , that health care providers would not be allowed to know if a patient had concealed certain information, since this may threaten the patient's privacy. Therefore, health care providers would not be able to adequately determine the quality of patient records, since they would not know *if* essential information was missing from patient records, let alone *which* information was missing.

Perceived problems regarding the liability of health care providers

The respondents found it unclear who would be liable when medical errors were made because of the incompleteness or incorrectness of electronically exchanged patient information. It is not always clear which health care provider has added information to a patient record. Moreover, health care providers may not be aware that relevant information is missing from a patient's record, because of inadequate interoperability between information systems or the patient's desire not to disclose certain information. These shortcomings make it difficult to trace the cause of errors.

Legal issues associated with the liability of health care providers

The implementation of the n-EPR would have raised new questions regarding the responsibilities and liabilities of the involved health care professionals. These questions relate not only to the possibility of health care professionals making errors, but also to the fact that a new technology may not function adequately, which may cause important data to be inaccessible for technical reasons. The question is whether health care providers can be held accountable for such 'system failures'. Furthermore, professionals are facing new obligations (such as making relevant index and medical data available to the n-EPR, keeping them up to date etc.) that may give rise to liability issues if the entered data turn out to be inaccurate, outdated or incomplete. The legal analysis showed that neither the proposed legislation underlying the Dutch n-EPR nor the current jurisprudence provides sufficient clarity about such liability issues.

DISCUSSION

Although n-EPRs are assumed to improve the efficiency, continuity, safety and quality of care, their overall adoption remains relatively low and meets resistance in several countries [2]. The implementation of the Dutch n-EPR followed a similar path, causing considerable political and societal controversy, which resulted in the rejection of its underlying legal framework by the Dutch Senate in April 2011. In this paper, we aimed to provide insight into factors that may have contributed to the problematic implementation of the Dutch n-EPR by investigating which problems health care providers perceived in the n-EPR, as well as legal issues associated with these perceived problems. Insight into these topics can provide suggestions about how to promote health care providers' willingness to adopt electronic information exchange, which can be useful for other countries currently implementing an n-EPR. The fact that many Dutch health care providers already exchange patient data by means of local or regional electronic information systems may indicate that they acknowledge the importance and usefulness of electronically exchanging patient information. Indeed, in another part of this research project we found that health care providers perceive several benefits of electronic information exchange. They expected it to promote the efficiency and quality of care, and stressed the usefulness of improved access to up-to-date information about patients [7]. Similar findings have been reported by Fontaine et al. [3]. However, we found that health care providers' trust in the safety of electronic information exchange and the reliability of the exchanged information decreased

when health information is exchanged at a larger scale (i.e. at a national instead of a local or regional scale) [10]. Health care providers probably feel more in control of information exchange and the associated risks when patient data are exchanged at a smaller scale. Moreover, an n-EPR will change the way in which information is being exchanged from a predominantly 'push' method (in which health care providers electronically send information to colleagues) to an increasing use of the 'pull' method (in which health care providers have access to information recorded by their colleagues). In the latter case, health care professionals may feel that they have less control over who has access to patient data, which may contribute to their reluctance to adopt a national system.

Perceived problems of the Dutch national electronic patient record and associated legal issues

The health care providers participating in this study perceived several problems of the proposed n-EPR, which were likely to influence their willingness to adopt it.

Firstly, the respondents expressed concerns about the safety of electronic information exchange and the safeguards to ensure the legitimacy of health care providers' access to patient information [cf. 3]. Previous research has indicated that the use of electronic medical records may negatively affect patients' privacy [11-13]. The amount of data being available through an n-EPR and the number of included health care providers increase the risk of unauthorised access to patient data. Moreover, although the proposed Dutch n-EPR contained more elaborate security requirements than applied in already existing systems of electronic information exchange in the Netherlands [9], doubts have been expressed whether these requirements would sufficiently protect against unauthorised access [14].

