Towards a national implementation of the electronic locum record: Analysis of a regional approach in the Netherlands

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ABSTRACT

New technology enables an increase in the possibilities within the health care industry. Technology can support the exchange of medical data between health care providers, which would result in an improvement of the availability and quality of information. However, many developed countries are making little progress in this field and yet there is a lot to improve upon. This paper will focus on the development of the electronic locum record (ELR), which is used among health care providers to exchange data in the Netherlands. This research includes an analysis of a regional approach of data exchange that proved to be successful in the Twente region. The adoption process will be investigated by analysing several interviews with general practitioners (GPs) and experts in the region combined with a literature review. One important framework that has been used is Rogers' diffusion of innovation theory (1995). This paper analyses the future development of the national service, which has already been established but most of the Dutch citizens are not aware of this, although they have to give permission before their data can be exchanged. Therefore, this paper has identified and described the factors that play an important role in the adoption process of the electronic locum record. Trust, perceived risks and social influence have shown to be important. The role of change agents, type of innovation decisions and monetary incentives have also proved to influence the rate of adoption of the ELR in Twente.

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Keywords

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1. INTRODUCTION

E-Health is a topic that has been mentioned often in the news. The World Health Organization defines e-Health as the transfer of health resources and health care by electronic means.

According to Turan and Palvia (2013), health care spending is increasing in every nation and governments are trying to find more efficient ways to provide health care to their citizens. They state that "IT offers many benefits and can give healthcare professionals a greater ability to streamline and standardize processes, as well as to access, share and analyze healthcare and patient information" (p. 57). Krijgsman and Klein Wolterink (2012) demonstrate that within e-Health, three dimensions could be defined; these are e-care, e-public health and e-care support. E-care covers the primary care such as e-diagnosis and e-therapy. E-public health has to do with prevention and education. E-care support covers the activities, which support the primary care process. It consists of two pillars, which are e-quality and e-management & e-administration. The latter covers several aspects such as e-logistics and e-finance. Another one of them is e-records, which this paper will focus on. There are multiple possibilities within the e-records dimension. For instance, the electronic health record systems or practice management systems for a general practitioner have the highest penetration so far. Iakovidis (1998) notes that these applications are very popular in countries with a strong tradition of primary care such as the UK, Ireland, The Netherlands and Denmark. Europe has been known to adopt information systems in health care and serves as a role model for other continents.

According to Masaud-Wahaishi and Ghenniwa (2009), "a complete electronic medical patient-case file, which might be shared between specialists and can be interchanged between hospitals and with general practitioners (GPs), will be crucial in diagnosing diseases correctly, avoiding duplicative risky and expensive tests and developing effective treatment plans" (p. 1). When zooming in on one country in particular, it has shown that this file has gained a lot of attention in the Dutch media since sensitive patient data is at stake and the development of this file has been criticised. Therefore, the file has not yet been entirely successfully implemented on a national level. However, a service is already provided on a national level via a national switch point (NSP, in Dutch: Landelijk Schakelpunt, LSP). This development does not seem to be well known until now, so it is necessary to investigate what factors are influencing the adoption process of a similar innovation. This paper will research a small success that has been achieved on a regional level. It started off with a pilot study of an electronic locum record (ELR, in Dutch: Waarneemdossier Huisartsen, WDH) in the eastern part of the Netherlands, a region named Twente. This paper will demonstrate the reasons for the success of the ELR in Twente and what knowledge can be provided to other regions so a national implementation could be accelerated. Therefore the following research question has been proposed: "*What are the reasons for the success of the electronic locum record in Twente and what knowledge can be provided to other regions?*"

The paper's findings are of scientific relevance since a lot has been written in the field of e-records, but still many countries are struggling with a successful implementation. This paper combines interviews that have been conducted with several key players in a certain region, applies theories to real life situations, connects to existing literature and can therefore add value.

The structure of the paper is as follows. First, in order to give an insight in the current situation, background information will be given about information systems and several applications that are important. Both patients and general practitioners (GPs) are involved in the adoption process of the national service, the GP is the end-user and the patient has to give permission to exchange data. Since this permission requirement was not yet implemented in the pilot in Twente, Chapter 3 will focus on the adoption process of the ELR in Twente from the GPs' perspective. This will occur by analysing interviews with GPs in Twente that have been conducted by Health Science students at the University of Twente in April 2014. The framework that has been used to analyse the adoption process is the diffusion of innovation theory by Rogers (1995). The reason why this framework has been chosen is because it takes the socio-cultural context into account, which is necessary to get a structural overview of the adoption process of the ELR in Twente since both regional and national parties were involved. Furthermore, the theory is one of the best-known innovation theories in the world. In Chapter 4, the adoption process of the national ELR will be analysed. Literature review has shown that trust and security have been important in the adoption process. In this chapter, the adoption process of the national ELR will be analysed according to several factors that have been identified by Landeweerd, Spil & Klein (2013) since they cover the topics trust and security. Chapter 5 will show the results of interviews that have been held with spokespersons in the region to get an insight in the influence that several organizations have had in the adoption process and to test the importance of the variables that have been mentioned before. Chapter 6 will describe the innovation-decision process by Rogers (1995). The paper ends with a discussion and conclusion, where the reasons for success have been identified. Furthermore limitations and possible future research will be described.

2. BACKGROUND INFORMATION

2.1 Information systems

There are several types of health care information systems (HCIS) that are used in general practices. According to Khan & Visscher (2011) there are approximately ten different information systems that are used in the Netherlands of which four information systems are used the most. These are: Promedico-ASP, Medicom, Mira and MicroHIS 8.5.2. In the Twente region many general practices are connected to an Application Service Provider (ASP), or they make use of a HCIS that works according to the ASP technique. ASP implies that the HCIS and the data that belongs to the HCIS are stored and administered by an external party. When practices make use of Promedico-ASP, Medicom and Mira, their data is stored centrally.

Khan et al. (2011) demonstrate that most GPs in the Twente region are using Promedico-ASP, this is shown in the figure below. Within their research, 96 general practices that are connected to the GPs' service of the region Twente-Oost and Hengelo have been investigated.

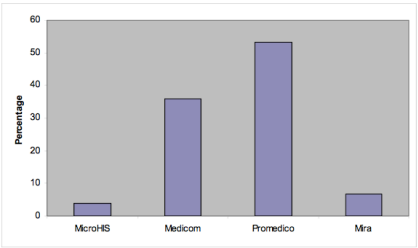

Figure 1. Division of different medical information systems in the region of Twente (2011)[1]

[1] Retrieved from: Khan, N.A. & Visscher, S. (2011)

In 2007, a research commissioned by the Ministry of Health, Welfare and Sports demonstrated that a general practice, connected to an ASP, will earn back the investments that come with the introduction of the ELR, within 5 years. A general practice that administers its own HCIS will hardly earn back any of the money.[2] Therefore it is more profitable to switch to an ASP construction.

