Collaboration and the Knowledge Economy: Issues, Applications, Case Studies
Paul Cunningham and Miriam Cunningham (Eds)
IOS Press, 2008 Amsterdam
ISBN 978–1–58603–924-0

eAdoption in Practice: Case of the Dutch Electronic Out-of-hours Record

Mildo VAN STADEN[1], Pieter VERHAGEN[1], Timber HAAKER[2]
[1]TNO Information and Communication Technology,
Brassersplein 2, 2628 VK Delft, The Netherlands
Tel: +3115 285 7249, Fax: +3115 285 7382,
Email: mildo.vanstaden@tno.nl, pieter.verhagen@tno.nl
[2]Telematica Institute, Brouwerijstraat 1, 7523 XC Enschede, The Netherlands
Tel: +3153 4850485, Fax: +3153 4850400, Email: timber.haaker@telin.nl

Abstract: This paper examines the results of an assessment of the Dutch Electronic Out-of-hours Record (EOR) system, in use with local health practitioners. The objectives of the assessment were threefold: 1) to do a cost/benefit analysis of the EOR, 2) to examine innovation attitudes of health practitioners, and 3) to derive innovation strategies from the EOR experience. The results of the assessment show a moderate success of the EOR. Short term effects include efficiency gains and an improved professional position of local health practitioners. Within the scope of the study it was methodological difficult to measure an improved quality of healthcare yet. The study also revealed a number of practical and technical shortcomings of the EOR system that may hamper a wider uptake. Finally, the study calls into questions some of the fundamental aspects of the EOR approach. They relate both to the executive summary, the core of the EOR, and to the considerable efforts required by practitioners to register their records according to strict prescribed guidelines. The assessment learns that initiators should adapt and follow an incremental, step by step, implementation approach. This is especially important if there is a reluctance towards adopting the EOR. It is recommended to evaluate the user experience during implementation, and to allow for user driven adaptations. The essential meaning of ICT for users gets momentum during the use of ICT (domestication of ICT), not before the introduction of ICT.

Keywords: eHealth, eAdoption, electronic health records, implementation, evaluation, domestication, cost/benefit analysis.

1. Introduction

This paper examines the results of an assessment of the Dutch Electronic Out-of-hours Record (EOR) in use with local health practitioners**.** The EOR (in Dutch: WaarneemDossier Huisartsen or WDH) is one of the first steps towards an Electronic Health Record (EHR) in the Netherlands. The study was conducted by TNO and Telematica Institute in 2007.

The introduction and adoption of ICT is fraught with barriers and obstacles (see table 1). A key force obstructing the uptake of ICT in the Dutch public sector are *systemic failures* (see Table 1). By closely monitoring and evaluating the innovation process we can learn about the barriers and obstacles endemic to the public sector and develop insights on how to overcome them.

Table 1: Policy Context: the Moderate Progress of the Electronic Health Record

One of the aims of the Dutch government's ICT policy for the health care sector is to improve the quality and efficiency by use of ICT[i]. The government tries to achieve this by applying a nationwide implementation of the Electronic Health Record (EHR). The Dutch government is working closely together with actors in the health care sector to build a nationwide system for the safe and reliable electronic exchange of medical data. ICT suppliers will be able to use Dutch designs for IT architecture in the health care sector to build the necessary functions into the systems of the health care providers, enabling the electronic exchange of health care information on a national scale. The Electronic Health Record is a virtual record, comprising a set of applications that are connected to the national infrastructure. Data from different health care information systems are linked in the EPD. Authorized care providers can consult these data to obtain a clear picture of a patient's medical history or medication use. The deployment of the EHR starts with EOR pilots and one of these pilots are subject of our research. The deployment of the EHR is not a plain sailing process and many obstacles, commonly referred as systemic failures, have to be taken away. The obstacles concern aspects as: lack of incentives among practitioners, lack of coordination between organisations, lack of involvement of practitioners in design and implementation, a low innovation attitude by users, technology deficiencies, lack of standards, free rider behaviour, etc.)[ii]. Besides there are privacy and security concerns among practitioners relating to the EHR. Some experts are even questioning the fundamental design principles of the EHR, because designers do not take into account the perspective of citizens as most important user of health services. They argue that citizens should have access to records and be the main responsible actor to keep the record up-to-date[iii].