Secondly, the participating health care providers were concerned that essential information about patients would be missed or misunderstood, because of inadequate or incomplete record keeping. Legally, health care professionals are responsible for providing accurate information to colleagues. Despite an increasing attention for systematic and uniform recording of patient data, e.g. by the

development of guidelines [15], the application of these guidelines in daily practice is limited [16]. It can be questioned whether guidelines are sufficient to create trust and legal certainty among health care providers about their main obligations concerning electronic record keeping.

Health care professionals have the legal duty to verify the information they receive from colleagues if there is any reason to doubt the quality or completeness of the information. The health care providers participating in this study indicated that this might raise problems in case of an n-EPR, because they found it difficult to evaluate the value of the information they received from unfamiliar health care providers and to contact these health care providers when the received information was unclear or incomplete.

Respondents' concerns about their liability in case of an n-EPR were confirmed by our legal analysis, which showed that neither the existing nor the proposed legislation provides sufficient clarity about the extent to which health care providers can be held liable for medical errors which result from the incompleteness or incorrectness of electronically exchanged patient information. More clarity about the implications of the n-EPR for health care providers' liability seems essential to promote their trust in and willingness to adopt the n-EPR.

The legal part of the study revealed that health care providers' reluctance regarding the adoption of the n-EPR may partly be attributed to legal problems. Some of the legal issues described above do not apply exclusively to electronic information exchange in an n-EPR, but also to current local or regional information exchange. However, the development of a national system will raise additional questions, and existing risks and uncertainties are likely to become more pronounced

when present local and regional information exchange is extended to a national level.

These uncertainties were not resolved by the proposed legal framework underlying the n-EPR.

Methodological reflections

The empirical part of this study was conducted in three health care settings. To obtain a broad picture of health care providers' perceptions, we aimed to include two health care organisations in each setting that differed in the extent to which electronic information exchange was being used. This aim was not met for ambulatory mental health care.

Because the empirical part of the study included a limited number of health care providers and settings, caution should be exercised in generalising the findings. Respondents with explicit opinions about the n-EPR may have been more likely to participate in this study, thereby possibly biasing the results, either positively or negatively. To minimise this effect, interview questions addressed perceived problems as well as benefits of electronic information exchange. The perceived benefits of electronic information exchange have been described elsewhere [7]. Furthermore, we encourage future researchers to examine the generalisability of our findings in larger samples and a broader range of health care settings.

CONCLUSIONS

Which lessons can be learned from the Dutch experience? In their review of factors influencing the implementation of electronic information exchange in primary care practices, Fontaine et al. [3] concluded that successful implementation requires a balance between reasonable expectations and the ability to deliver demonstrable benefits to health care providers. Health care providers will only be willing to adopt an n-EPR if it incorporates considerable benefits for their clinical work [17]. The clinical need as felt by health care providers instead of the technical possibilities should therefore be leading in the implementation of an n-EPR.

In another part of this research project, health care providers were found to have a preference for local and regional systems of information exchange [7]. Considering this preference and health care providers' concerns about the n-EPR found in this study, it is recommended to start the implementation of an n-EPR in limited geographical areas. This will allow health care providers to experience the benefits of electronic information exchange before being asked to participate in information exchange at a larger scale. This approach may make it possible to reach a critical threshold, after which the adoption rate will accelerate because individual health care providers become aware that everybody else has adopted the technology and it becomes worthwhile to join [18].

Although we think that regulation of electronic information exchange is necessary, legislation should not primarily be used instrumentally, i.e. to enable electronic information exchange at a national level, but should mainly be used to increase legal

certainty among all parties involved in electronic information exchange. It should provide sufficient clarity about health care professionals' responsibilities and liabilities in electronic information exchange.

Addressing the needs and perceptions of health care providers is important for a successful implementation of an n-EPR. Efforts should therefore be focused on minimising the problems that health care providers perceive in the n-EPR, as these may cause resistance to implementation [7,19]. The safety and confidentiality of electronic information exchange may be improved by finding ways to automatically select suspicious requests for access to electronic patient records and by increasing health care providers' awareness of the importance of carefulness in using and accessing patient data. To safeguard patients' privacy, some diagnoses (e.g. child abuse or sexually transmitted diseases) can be given a privacy code or may be recorded in a separate secure part of electronic information systems, thereby limiting the accessibility of these data to others.