2.2 ELR

In the Netherlands, two regions were chosen by the Ministry of Health, Welfare and Sports to perform a pilot of the ELR: Nijmegen and Twente. These regions were chosen because there were already various developments happening in the field of information exchange. A number of GPs already agreed amongst each other to gain mutual access to their systems since they were all using the same HCIS. For example the Medicom system makes use of clusters so every GP that is connected to the Medicom system can have access to files of other GPs. However, when a practice and a general practitioner post, (GPPs, in Dutch: Huisartsenpost) implement different systems, it is not possible to have access to other files. Therefore the ELR was introduced.

The ELR is a service that has been used among general practitioners since June 2005 in the region of Twente. Dumay and Haaker (2010) highlight that the main aim of this service is to give GPs access to "a summary, including the most significant health problems, the most recent records of the patients' visits to the practice, current medication data and information on allergies and intolerances" (p. 625). So when a patient visits a GPP where their own GP is not present, their most important medical history can easily be reviewed. Within the region of Twente, the information was exchanged via a regional switch point (RSP, in Dutch: Regionaal SchakelPunt, RSP) to which GPs could connect. The principle of the service is to have access to a summary of information instead of giving access to the medical file itself. Therefore the attending GP remains the primary owner of the medical file. When another GP has been consulted, these findings can be returned to the primary GP by sending a locum medical note (LMN, in Dutch: WaarneemRetourBericht, WRB), which consists of four themes: activities; consultation report; medication and specific transfer of data. The primary GP can then include this new information in the medical file of the patient that is stored in their HCIS.

2.3 EHR

The pilot study of the ELR was meant to give useful input for a more extensive, national service: the electronic health record (EHR, in Dutch: Elektronisch Patientendossier, EPD). Another pilot study was introduced in the regions of Friesland and Noord-Holland concerning the exchange of medicine history between pharmacies: the electronic medication record (EMR, in Dutch: Elektronisch Medicatie Dossier, EMD). In 2008, the EHR was introduced on a national level by the Ministry of Health, Welfare and Sports. The EHR would be a service that supported the exchange of medical records and medicine history. Patients would have the possibility to make an objection against the exchange of their personal data or they could choose to exclude themselves from participating in the EHR. The EHR received much criticism, especially in terms of privacy and security issues. On 5 April 2011 the Senate rejected the law draft.

2.4 NSP

However, some organizations did believe in the concept of a medical data exchange service. Therefore an umbrella organisation of GPs, pharmacies and hospitals (VZVZ) and the Federation of Patients and Consumer Organisations in the Netherlands NPCF (in Dutch: Nederlandse Patiënten Consumenten Federatie) have been working on a second start by adjusting the development of the NSP.

The NSP was introduced in January 2006 and is a switch point, where GPs, GPPs, pharmacists and medical specialists can connect to with their HCIS. This system is similar to the RSP since it provides information exchange between people. The NSP does not store data itself, but it serves as a link between two systems that are used by health care providers. They make use of a unique health care provider identification (UHPI, in Dutch: Unieke Zorgverlener Identificatie, UZI) card and password that gives them access to system, but they can only request information from patients in the region they are situated in. Every patient is linked to their record by their personal public service number (PPSN, in Dutch: burgerservicenummer, BSN) and the available data consists of personal information such as name, address, date of birth, age and gender. Furthermore, an overview of current medicine use can be reviewed.

A GP treating a patient from another practise also has the option to request data from the medical file such as current health issues, prescribed medicines, known allergies, information about contact with the patient in the past four months and other details that might be important.

The main idea is that patient information can only be shared within the region the health professional is connected to. Hospitals can have access to different regions since patients often reside in an alternate region than the one in which the hospital is situated in. A GP who can prove that he is treating a patient from another region can file a request to gain access to information of a patient who does not reside in the region in which their practice is situated. Since 1 January 2013, Dutch people must give permission to their health care professionals so their data can be shared among the other health care providers in the region via the NSP. From 1 January 2013 on, the ELR service used in several regions via the NSP has been implemented on a national level. On 23 June 2014, 3.95 million Dutch inhabitants had given permission for data exchange via NSP. Currently 82% of all Dutch health care professionals are affiliated to the NSP.[3] The figure below shows the percentage per institution.

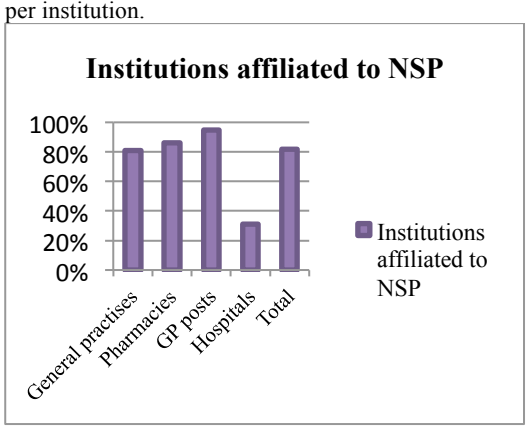

Figure 2. Institutions affiliated to NSP

[2] Ministerie van Volksgezondheid, Welzijn en Sport. (2007). Business Cases Waarneemdossier Huisartsen; Elektronisch medicatiedossier

[3] Current status on 23 June 2014. Retrieved from: https://www.vzvz.nl/page/Zorgconsument/Links/Over-de-VZVZ/Feiten-en-cijfers

3. ADOPTION PROCESS ELR TWENTE

The pilot study of the ELR started in June 2005 in Twente. At first a small group of GPs worked together and gradually it grew into a successful cooperation between GPs in the region. This chapter will analyse what factors have influenced the adoption process of the ELR, by means of the diffusion of innovation theory by Rogers (1995). He mentions five variables that determine the rate of adoptions, which are shown in Figure 3. These variables are: perceived attributes of innovations; type of innovations-decision; communication channels; nature of the social system and extent of change agents' promotion effects.

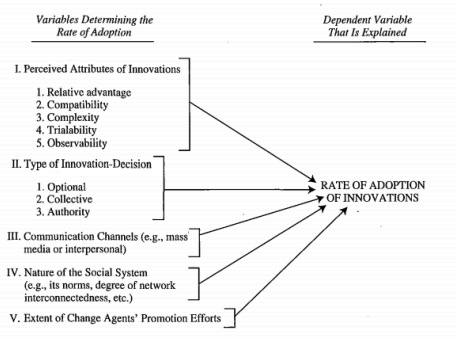

Figure 3. Variables determining the rate of adoption of innovations (Rogers, 1995)

Interviews have taken place with GPs in the region and after analysing the results, several outcomes were established.
The GPs have been categorized on the basis of innovativeness (Rogers, 1971). According to the students who have undertaken the interviews, 30% of the interviewed GPs could be seen as early adopters, 10% could be seen as early majority and 60% could be seen as late majority (N=10).
This chapter will focus, first, on the side of the GPs since the interviews have taken place with GPs. However, the variables type of innovation-decisions and nature of social system have shown to be more related to the governance structure.