2. Objectives

The approach of this study included a cost/benefit analysis and a survey of innovation attitude and user behaviour of health practitioners shortly before and short after the introduction of the EOR. Our specific interest was to examine how the EOR plays a role in the daily working routine of local health practitioners. How do they cope with the ICT aspects? What do they perceive as the costs and benefits of the EOR? What is their attitude towards innovation and what brings them to use the EOR in their daily work, taking into account that the use was not compulsory. The results of the survey with healthcare practitioners also provide clues on the success of the implementation strategy followed by ICT service providers. The specific research questions are:

- What are cost/benefits of the EOR? (in terms of better health care, more efficiency, etc);
- What is the innovation attitude of health practitioners with regard to the EOR? How could we explain this attitude?;
- What are lessons learned for subsequent innovation strategies in the health sector?

3. Methodology

Two research methodologies were employed to make a profound analysis of the implementation of the EOR and the attitude and behaviour of the health practitioners. The methodology comprises two components:

3.1 Surveys

A quantitative survey among health practitioners in the region of the city Almelo shortly before (t^0, 25 respondents) and shortly after the introduction of the EOR (t^1, 19 respondents). In order to bring the collected data in perspective, we did a t^1 measurement in the city of Enschede (40 respondents) where they use a more or less similar EOR for more than a year. Prior to the surveys five interviews were held to collect input for the design of the surveys. The survey covered questions which are strongly related tot cost /benefits, e.g. "Are you able to communicate better with your patients", "Do you experience efficiency gains?" In addition the survey included questions to gain evidence on the innovation

attitude, e.g.: “What are your past experiences with ICT?” and “Do you have sufficient time to get acquainted with the ICT elements?” The actual use of the EOR and more specifically, the use of the electronic executive summary are strong indicators for the popularity and the attitude of the EOR (level of users and non-users).

3.2 Qualitative Analysis

The qualitative analysis contained a more in depth analysis of the innovation attitude. The results of the survey raised sufficient questions to serve as a good starting point for the design of the questionnaire and to conduct the interviews (10).The questions were grouped to cover the following themes[iv]:

- Weighing the balance between pros and cons of ICT – users make a balance of the perceived value of ICT but also of uncertainties or cons accompanying the ICT solution (in this case: the EOR). Positive or negative ICT experiences in the past could also determine the perceived value of an ICT solution.
- Internal or external pressure - users engage in ICT due to internal or external pressures. The market pressure could require innovation in a highly competitive environment. Or unsatisfied customers but also government regulations could impose pressure to innovate and change. Hence there could be peer pressure to use (or use not) ICT.
- Individual and organisational capabilities – this refers to the level of control by a user. Skills are an important factor determining actual usage and include the time available to get acquainted to the ICT, the resources, the organisation and the technological embedding of ICT in the user environment.

4. Technology Description

What is the EOR? The EOR (in Dutch: WaarneemDossier Huisartsen or WDH) is one of the first steps towards a Dutch Electronic Health Record (EHR) in the Netherlands. The purpose of this system is to grant Out-of-hours Practitioners (OPs) who work night or weekend shifts at an Out-of-hours Primary Care Cooperative (OPCC) to access the records of the local general practitioner whom a patient would visit during regular opening hours. When the OP requests a patient’s information, an automatically generated summary of the patients file is generated from the information system of the patient’s general practitioner, including comments added specifically by the OP. After each treatment, information is added by the OP and stored in the system of the patient’s general practitioner, who receives a notification of the changes made. The EOR replaces an informal system of telephone calls, fax messages, and two separate health records: one file at the general practitioner’s practice and one file at the OPCC filled with information from occasional visits. OPs would not know about prescribed medication, preconditions and allergies of a patient. The only exception is when a health practitioner would suspect an incident with a particular patient during his or her absence; in that case he or she would send a fax to the OPCC in advance. This would be the case with terminally ill patients in the last stage of their disease. All general practitioners have to work shifts at the OPCC, usually twice a month.

Figure 1 below is a simplified illustration of the EOR in relation to HPP’s and OPCC’s.