The quality of record keeping should be improved to increase health care providers' trust in electronic information exchange. Training health care providers in the adequate recording of medical data is important to enhance the uniformity and quality of patient records. Such improvements can also be achieved by adapting electronic information systems to facilitate adequate recording (e.g. including effective and efficient search functions), and by regularly evaluating health care providers' records and providing feedback.

AUTHORS' CONTRIBUTIONS

MZ and FJW carried out the data collection for the empirical part of the study. MZ performed the analyses for the empirical part of the study. MCP performed the analyses for the legal part of the study. MZ drafted the manuscript. RAV, RDF and JKMG designed the study and formulated the research questions. All authors critically reviewed the manuscript. All authors read and approved the final manuscript.

ACKNOWLEDGEMENTS

The authors wish to thank A. Abu-Hanna and A. Hasman for their contribution to the design of the study and the interpretation of its results. This study was financially supported by the Netherlands Organisation for Scientific Research (NWO). The authors declare that they have not entered into an agreement with the funding organisation that has limited their ability to complete the research as planned and publish the results. The funding organisation has had no role in the study design, the collection, analysis, and interpretation of the data, the preparation of the manuscript, or in the decision to submit the paper for publication.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

SUMMARY TABLE

What was already known on the topic:

National electronic patient records (n-EPRs) are currently being implemented in several countries. By facilitating health care providers' access to relevant patient data, n-EPRs are assumed to improve the efficiency, continuity, safety and quality of care.

Despite their assumed positive effects, the adoption of n-EPRs remains relatively low and meets resistance from several involved parties.

To explain health care providers' reluctance in adopting the n-EPR, it is important to gain insight into their attitude towards the n-EPR, which may be influenced by their perceptions of problems associated with the n-EPR as well as by the legal framework underlying the n-EPR.

What this study added to our knowledge:

It is recommended to start the implementation of an n-EPR in limited geographical areas. This will allow health care providers to experience the benefits of electronic information exchange before being asked to participate in information exchange at a larger scale.

Legislation underlying the n-EPR should mainly be used to increase legal certainty among all parties involved in electronic information exchange. It should provide sufficient clarity about health care professionals' responsibilities and liabilities in electronic information exchange.

Efforts should be focused on minimising the problems that health care providers perceive in the n-EPR, as these may cause resistance to implementation.

REFERENCES

1. Arnold S, Wieners WW, Global Enterprise Task Force Members. *Electronic health records: a global perspective*. Chicago: Healthcare Information and Management Systems Society (HIMSS); 2008.
2. Boonstra A, Broekhuis M. Barriers to the acceptance of electronic medical records by physicians: From systematic review to taxonomy and interventions. *BMC Health Serv Res*. 2010;10:231.
3. Fontaine P, Ross SE, Zink T, Schilling LM. Systematic review of health information exchange in primary care practices. *J Am Board Fam Med*. 2010;23:655-670.
4. Schippers EI. [Progress report national infrastructure for information exchange in health care, third quarter of 2010]. The Hague: Ministry of Health, Welfare and Sport; 2010. Dutch.
5. Katzenbauer M. ['Too early for national EPR']. *Medisch Contact* 2009;64:880-883. Dutch.
6. Pirnejad H, Bal R, Stoop AP, Berg M. Inter-organisational communication networks in healthcare: Centralised versus decentralised approaches. *Int J Integr Care*. 2007;7:16 May.
7. Zwaanswijk M, Verheij RA, Wiesman FJ, Friele RD. Benefits and problems of electronic information exchange as perceived by health care professionals: an interview study. *BMC Health Serv Res*. 2011;11:256.
8. Ploem C, Gevers S. Introduction of a national electronic patient record in the Netherlands: Some legal issues. *Eur J Health Law*. 2011;18:191-204.
9. Ploem MC. [To a national EPR: comments regarding law proposal 31466]. *Tijdschrift voor Gezondheidsrecht*. 2010;4:264-284. Dutch.