3.1 Perceived Attributes of Innovation

When taking the first variable into account that determines the rate of innovation, five perceived attributes of innovation are introduced based on the theory of Rogers (1995). When analysing the interviews that have taken place with GPs in the region, those attributes have been used. Some of the attributes are more applicable than others in the case of the ELR, the attributes trialability and observability are of less importance.

3.1.1 Relative Advantage

Relative advantage is described by Rogers (1995) as "an indication of the benefits and the costs resulting from adoption of an innovation. The sub dimensions of relative advantage include the degree of economic profitability, low initial cost, a decrease in discomfort, social prestige, a savings in time and effort, and the immediacy of the reward" (p. 216). The most important reason why GPs started using a HCIS instead of the paper based medical file achieving method, is the fact that from one point on they could only file online declarations to the health insurance companies. There is a guideline for electronic registration (GER, in Dutch: Adequate Dossiervorming Elektronisch Patiënt Dossier, ADEPD), which supports GPs to fill in their files in the same way as their colleagues, so information is stored on the right place in the file. The method GPs are using is called SOEP which stands for 'subjective, objective; evaluation; plan' (In Dutch: subjectief; objectief; evaluatie; plan). The relative advantage of information exchange between GPs is the fact that they have a more detailed image of a new patient since they have access to the medical history. Therefore, when a patient forgets to mention an important aspect of its disease, this can be looked up via the ELR. Furthermore when a patient has forgotten the name of a medicine, this can also be checked, which saves a lot of time.

3.1.2 Compatibility

The compatibility of the innovation is described by Rogers (1995) as "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (p. 224). The ELR seems compatible with their existing values and past experiences since some of the GPs already gave permission to other GPs in the region to have access to their information systems. It has shown that they already saw the benefit of sharing medical data before the ELR was introduced. The needs of the potential adopters are in this case pushed by technology since the development of the information systems provided new opportunities for the GPs to handle data in a different way. The GPs have pointed out that it has improved the availability of the information.

3.1.3 Complexity

Rogers (1995) notes that the complexity of the system "is the degree to which an innovation is perceived as relatively difficult to understand and use" (p.242). The complexity of the system is related to the adopter categorization that has been mentioned earlier. Some of the GPs who have been interviewed have mentioned that they are used to digitize files seeing as they have only recently started working as a GP. Their private and professional lives are interwoven with ICT tools and they find it easy to adapt to new technologies. They can be categorized as early adopters. Therefore, the complexity of the ELR is lower for them than for GPs who have been used to the paper based system since the start of their career. It is possible to obtain training and some GPs are working together with other colleagues to train their skills. The rate of complexity is higher for this late majority, compared to their younger colleagues. A 2010 research to evaluate the pilot of the ELR resulted in a positive response with relation to the training and instruction in using the ELR that had been offered. The outcomes of this evaluation were as follows: good: 63%; sufficient: 23%; insufficient: 14%.[4]

3.1.4 Trialability

Trialability is defined by Rogers (1995) as "the degree to which an innovation may be experimented with on a limited basis" (p. 243). Since the participation of GPs in the ELR project was on a voluntary basis, it can be said that the trialability is high. According to Rogers (1995): Relatively earlier adopters of an innovation perceive trialability as more important than later adopters do.

3.1.5. Observability

Rogers (1995) states that the observability "is the degree to which the results of an innovation are visible to others" (p. 243). Since the privacy issue has been discussed frequently, the observability of the data itself should not be very high in order to conciliate with the Dutch citizens. Therefore the data exchange within the ELR has been arranged on a regional level with limited boundaries.

[4] Retrieved from: Dumay, A.C.M. & Haaker, T.I (2010)

3.2 Type of Innovation-Decisions

According to Rogers (1995) "The more persons involved in making an innovation-decision, the slower the rate of adoption. One means of speeding the rate of adoption of an innovation is to attempt to alter the unit of decision so that fewer individuals are involved" (p. 206-207). The start of the ELR pilot in Twente was an authority innovation-decision, driven by the fact that some GPs in this region were already co-operating, hence the Ministry saw potential in developing this further. However, in Twente, regional organizations have been responsible for the development of the service, which speeded up the decision-making processes.

3.3 Communication Channels

The third variable introduced by Rogers (1995) is the communication channel used to diffuse the innovation. He demonstrated that "if an inappropriate communication channel were used, such as mass media channels for complex new ideas, a slower rate of adoption resulted" (p. 208). The national association for GPs LHV (in Dutch: Landelijke Huisartsen Vereniging) has 23 regional subdivisions. Communication between the regional and national level happens via a national board in which all regions are represented. One of these subdivisions focuses on the Twente region, which is the society of GPs in Twente (In Dutch: Huisartsenkring Twente, HKT). In Twente, 330 GPs from 256 general practices are connected to the HKT. The board of the HKT consists of five persons who are responsible for the communication with the GPs in the region. According to a GP from Enschede, the HKT is very active and involves its members more often compared to some of the other subdivisions.

3.4 Nature of the Social System

Rogers (1995) defines "the nature of the social system, such as the norms of the system and the degree to which the communication net- work structure is highly interconnected, also affects an innovation's rate of adoption" (p. 208). The social system related to the ELR consists of health care professionals, patients, companies and institutions in the ICT and health care industry and the Dutch government. The common goal is to decrease the amount of mistakes made within the health care sector by increasing the quality of information exchange. The social and communication structure can be described as units in a system. The Ministry of Health, Welfare and Sports is involved from the government's side. Furthermore the national institute of ICT in health care Nictiz (in Dutch: Nationaal ICT Instituut in de Zorg) is involved. IZIT is the regional organisation that is responsible for the development of the ICT structure in health care in Twente. The GPs in Twente are represented by the HKT and the patients are represented by the NPCF. In Twente, the social system is highly interconnected since IZIT has set up a task group that focused entirely on the development of the ELR in Twente. HKT and some other regional organizations have participated in this task group.

3.5 Change Agents' Promotion Effects

According to Rogers (1995), there may not be a linear and direct relationship between rate of adoption and change agents' efforts. The greatest response to change agent efforts occurs when opinion leaders adopt this. Afterwards, the innovation will then continue to spread with little promotion by change agents, after a critical mass of adopters is reached. In this case, opinion leaders are persons who communicate with GPs in their region. There are three GPs in Twente who have been involved in the prior stages of the development of the ELR, since they were already interested in the possibilities of ICT in health care. They can be seen as early adopters and opinion leaders since they have been working with the service from the start.