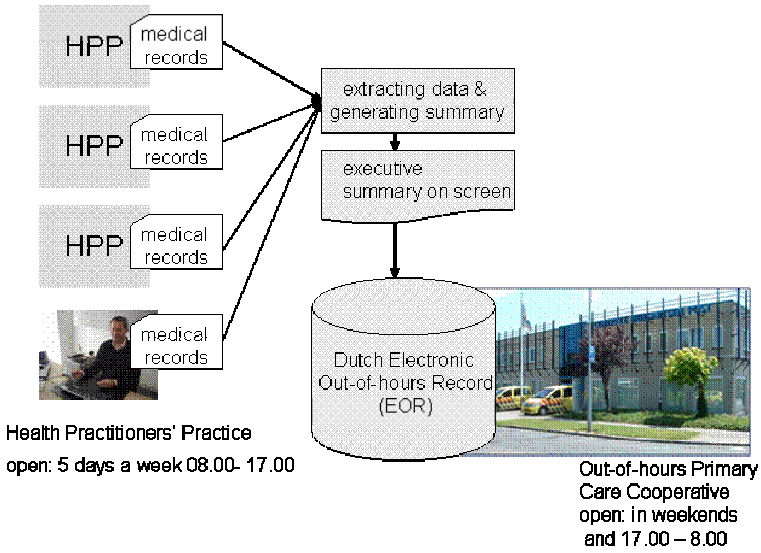

Figure 1: Simplified Illustration of the EOR

5. Results

The results of the case study show a moderate success of EOR. Some of the evidence points to a positive effect of EORs is successful. The OPs find that the EOR contributes to a better quality of triages and medical treatments, in particular for patients who have communication problems (speak a foreign language, are unconscious, aggressive, have a low understanding of his own health or medication status etc.) or face co-morbidity (more than one illness). The EOR is especially useful to inform the OPs on the medication history of patients thereby improving the efficiency and the professional position of the OPs in the OPCC. The survey indicated that health practitioners expect to experience the benefits of EOR fully (5 on a scale of 1 (not agree) to 7 (agree) in all three measurements), but they expect to harvest these benefits only in the long run.

Some problems have to be tackled before benefits will appear fully.

Firstly, there are some practical deficiencies of the EOR system. These deficiencies concern bare essentials of the EOR system. In recent research we have seen that users avert ICT use if key functionality is missing of does not function properly[v]. Surprisingly enough the bare essential in the EOR case is not the executive summary although it is the core functionality of the system. It is not bare essential because the summary is not compulsory. But if an OP decides to send a return message ("waarneemdretourbericht") with the EOR to the local health practitioner, than the local practitioner is forced to process the return message on the system. The return message is only a minor functionality of the EOR, however, in contrary to the executive summary all local practitioners are forced to use it which makes the return message a bare essential. Unfortunately, this feature failed to work properly according to the evaluation resulting in reduced enthusiasm for EOR among already sceptical users.

The results also show a contradiction between the expectations of users and those of the ICT suppliers. Although ICT suppliers bet on a fast implementation, users tend to go more slowly, especially since they do not experience the advantage of the EOR immediately.

Apart from practical shortcomings, the EOR was not able to meet all expectations related to outcomes and impact. The core functionality of the EOR is the electronic executive summary. When the OP requests a patient's information, an automatically generated summary of the patients file is provided directly from the information system of the health practitioner, including comments added specifically for the OP. However, the added value of the executive summary is being disputed. Some health practitioners share doubts about the quantity and quality of information of the executive summary. From their

perspective the summary is too shallow to warrant its usage. After one year experience with the EOR in Enschede, a full 35% of OPs still do not use the executive summary.

For a proper functioning of the electronic summary the medical records in the health practitioners' practice should be described according to strict prescribed guidelines, developed by the government in cooperation with health practitioner's organisations. If not, the summary could not be appropriately generated. The guidelines compel health practitioners to work according to prescribed procedures which not always logically fit with the way health practitioners organise their daily work. This means adjustments, other ways of working and more efforts and stress to work according to the guidelines. One group experienced problems with the further infringement of ICT tools in their professional work. As professionals they are reluctant and sceptical towards ICT developments that attempt to standardise rules and protocols to achieve efficiency and compliance with other systems and networks.

OPs face a dilemma. For the system to work best, *all* general practitioners need to work according to the new guidelines, so the system can recover data from all patients within an OPCC region. For an individual practitioner however, working according to the new rules benefits all others rather than himself. Depending on earlier investments in ICT-systems and earlier compliance with guidelines, a single general practitioner may have to invest up to € 8.000 and spend a disproportionate amount of his/her (non-billable) hours in making systems compliant with the new standards.

Further, the EOR case learns that benefits of the system merely concern efficiency gains and supports the professional functioning of the general healthcare practitioner on the OPCC, although as we have seen the added value of this information is still being questioned. In the short run, no financial gains are to be expected. An important reason to introduce the EOR was the reduction of medical errors which the EOR could bring along. Based on the survey there is no clear evidence that the EOR leads to fewer medication errors, but practitioners are optimistic that the EOR will yield this type of benefits in the nearby future. In practice, the EOR has mainly been driven by automation of administrative processes to yield some efficiency gains. An interesting conclusion for governments and insurance companies, but it conflicts with the hopes and expectations of health practitioners in relation to quality of medical care.