10. Ploem MC, Zwaanswijk M, Wiesman FJ, Verheij RA, Friele RD, Gevers JKM. [Health care providers' trust in electronic information exchange and the national EPR]. Utrecht/Amsterdam: NIVEL/AMC; 2011. Dutch.
11. Kemper AR, Uren RL, Clark SJ. Adoption of electronic health records in primary care pediatric practices. *Pediatrics* 2006;118:20-24.
12. Valdes I, Kibbe DC, Tolleson G, Kunik ME, Petersen LA. Barriers to proliferation of electronic medical records. *Inform Primary Care*. 2004;12:3-9.
13. Vishwanath A, Scamurra SD. Barriers to the adoption of electronic health records: Using concept mapping to develop a comprehensive empirical model. *Health Inform J*. 2007;13:119-134.
14. Van 't Noordende G. A security analysis of the Dutch electronic patient record system. Technical Report UVA-SNE-2010-01. Amsterdam: University of Amsterdam, 2010.
15. Dutch College of General Practitioners. [Guideline adequate record keeping with the electronic patient record (ADEPD)]. Utrecht; 2009. Dutch.
16. Dumay ACM, Haaker TI. The electronic locum record for general practitioners: Outcome of an evaluation study in the Netherlands. *Int J Med Inform*. 2010;79:623-636.
17. De Veer AJE, Francke AL. Attitudes of nursing staff towards electronic patient records: A questionnaire survey. *Int J Nurs Stud*. 2010;47:846-854.
18. Rogers EM, Singhal A. Diffusion of Innovations. In: Salwen M, Stacks DW, editors. *An integrated approach to communication theory and research*. Norwood, NJ: Lawrence Erlbaum Associates; 1996. p. 409-420.
19. Lapointe L, Rivard S. A multilevel model of resistance to information technology implementation. *MIS Quart*. 2005;29:461-491.

BOX AND TABLES

BOX 1. CHARACTERISTICS OF THE PROPOSED DUTCH NATIONAL ELECTRONIC PATIENT RECORD

The proposed Dutch n-EPR can best be regarded as a linkage system, through which a selection of medical data (summary care record) stored in local electronic patient records would in principle be accessible for specific groups of health care providers. Patient data were not stored in a central database, but were exchanged through the National Switch Point (NSP). The NSP held an index record for each Dutch inhabitant, indicating where his/her electronic patient records were stored. Patient data were available to authorised medical professionals 24 hours a day.

To ensure a safe exchange of information, the n-EPR contained technical measures to verify the identity of patients and health care providers. The Citizen Service Number, which is unique for each Dutch citizen, was used to link electronic patient records to individual patients. Health care providers could access the n-EPR by means of a personal ID chip card and password. In principle, access to patient records was restricted to health care providers who were directly involved in providing health care to the patient. All accesses were logged.

The legal framework of the Dutch n-EPR was laid down in the proposed Act on electronic health information exchange. This act obliged health care providers to connect their electronic information system to the national infrastructure. Before being allowed to do this, health care organisations had to fulfil a set of organisational, technical and security requirements. Additionally, health care providers were supposed to communicate their patients' index data to the NSP and make relevant selections of medical data accessible to other health care providers. They were also expected to keep logging data of every form of processing of medical data.

The proposed act also addressed patients' legal position in the context of the n-EPR. Patients had to be informed beforehand about the recording of their index data and could object to this. Once included in the n-EPR, patients could object to further processing of their data at any time. Health care professionals needed their patients' consent before being allowed to consult their medical data. Patients had the right to inspect their record and to conceal, change or delete their record or parts of it. They also had the right to inspect the logging data of their record to see which health care providers had accessed it.

TABLE I. CHARACTERISTICS OF RESPONDENTS (N=17)

	N	%
Health care setting		
Acute care	6	35
Diabetes care	5	29
Ambulatory mental health care	6	35
Function		
GP	7	41
GP assistant	2	12
Psychologist / social worker	2	12
Psychiatrist	2	12
Medical informatics expert	2	12
Other	2	12
Gender		
Male	12	71
Female	5	29