4. ADOPTION PROCESS NATIONAL ELR

Rogers (1995) demonstrates that the tipping point is marked by opinion leader adoption. Well-informed opinion leaders communicate their approval or disapproval of an innovation, based on the innovators' experiences, to the rest of the social system. The majority responds by rapidly adopting this system. Several factors play a role when analysing user adoption. Chapter 3 has focused more on the user adoption from the GPs' side. However, it has shown that the national EHR failed due to unclear communication about the service, which resulted in the Senate voting against the law draft. Van der Linden, Kalra & Hasman (2009) state that privacy and security issues play an important role in the national implementation of EHR in the Netherlands. Therefore how the future adoption process of a national service could be improved when taking these factors into account should be investigated. Landeweerd, Spil & Klein (2013) identified nine factors that can influence e-commerce adoption. These are: perceived compatibility; perceived usefulness; perceived usability; information quality; service quality; system quality; perceived risks; trust; social & personal influence. Some of these factors have already been covered in combination with the theory of Rogers (1995) in Chapter 3. However, when analysing the important issues that play a role in the future adoption process on a national level, some of the remaining factors can be used. The first factor is trust, which is related to privacy and is important for both the GPs and the patients, since patients have to give permission from 1 January 2013 on. The second factor is perceived risks, which is also related to trust since higher trust can reduce perceived risks. The third factor is social influence, this factor has shown to be more applicable concerning the adoption process of GPs.

4.1 Trust

Hoffman and Söllner (2012) state that current research conducted in the disciplines of computer science and in the behavioural sciences has recognized trust as a factor of major importance in system design. They developed an exemplary model in which three dimensions play a role: performance, process and purpose.

According to a research commissioned by NPCF in 2009, the main reasons why people raised objections towards the EHR in 2009, were privacy (48%), availability of data to everyone (47%) and security and safety of the system (32%). Only 6.4% of the respondents did not want to give permission to exchange their medical data via the EHR, so the purpose was clear to most of the Dutch citizens. However, the communication by the Ministry of Health, Welfare and Sports was not clear enough concerning the competence and reliability over time in the performance dimension. It was not entirely clear how this EHR would work and who would have access to which data.[5]

The research that has been mentioned above also showed that the main reason why people in the Netherlands would not give permission to exchange their medical data was their fear of violation of privacy (51.7%) and fear of misuse (17.2%) but only 4% of the respondents (N=723) would make use of this right to block the exchange. The reason why patients did not make use of their rights to hold back the exchange of their

[5] Retrieved from: Thiel, van L. (2009). *Evaluatie Elektronisch Patientendossier (NPCF)*

medical data or to look into the medical file was because they trust their GP (77%). The next reason was because holding back information could harm their health (23.7%).[6]

Therefore it is seen that trust is an important factor that should be taken into account. Communication is a key word so patients know what to expect of the system because sensitive medical data should be protected and with it the patient's privacy.

There has been research into the different ways of informing patients about the introduction of the ELR in the Twente region. Three methods have been chosen to inform the patients. One of them was to send out brochures; the second one was to send out a personally addressed letter from the GP and a brochure; the third option was to receive a letter with the same content as the personally addressed letter. Furthermore, posters have been put up in every general practice. A website was developed where information was available and an article was published in the regional newspaper Tubantia. According to the results of this research, which are shown in Table 1, the patients that received a personal letter and a brochure felt the most informed (91.5%) and the patients that received only the brochure felt the least informed (82.9%).[7]

Table 1. Reach of education material identified for several methods (2005)

	Personal letter and brochure n=268 (%)	Brochure n=221 (%)	Letter n=234 (%)	Total n=723 (%)
Read a poster during GP visit	16.0	8.6	10.7	12.0
Read an article in regional newspaper	52.2	34.8	42.3	43.7
Saw or read brochure	75.1	55.5	55.5	62.8
Received and read brochure	63.1	46.6	-	51.8
Received and read letter	81.1	-	65.3	73.9
Read no material	12.1	41.4	26.5	25.5

4.2 Perceived Risks

Fragopoulos, Gialelis and Serpanos (2008) state that some of the most significant threats for pervasive health care environments are "(a) non-authorized access to patient's medical data, that is, a nurse and a doctor must have different authorities and access control to medical data; (b) intentional alteration of medical data, thus leading to incorrect diagnosis and patient's treatment; (c) disclosure of medical data to third parties (e.g., to insurance companies, or any third parties that may use such records to gain profit aiming to increase their revenue)" (p. 3).

Therefore certain requirements should be set to overcome these threats. Following van der Haak, Wolff and Brander (2003), there are five fundamental objectives that should be taken into account when exchanging medical data. These are: confidentiality; integrity; authentication; accountability; availability. The next section will describe how the five objectives cover the threats mentioned above in relation to the current service of the NSP.

4.2.1 Confidentiality

Concerning threat one, the data is only accessible to health care providers who are living in the same region as the primary GP and who are treating the patient. The NSP meets several requirements from laws that are connected to privacy, such as the Dutch Data Protection Act (In Dutch: Wet bescherming persoonsgegevens, Wbp) and the Dutch Medical Treatment Agreement Act (In Dutch: Wet op de geneeskundige behandelingsovereenkomst, WGBO).

4.2.2 Integrity

The second threat, intentional alteration of medical data, is less applicable since only the main GP has editing rights in the medical file of the patient, GPs that have requested information of a certain patient only receive a summary of the medical history. They can send a message with comments to the main GP who can include this in the medical file.

4.2.3 Authentication

Concerning threat one and three, only people who own a personal UHPI card can access the data. People can only apply for this card when they fulfil certain requirements such as a medical education. The card is set to read-only, therefore no data can be written on it. It serves as an identification card for GPs, pharmacists and medical specialists and comes with a pin code.

4.2.4 Accountability

The NSP has implemented an option so patients can check who has made their data available and who has accessed this data. Since everyone who wants to access this data needs to make use of an UHPI-card, the system registers automatically who has consulted which data on what moment. This is a requirement that is also suggested by Haas and Wohlgemuth (2010), they state "patients may inspect their logs of the securely logged access requests and check their completeness and correctness by checking the behavior of the EHR system. Legitimately disclosed data is tagged with a watermark to link it to the data consumer" (p. e30). This serves as a solution to the first and third threat.

4.2.5. Availability

GPs, pharmacists and medical specialists can only get access to this information when the patient has given permission for data exchange via the NSP. The patient cannot get access to the summary. However, the patient does have the right to look into its own file, so a GP should give the patient the possibility to check the data upon demand. This also covers threat one and three.

4.3 Social Influence

According to Kijsanayotina and Pannarunothai (2008), social influence (SI) is defined as the degree to which an individual perceives that important others believe he or she should use health IT. It is assumed that individual's behaviour is influenced by the way in which one believes others will view this person as a result of having used health IT. Fleuren, Wiefferink and Paulussen (2004), mention four determinants that include social influence. Support from colleagues and other health care professionals would facilitate the implementation of the innovation. Furthermore, greater support from higher management or supervisors in the department or organization with respect to the implementation of the innovation could facilitate the process. Simultaneously, little support from each of these four groups would impede the implementation of the innovation. When GPs meet each other they can exchange their experiences and motivate each other when they have experienced working with the ELR in a positive way. They can learn from each other, this was also mentioned during an interview with a GP from the Twente who considered himself an early adopter and could therefore help his colleagues who had difficulties with the information system. Especially in general practices where more than one GP is employed, social influence plays an role since they need to use the same system and tools to ensure a good cooperation.