In the t^{o} measurement users perceive the EOR as predominantly positive, but after the first experiences there was a set back in expectations. Initially the expectations are high, followed by some disappointment because the innovation does not fully satisfy the expectations. The high expectations raised by ICT suppliers, the one-sided focus on efficiency of the EOR and the tight guidelines of practitioners, may account for some of the reluctance by health practitioners to fully engage with EOR, in spite of likely positive aspects of EOR in the long term.

An important incentive to use the EOR is not directly motivated by the demands of patients, but by the intrinsic motivation of the health practitioner themselves to improve their own professional information position. There is also a financial motive in the form of a 'start-up subsidy'. Furthermore, there is peer pressure among OPs because the success of the EOR depends on the scale of connected health practitioners to the EOR: the more practitioners connected to the system the more executive summaries will be available.

By comparing the usage statistics from the EOR for both Almelo and Enschede, the reluctance in accepting the EOR becomes visible. During the course of our research, the Enschede OPCC was already working with the system for almost one year, the Almelo OPCC started during our research period.

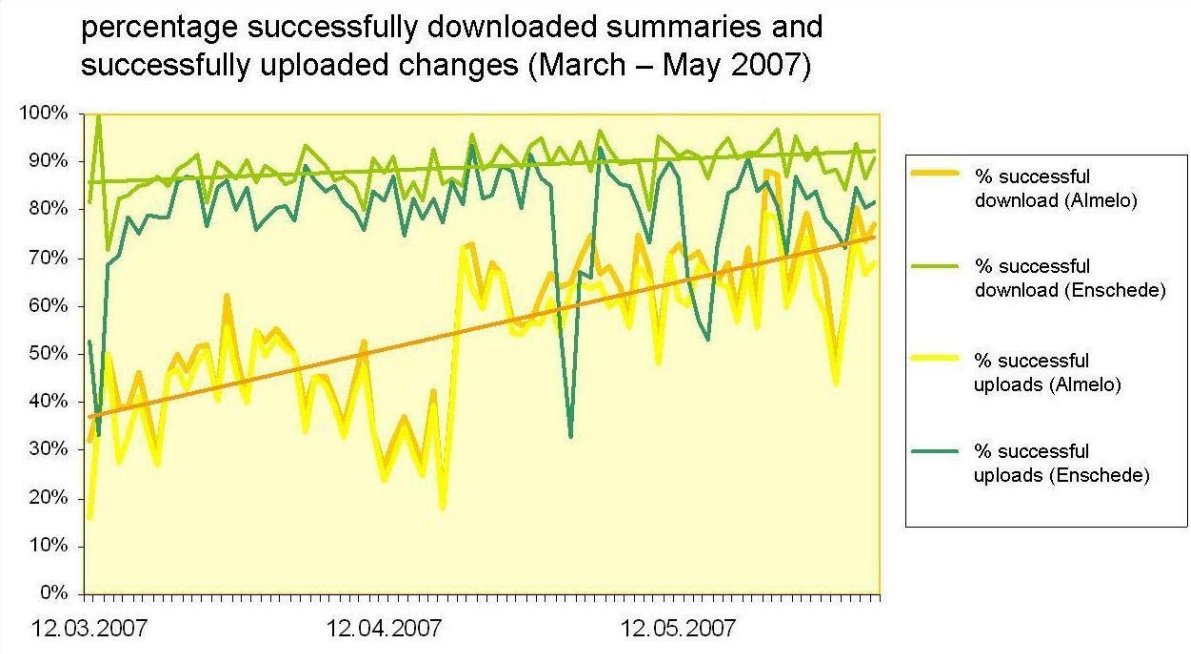

Figure 2: Percentage of Downloaded Summaries as Indicator of Success of the System

The figure above shows OPs in Enschede who have been working with the system for one year. They successfully downloaded the patient record summary in approximate 90% of the cases. Reasons for not downloading successfully range from: 1) the OP is not requesting the file during treatment; 2) the system is malfunctioning; or 3) there is no record available because the local practitioner has not restructured his record according to the new guidelines. Uploading of the updated information to the health practitioners system is successful in about 80% of the cases, although the system still faces many malfunctions, resulting in days where less than 50% of the treatments where directly logged in.