[6] Retrieved from: Thiel, van L. (2009). *Evaluatie Elektronisch Patientendossier (NPCF)*

[7] Retrieved from: *Resultaten autorisatiepilot WDH in Twente* (2005). (NHG, Nictiz, KNMG, NPCF)

5. EXPERTS' VIEW

When analysing the national implementation of the ELR it shows that the regional service that has been used before, offered the same service as the NSP is providing right now on a national level. This is caused by the fact that the RSP, where the ELR was connected to in the beginning has been replaced by the NSP.

Several parties are involved in the development of the regional and national services. This chapter will present the results of interviews with spokespersons from different organizations in the region to investigate the influence of the variables that have been mentioned before. The interviews are held in Dutch and are afterwards translated by the author from Dutch to English. There are transcripts and recordings available. The chapter ends by describing the features of the NSP that are displayed according to a model that has been developed by the national institute of ICT in health care, Nictiz.

5.1 IZIT

IZIT is an organisation that is responsible for the development of the ICT structure behind the information exchange between health care providers in the region of Twente. There are six other regional organisations in the Netherlands, which are working together with IZIT to provide important input to Nictiz. IZIT has been involved with the development of the ELR in Twente and is right now focussing on another project: ZorgNetOost. This is a project that moderates the communication and information exchange between various health care providers in the region. An interview has taken place with Renie Heerbaart, director of IZIT to get an insight in the regional view on the development of the ELR in the Netherlands.

Mrs Heerbaart, has been involved in the development of the ELR and ZorgNetOost since she is working for IZIT since 2004. She also represents the region of Twente during national meetings with Nictiz and other regional organizations. According to her, there are two types of information exchange. These being push and pull. When information is exchanged between two people, for example when a GP refers a patient to a medical specialist (e-referring), this can be described as push. The GP knows who is receiving the information and the patient has given implicit permission to exchange information since both know what the next steps in the treatment process are. When the GP is registering the files into the NSP system, it is not known who will access this information at what time, since the primary GP cannot predict when a patient will visit another GP. Therefore this is classified as pull and explicit permission of the patient is needed. The services that ZorgNetOost is currently providing can be classified as push.

Mrs Heerbaart mentions the importance of the regional organizations; trust is a variable that plays a very important role within information exchange. GPs have to get used to the fact that their colleagues can see what they have noted down; they are offering a look in their own backyard. But they see the benefits of this service and therefore, when they have been given the opportunity to organize their files in the right way; they are willing to connect to the NSP. In Twente, GPs were already used to exchanging information and therefore she thinks that it has been more accessible to start using the ELR. According to Mrs Heerbaart, both advantages and disadvantages exist concerning the national implementation of the ELR. Because more parties are involved, decision-making is taking more time and regional interests are not always taken into account. One example is the exchange of information concerning e-reference, this cannot be handled via the NSP; this has to be solved via a regional service in Twente. However, because of the national approach, more money is available to develop higher security standards and build a better ICT structure.

Mrs Heerbaart highlights that the success in Twente was the result from several factors. One important factor that should be taken into account is the fact that the health insurance company Menzis provided a subsidy to IZIT, which IZIT used to pay for the instalment of the tools that were necessary when a general practice connected to this server.

Social influence does not seem to be very important since, according to Mrs Heerbaart, GPs follow their own opinion and will not be greatly influenced by other parties. She mentions the three GPs that have been involved with the start of the ELR. She believes that some people could rely more on their opinion since they are more experienced within the project. Concerning the risks involved, a system can be very safe but as soon as people are involved, it can never be 100% safe. Mrs Heerbaart does believe that the current system is as safe as possible. Of course it could always happen that a GP wants to do harm or a GP stores his password and UHPI card in an unsafe place. However, this is hard to prevent within a system where human beings are involved.

When looking at the future of e-records, Mrs Heerbaart thinks that the ideal situation would be patients taking care of their files themselves. They should have the controlling rights of the file and they should be able to decide who has access to their information. Within the current system, patients can give permission to their GP, but the GP decides if he wants to connect to the NSP not. The umbrella organizations decide who can connect to the NSP. Therefore the patient does not have much power and she hopes to see this changed in the future.

5.2 LHV Twente

LHV has been mentioned before in Chapter 3 as the national association for GPs. One of the regional subdivisions within this organization is located in the Twente region: HKT, which has a local board that is responsible for the regional policymaking and communicates with all GPs in this region. An interview has been conducted with Jan Anne Wind, who is the chairman of this local board. The aim of this interview was to investigate the influence of the regional subdivision on the adoption of the electronic locum record.

Mr Wind has been the chairman of HKT since 2008. The main aim of this organization is to maintain relationships with the national organization. They represent the region of Twente in meetings and they coordinate the communication between several parties. Furthermore they play a role in the continued education and the handling of complaints.

When asking about the contribution of HKT to the adoption process of the ELR, Mr Wind mentions that some of their members participated in a task group that was established by IZIT to work on the development of the ELR. HKT has chosen not to be a member anymore since IZIT changed its structure into a shareholder structure, but they are still actively involved by giving advice. The success of the adoption process depends on many factors divided over various levels. However, one of the main reasons according to Mr Wind is the fact that several municipalities in Twente decided that GPs should use one HCIS. When GPs are using the same HCIS, clusters can be formed, for example with Medicom in Hengelo and Promedico in Enschede. When making use of the same system, all files can be shared between the GPs who are in this particular cluster. Therefore the GPs were already used to sharing information. Mr Wind also mentions that when Airport Twente closed in 2003, more money became available for innovation in the region. A

part of this money has been invested in the development of a good ICT structure in health care.

The HKT has been providing a lot of training when the ELR started; especially the GER guidelines that are related to filling in the files according to specific standards have been explained thoroughly. Currently not much training is offered since most GPs are already used to working with the several systems.

Mr Wind thinks that the advantage of the national implementation of the NSP is the security of the system. The system is better protected than the systems that have been used in the region before, such as the regional server ELS (in Dutch: eerstelijns server), which is still in use by some GPs. A disadvantage is the slow pace of decision-making processes; everything has to be organized on a national level so it is difficult to adapt quickly to new innovations. One of the requirements that the HKT has put forward is the regional organization of the NSP. Data should only be shared on a regional level.
Concerning the variable trust, Mr Wind believes that this plays a very important role. The regional organization of the NSP feels safer to most patients since their data is not shared on a national level. Furthermore, GPs in the region were already used to trusting each other and sharing information; this should be one of the reasons why the adaption process came along so successfully.
The social influence is of less importance but Mr Wind tells that the members of HKT are very engaged. They are very critical towards their profession and therefore very interested in new innovations. They work together with an enthusiastic team, therefore it is easier to take up a project.
The perceived risks are important, since it can delay or speed up the process. Mr Wind mentions that the opt-in caused a set back in the adoption process. Every patient has to give permission, which caused a lot of extra work for the GPs and it also delayed the process since the patients were not connected to the system automatically. Mr Wind thinks the risks have decreased since the NSP has been introduced because the system is better protected.
As for the future, Mr Wind notes that technology will keep offering new possibilities, which will increase the user comfort. Currently he can already have access to files on his tablet when he is a visiting patient at home. It would be great if patients could have easier access to their data, but Mr Wind does not feel comfortable about patients filling in their own files since there is a danger that this will be very subjective. Medical relevant matters should be noted down, although they can be embarrassing. However, he only supports that fact that people are more involved in their treatment process, but this also requires a certain responsibility.

5.3 NICTIZ

NICTIZ is the national institute for ICT in health care and is responsible for collecting national and international data related to ICT-standards in health care. They have developed several standards that ICT-providers have to meet in order to deliver a secure health care information system. These standards enable the interoperability between various organisations and systems; one of them is the NSP. NICTIZ makes use of a model that consists of five interoperability levels, which need to be taken into account within the cooperation between health care providers when they exchange information. These levels are organisation; care process; information; systems; infrastructure & technology. This model will be used to describe the current service of the NSP. An info graphic with more detailed information can be found in Appendix B.

5.3.1. Organisation

GPs, GPPs, pharmacists and medical specialists are authorised to connect to the NSP. The parties that are responsible for the privacy and information security policy are: CBP (In Dutch: College Bescherming Persoonsgegevens) and IGZ (In Dutch: Inspectie voor de Gezondheidszorg).

5.3.2. Care process

Data is stored in a file in the HCIS of a GP. Data from this file can be shared via the NSP by displaying a professional summary. Only the PPSN is saved in the NSP, which connects the right information to the right patient.
There are six steps in this process:

1. GP connects to NSP
2. Patient gives permission
3. GP registers patients by making use of the PPSN
4. Health provider uses PPSN to request information via NSP
5. Health provider receives information of patient via NSP
6. Health provider can send a retour message to the main GP so information to file can be added

Data is exchanged when a patient visits someone who does not have a medical file of this patient yet. This health provider can then request information via the NSP to get an insight in the medical history of the patient. Permission from the patient is required. An example form that can be used can be found in Appendix C.

5.3.3. Information

The data set that health care providers have access to after requesting information consists of:
Personal data such as name, address, date of birth, age, gender and an overview of the medicines that are used by the patient.
Additionally, a GP can review a professional summary. This consists of:

- Current health problems
- Prescribed medicines
- Known allergies
- Information about contact with the patient in the last four months/ five most recent contact moments
- Other details that can be of importance

This data set is administered by the primary GP. Only this GP can execute changes in the file. It is only possible for health care providers who are treating a certain patient to request information of this patient. Everyone who has requested information can be traced back since this is monitored.

5.3.4. Systems

The security measures consist of a Good Health care Information System Maintenance Practice (GHISMP, in Dutch: Goed Beheerd Zorgsysteem, GBZ). Every health care provider who wants to connect to the NSP requires a secured and qualified information system, referred to as QHIS and a qualified care service provider (QCSP, in Dutch: Zorg Service Provider, ZSP) that connects the system to the NSP. People can only have access to the system when they make use of their UHPI-card and the corresponding password.

5.4.5. Infrastructure and Technology

As Dumay et al. (2010) demonstrate: “An HCIS is qualified to link to the NSP only when it complies with a system-to-system interoperability standard for exchanging HL7 vs. 3 messages and also complies with the Dutch standard NEN 7510 for information security” (p. 624).

6. INNOVATION-DECISION PROCESS

This chapter will describe the innovation-decision process of technology adoption by Rogers (1995), which is shown in Figure 4. The aim of this chapter is to give an insight in the innovation-decision process from the GPs' perspective since they are the users of the system and they have to make the decision to adopt or reject the innovation. They have the choice to connect to the NSP or not.

The knowledge stage is the first stage, and covers the understanding and perceptions of ELR by the users. GPs in Twente are aware of the ELR by now since it has been introduced in 2005 and the HKT has organized several meetings and trainings. The second stage, the persuasion stage, covers the variables by Rogers (1995) that have been mentioned in Chapter 3. It describes the attitudes towards and the usefulness of the ELR. These variables influence the decision of the user to adopt or reject the innovation. This happens in the third stage, the decision stage. Figure 4 shows that in the decision stage users could choose to reject the innovation in the beginning stage, but later decide to adopt the innovation.

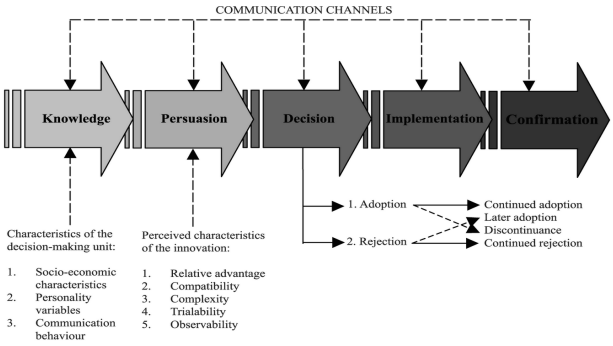

Figure 4. Rogers' innovation-decision process of technology adoption (1995)

During the implementation stage, innovations can be re-invented to speed up the decision making process of the remaining part of the users. This is also shown within the development of the NSP, when it became clear that the EHR, although people were supporting the purpose, failed to meet certain requirements, the service evolved by changing certain features that caused criticism within the EHR. One example is the decision to exchange data only on a regional level instead of on a national level. This is similar to the ELR that was used in Twente and this regulation has been promoted by the HKT. Another example that has to be taken into account is the opt-in arrangement. Since 1 January 2013, patients have to give permission if they want their data to be exchanged via the NSP. Therefore, instead of all patients being automatically connected to the system until they request to be removed from the system, GPs have to inform their patients and connect every individual to the system manually after they have given permission. This could influence the decision making process since it could decrease the relative advantage due to more work.

In the confirmation stage, people finalize their decision regarding the adoption of the technology. There are two options: adoption and reversal. In the case of the ELR, GPs can choose to adopt the system and connect to the NSP after fulfilling the requirements that are mentioned in Chapter 5 or they can choose to reject the innovation and not connect to the NSP.

7. DISCUSSION

As mentioned before, the ELR pilot study started in 2005 and proved to work in the Twente region. This project provided input for the national development of the EHR, but the national implementation has been unsuccessful and caused some problems related to privacy, security and trust. Dutch citizens have become more cautious and the government demanded a more transparent communication with regard to the final product.

7.1 Current Status NSP

Currently, many institutions in the Netherlands are connected to the NSP. Also, as mentioned in Chapter 4, only a small amount of people would not exchange their data since they were afraid of several privacy related issues. However, according to VZVZ only 23.5%[8] of the Dutch population has given permission to exchange their data via the NSP. Mrs Heerbaart mentioned that in April 2014, 49% of the patients in Twente were connected to the system. She also mentioned that it is important to take into account that however 49% of the patients were registered, the rate of information that was asked for and received by GPs was 80%. She explained that people with a complex medical history, who are visiting their GP more often than other people, are more aware of the benefits that are related to the availability of their records and have a tendency to give permission to exchange their data more frequently.