The Almelo graph shows that, during the first three months of operation, the amount of successful down- and uploads increased significantly, but is still below the Enschede average. The low reliability of the system, especially in the beginning, reduced the OPs acceptance of the system. One OP stated in an interview: “imagine you have to work with an e-mail program that is only able to receive or send an e-mail in 50% of the cases. That is unworkable”. Low acceptance of the system means that OPs are less willing to invest time and resources in updating their files and ICT-infrastructure to work with the EOR.

The figures show a positive trend towards an acceptable level of functionality, however, the professionals were clearly more optimistic at the start and expected a proper functioning of the EOR in an earlier stage to begin with.

The regions of Enschede and Almelo are the first regions to work with the EOR. In the Netherlands this region is known as a cooperative region with regard to innovations that could be explained by a well-organized group of opinion leaders with a vision of future benefits. When the system is rolled-out in regions less willing to cooperate, the initial low functionality and long-term benefits can be a serious obstacle to a full rollout.

6. Conclusions and Lessons Learned

This paper examines the results of assessment of the EOR system. The focus was on the impact of technologies on users and vice versa, not the impact of technologies as such. Understanding how ICT is being used is significant for the progress of eGovernment, as user behaviour determines the success of ICT and its positive impact on society as a whole.

Based on the study results some recommendations could be drawn-up for subsequent innovation strategies in the public sector.

The assessment showed that the EOR improves the efficiency and the professional position towards patients of the OPs in the OPCC. Benefits in terms of cost reduction are negligible while there is no clear evidence yet that EOR reduces medical errors. The latter requires more research. On the downside not all of the functionalities in the EOR fit well with the daily work routines of health practitioners. To guarantee a proper functioning of the EOR, a lot of effort is necessary to adjust the medical records of local health practitioner before it can be used to generate summaries automatically.

Another important impediment is the executive summary. The added value of the summary is being questioned by several OPs. An important incentive to innovate is to improve the information position of the professional them self. Information on the OPCC improves the position of the OP towards the patient. Further incentives are peer pressure to get engaged in EOR and the financial start-up subsidies.

What lessons could be learned? Clearly an incremental, step by step, implementation approach is important to overcome a negative attitude towards the proposed innovation, or to take reluctant or sceptical users on board. Before introduction test all functionalities thoroughly (this takes time, cost money, but is very valuable)

- Focus on core functionality (the essential part of the innovation for users) and ascertain that they work perfectly well. Only by involving target groups in the implementation process can the core functions be determined.
- Focus on the valued added for users. In the EOR for example, a technical facility to use the EOR for mobile purposes is missing while there is a clear need. Approximately 20% of the patients have co-morbidity and should be considered as 'complex' patients who need visits at home on a regularly base. The OPCC has an average of 125 consults a day, 25 of them are visits. This functionality should be extended.

Reflect on experiences with the use of ICT during the implementation process. The essential meaning of ICT for users gets momentum during the use of ICT (domestication of ICT), not before the introduction of ICT. At the start it is difficult to predict how ICT will be used or what outcomes are to be expected. In the EOR for example there is an indication that the electronic summary can be most valuable for information on medications (medicine history). This could be starting point to extent this type of information service further. Another outcome are the tight guidelines procedures imposed on health practitioners. This certainly needs evaluation and reflection in order to accomplish a better-balanced and flexible approach to meet different needs and demands of users. Probably it is possible to enlighten the guidelines slightly which makes it more acceptable for users but without jeopardising the functioning of the EOR (generating of the electronic summary).

A strategy to encourage the use of ICT is to invest in informal opinion leaders among users. The opinion leaders could either encourage or discourage the use of ICT among peers. Take the critics seriously and make users – also sceptical users – co responsible for design and implementation of ICT.

---

[i] See also http://www.minvws.nl/en/folders/meva/2007/the-dutch-approach-status-quo-on-nationwide-ehr.asp

[ii] See also http://www.maatschappelijkesectorenenict.nl/

[iii] See among others: G. Dijkmans van Gunst, YNNO. Provide patients online access to own medical records. In: de Volkskrant, 20 March 2007, Amsterdam. T. Doorenbosch, With Internet patients are in control, In: De Automatiseringsgids, 15 September 2006, Den Haag.

[iv] M. van Staden & V. Frissen – TNO. Maatschappelijke impact van ICT, impact assessment raamwerk, Delft, 2007

[v] V. Frissen & M. van Staden, TNO. "It's not possible anymore to escape…." Digital working in the Ministry of the Interial and Kingdom Relations. Den Haag, 2005.