7.2 Study Limitations

This paper has been focusing on the Twente region and therefore only GPs from this region have been interviewed. An interview with the regional subdivision of the LHV has been held to hear about their experiences and their influence on the adoption process. This has not been done in other regions since the paper was focussing on the reasons why the system in Twente has proved to be successful but this also means that it has not been investigated how other subdivisions are managed and how other GPs think about the system. Additionally, an interview has taken place with the director of the regional organization of ICT in health care in Twente. There have no interviews taken place with employees of similar institutions in other regions, which could be used to compare the different opinions. Furthermore, employees of Nictiz have been contacted frequently but in the end nobody was willing to answer any questions. Therefore, the opinion of a person who operates on a national level is missing. This study has focused on the adoption process in the Netherlands, which was within the scope of the assignment, but therefore it limits the generalizability of the findings, since it has not investigated the adoption process in other countries.

7.3 Influencing Factors

When comparing the outcomes of the interviews with the variables that have been mentioned in literature it shows that several variables of Rogers (1995) and Landeweerd et al. (2013) have proven to be important in this case. Friedman and Iakovidis (2009) demonstrate that the success of establishing a network to exchange health information depends on the ability to protect personal data and the trust of people that will result from this ability. This covers both factors trust and perceived risks as demonstrated by Landeweerd et al. (2013). It shows that both are very important in the adoption process.

The first factor trust is important for all people involved in the adoption process. GPs have to trust each other since they are exchanging sensitive data and they should make use of guidelines to fill in their files in the same way as their colleagues. Dumay and Haaker (2010) demonstrate that

[8] As calculated on 29-06-14. Retrieved from: https://www.vzvz.nl/page/Zorgconsument/Links/Over-de-VZVZ/Feiten-en-cijfers & http://www.cbs.nl/nl-NL/menu/themas/bevolking/cijfers/extra/bevolkingsteller.htm

"Uniform registration of patient information is imperative for nationwide implementation of the EHR" (p. 632). The patients should also be taken into account in this matter, although most of them are not against the exchange of their medical data but they have to be aware of the latest developments. When patients are better informed about the system, they have a tendency to trust the system more so they will give permission to exchange their data. Currently, people have several possibilities to give permission, they can do it online or via a paper form.

The second factor perceived risk is related to trust since greater trust can reduce perceived risks. Van der Haak, Wolff and Brander (2003) mention five objectives that should be met in order to provide a safe system. These are: confidentiality, integrity, authentication, authority and availability. Experts have confirmed that the data needs to be protected in the best way possible, even though it is not a fully automated system and therefore it can never be 100% safe. The website of the NSP offers an insight in the requirements that a general practice has to fulfil in order to connect to the NSP and experts have proved to be positive about the security regulations.

According to the interviews with experts, the factor social influence does not play a very big role in the adoption process since GPs have their own practice and they try to do what is best for their own corporation. However, the experts mention the influence of a few GPs in Twente who have put a lot of effort in the development of the ELR and are seen as opinion leaders by most of their colleagues. Yee, Millis and Airey (2008) argue that generation Y (born after 1978) professionals may be the change agents for health information technologies (HIT) implementation in health. This also covers the variable change agent's promotion effects by Rogers (1995). The interviews with GPs have shown that young colleagues are able to help their older colleagues when they have difficulties with adapting to the new system.

Rogers (1995) defines "One means of speeding the rate of adoption of an innovation is to attempt to alter the unit of decision so that fewer individuals are involved" (p. 207). In the case of the EHR in the Netherlands, the whole Ministry of Health, Welfare and Sports was involved, including the minister himself, being the spokesperson of the project. The post-evaluation of this project has shown that this has not been successful since too many parties were involved on a national level. During the second start that focused on the development of the NSP, lead by a board consisting of people from different organizations, decisions could be made much quicker since the government was less involved in the decision-making process. The outcomes of the interview with experts have shown that the national decision-making processes are moving very slow and regional interests are not always taken into account. However, there are more resources available to invest in a better ICT structure. Therefore, within a national implementation it is recommendable to use information that is present in every region, and appoint regional opinion leaders to guide the innovation.

Another important factor that has been mentioned in both interviews is money. According to Rogers (1995) "Incentives are direct or indirect payments of either cash or in kind that are given to an individual or a system to encourage some overt behavioral change. Often, the change entails the adoption of an innovation" (p. 219). In Twente, a health insurance company and municipality have provided subsidies to increase the quality of the ICT structure and compensate the corresponding installment costs.

7.4 Directions for Future Research

It would be recommendable to investigate how organizations in other regions of the Netherlands are operating to analyse the different working methods and influencing factors compared to what has been investigated in the Twente region. Additionally, it would be recommendable to investigate why currently not many people are not registered to the NSP and how this could be improved. Furthermore, several people have mentioned the personal patient file when asking about the future of EHR in the Netherlands. GPs and experts think that patients should have more access to their file and some even think that they should be able to update this information by themselves. Therefore it would be recommendable to investigate the possibilities of this approach to see how this could work in cooperation with the current systems.

8. CONCLUSION

The intention of this paper was to answer the following research question: "*What are the reasons for the success of the electronic locum record in Twente and what knowledge can be provided to other regions?"*

At the time of writing this paper many developments are taking place and one can only predict what the status in the near future will be.

This paper has shown that trust is an important factor. Since GPs in Twente already noticed the benefits of exchanging data, some co-operation had already taken place, which facilitated the introduction of the ELR. Patients should trust the system, as mentioned in Chapter 4, several methods can be used to inform patients. The method that has proven to be the most successful in Twente is sending a personal letter and a brochure to every household.

A successful adoption should take several perceived risks into account. Since sensitive information is at stake, the security of the privacy of the patients should be guaranteed. The system in Twente started via a regional switch point and therefore boundaries were built in automatically. However, since the NSP has been used instead of the RSP in Twente, the security of the system has improved because more resources have been available to develop a safer system.

Social influence does not play a very important role in the adoption process. However, the importance of opinion leaders should be taken into account since they can influence the people who are involved in the adoption process. In Twente, there have been a few GPs that have been involved since the start of the ELR and their opinion matters to most of their colleagues.

When taking the variable innovation decisions into account, it has shown that the more persons are involved in making an innovation-decision, the slower the rate of adoption in the development. The Ministry of Health, Welfare and Sports made the decision to start with the pilot study in Twente, but the project itself was taken up by regional organizations such as IZIT. This proved to be successful.

Furthermore, incentives have proved to influence the adoption process. In Twente, the installment costs have been compensated, therefore the relative advantage increased.

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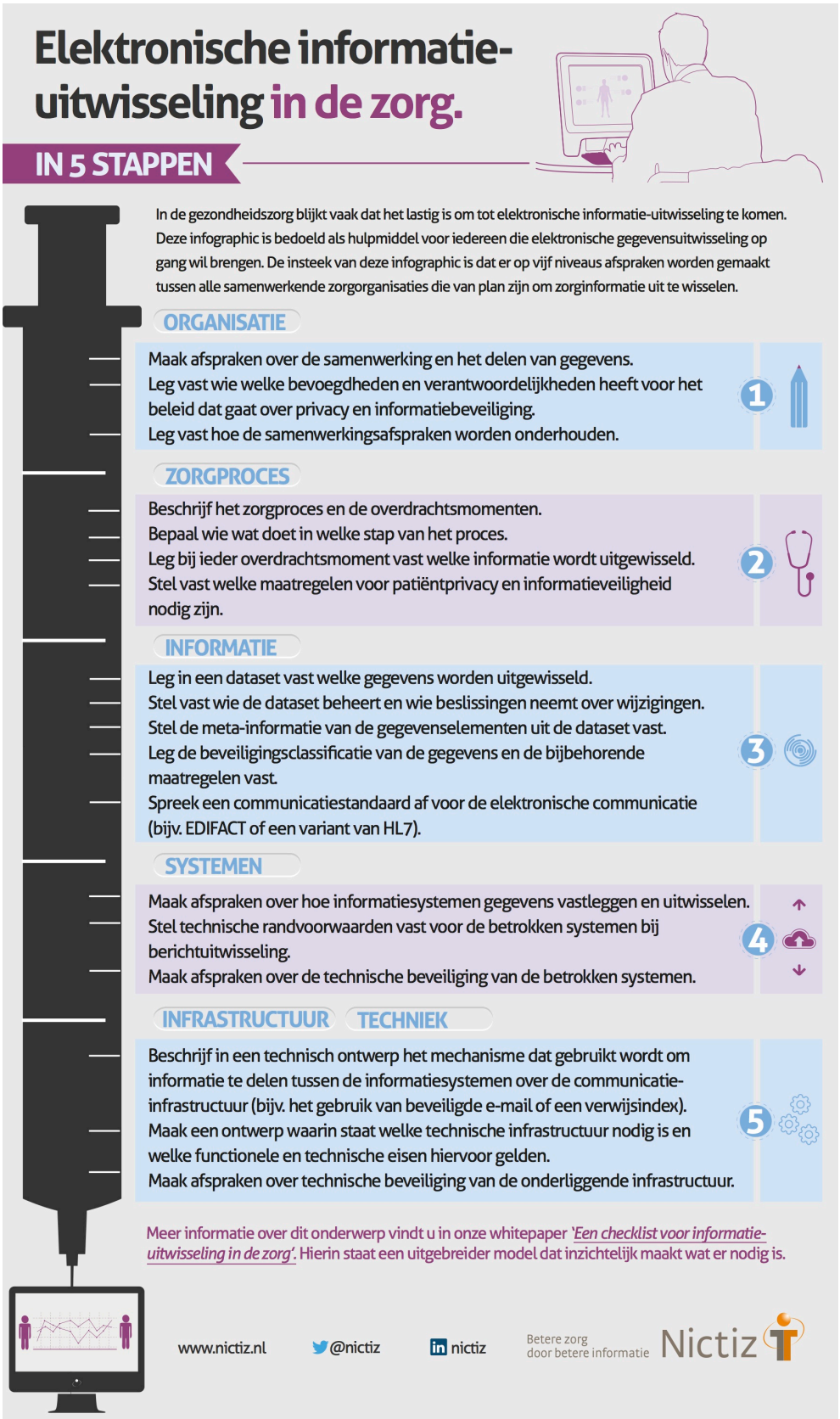
10. APPENDIX

A. List of Abbreviations

Abbreviation	Explanation	Dutch terminology
CBP	College for protection of personal data	College Bescherming Persoonsgegevens, CBP
EHR	Electronic health record	Elektronisch Patienten Dossier, EPD
ELR	Electronic locum record	Waarneemdossier Huisartsen , WDH
FLS	First line server	Eerste Lijns Server, ELS
GER	Guideline for electronic registration, a standard for correct registration in the EHR	Adequate Dossiervorming met het EPD, ADEPD
GHISMP	Good healthcare information system maintenance practice	Goedbeheerd Zorgsysteem, GBZ
GP	General practitioner	Huisarts
GPP	General practitioner post	Huisartsenpost
HKT	Society of GPs in Twente	Huisartsenkring Twente, HKT
IGZ	Inspection in health care	Inspectie voor de Gezondheidszorg, IGZ
LHV	National association for GPs	Landelijke Huisartsen Vereniging, LHV
Nictiz	National institute of ICT in health care	Nationaal Instituut ICT in de Zorg, Nictiz
NIVEL	Dutch institute for research in health care	Nederlands instituut voor onderzoek in de gezondheidszorg, NIVEL
NSP	National Switch point	Landelijk Schakelpunt, LSP
PPSN	Personal public service number	Burger Service Nummer, BSN
QHCIS	Qualified information system	Gekwalificeerd informatie systeem, XIS
QCSP	Qualified care service provider	Zorgservice provider, ZSP
UHPI	Unique health care provider identification	Unieke Zorgverlener Identificatie, UZI

B. Info graphic Electronic information exchange in health care. Retrieved from: http://www.nictiz.nl/module/360/727/Infographic_gegevens-uitwisseling.pdf



C. Example form that can be used to give permission to your GP in order to register your data to the NSP. Retrieved from:
http://zorgnetoost.nl/uploads/Registratieformulier_Huisarts_Opt-in_regionaal.pdf

TOESTEMMINGSREGISTRATIE FORMULIER PATIËNTEN

(bij 'Informatiefolder gegevensuitwisseling patiënten' Folder ID: optinregionaalv1.0)

☐ Ja, ik ga akkoord met het beschikbaar stellen van mijn gegevens voor raadpleging door andere zorgaanbieders, zoals in de informatiebrochure beschreven.

☐ nee, ik ga niet akkoord.

Naam:	
Adres:	
Geboortedatum:	
Huisarts:	

Als u kinderen heeft tot 16 jaar die onder uw gezag staan kunt u onderstaande invullen voor zover gewenst en van toepassing.

☐ Voor mijn kinderen tot 16 jaar geef ik hierbij ook toestemming voor het beschikbaar stellen van hen betreffende gegevens voor raadpleging door andere zorgaanbieders, op de wijze als in de informatiebrochure beschreven.

De kinderen waarvoor ik de toestemming verleen zijn:

Naam:	
Geboortedatum:	
Naam:	
Geboortedatum:	
Naam:	
Geboortedatum:	
Naam:	
Geboortedatum:	

Kinderen tussen 12 en 16 jaar vullen ook een eigen formulier in, overeenkomstig de wettelijke eisen. Zowel de toestemming van uw kind als van u is dan nodig. Kinderen vanaf 16 jaar vullen alleen een eigen formulier in.

Datum + plaats:	
Handtekening:	

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