

CHALMERS



Evaluating the socio-economic impact of e-recept in Västra Götaland Regionen, Sweden

Master of Science Thesis

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Göteborg, Sweden, 2011
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Abstract:

In a global drive to make health-care more efficient, various eHealth interventions are introduced every now and then to address the omni-prevalent issues of ageing populations and growing health-care expenditures. While it is obvious to the decision makers all over that eHealth *is* the way forward, other stakeholders involved in the process of deploying, and eventually using the interventions are not necessarily up to speed. This is especially true in the case of Health-care professionals, whose resistance to change is well recognised in the circles of Health-care Informatics, and which has been compounded by the deployment of failed or half-baked solutions that hinder their daily practices. However, a well implemented eHealth intervention does not fail to solicit due praise from all of its users and spreading knowledge about these “best practice” cases can help change the perspectives of the people who are otherwise sceptical about them.

E-recept, or the national implementation of ePrescriptions in Sweden, is definitely a “best practice” case, whose technical success is well known. In the context of this study, a socio-economic evaluation was carried out, while limiting the scope to Västra Götaland Regionen to keep the details manageable. A Cost-Benefit Analysis was carried out, using data gathered through open interviews and contacts with the relevant stakeholder organisations, with results presented in monetary terms, which were quite positive. However, it was found that the required data to effectively evaluate e-recept from different perspectives could not be acquired in its entirety. Although in some cases, data could not be provided for purely organisational reasons, there were also several instances where the proceedings pertaining to e-recept only existed where they were intertwined with other projects, and hence the specific economic aspects of e-recept's implementation and maintenance could not be separated for the purpose of this evaluation. In the end, that takes away from the credibility of the results, which are incomplete without those details.

It was thus concluded that while there is a need to push for eHealth, it is equally important to monitor and evaluate each intervention closely not just from a technical perspective, but also from a societal perspective. To that end, it will be necessary to rigorously maintain data about the performance and proceedings of each intervention, which can only be done through national initiatives launched by the authorities. Such initiatives would help bring a new level of transparency to the deployment of eHealth interventions. It can also help motivate the stakeholders to perform better when a culture is introduced where good performance is rewarded. And finally, it is the means of having a more informed public through the manifestation to the greater society what each person stands to gain from a given eHealth intervention, because in a sector like Health-care, everyone is a stakeholder.

Keywords: eHealth, e-recept, ePrescriptions, evaluation, Socio-economic, Västra Götaland Regionen, Cost-Benefit Analysis, Willingness to pay, health-care informatics.

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List of Abbreviations:

Abbreviation	Explanation
EHR	Electronic Health Record
HIT	Health Information Technology
NPR	National Product Register
CPOE	Computerized Physician Order Entry
CDSS	Clinical Decision Support System
VGR	Västra Götaland Regionen
ADE	Adverse Drug Effects
HPO	Health-care provider organisation
ICT	Information and Communications Technology
WTP	Willingness to pay
CBA	Cost-Benefit Analysis
FTE	Full Time Equivalent

1. Motivation for Evaluations

The advent of Information Technology has transformed business processes and organisational procedures as we know them. There is no doubt that these advances have helped people manage their resources in such a way that allowed them to explore avenues that were previously inaccessible. However, at the same time, a true indication of open mindedness would not be to consider any and all advances in technology as unquestionable “progress”, but to evaluate every advancement in technology that is made available to a person, an organisation, or a nation in its entirety, in order to see if, how and when this advancement can improve the current state of affairs in a given scenario.

Moving specifically to health-care, being one of the largest industries in the world, it faces problems at the same grand scale. In general, one of the main challenges faced today by the health care industry worldwide is to provide adequate health services to the public using the scarce resources at their disposal. Issues such as Europe's ageing population¹ result in a larger number of elderly depending on a smaller number of tax payers supporting them, while health care expenditures have been steadily shooting upwards over the past few decades, not only in terms of absolute figures but also as a share of GDP. Such factors, according to Zweifel et al.², have lead to a number of changes in legislation in several Western countries in order to control Healthcare expenditure. Besides legislation, it is also widely believed in Western countries that the use of eHealth, or electronic processes and communications in the Health care sector, can also help take care of these issues to a large extent, as stated by Stroetman et al.³. Europe has taken several initiatives to promote the use of eHealth in member states, one of them being the “European eHealth action plan”⁴. This plan includes general guidelines pertaining to the issues related to the improvement of health care provision for the patient, including those that deal with the implementation of ePrescriptions and electronic health records (EHRs).

Health-care is also an industry notorious for sticking to the traditional way of doing things as much as possible, which means any changes have to be introduced with extreme caution. While there is a lot of promise in adopting eHealth solutions, Harrison et al.⁵ state that it may also result in unintended and potentially harmful consequences that hinder the progress of health-care information technology (HIT). They place special emphasis on analysing the dynamics of health-care organisation while designing HIT products, along with continuous and rigorous evaluations and feedback sessions while implementing the system to ensure acceptability and convenience of the health-care providers, and safety and quality of treatment for the patients. They also state that those who have carried out successful HIT implementations have reported using methods where they are flexible to the needs and concerns of the users during implementation in terms of design parameters and also with the pace of the implementation. Catwell & Sheikh⁶ also agree that bringing ICT into health-care also brings new risks that must be carefully considered through the stages of design, development and deployment, followed by a recommendation of carrying out rigorous evaluations of the system at hand with the appropriate stakeholder's perspectives to ensure positive progress and to learn important lessons for future endeavours.

However, with the idea that “success breeds success”, identifying, studying, evaluating, and propagating knowledge about “best practice” examples of implementations of eHealth interventions can prove to be most useful in helping not only taking away bad impressions that have settled in with various stakeholders from previous experience marred by unprofessional approaches, but also serve as a guideline for providing good policies and recommendations that can be used towards succesful future endeavours. One of such cases identified by Stroetman et al.³ is the implementation of ePrescriptions in Sweden, which has been chosen as the object of the evaluation exercise carried out in this study.

This call for evaluations can be further elaborated by the fact that there are different types and approaches for evaluating the object of concern. It is important to clearly identify the object, what it includes and what it does not, to specify the scope as to what details in time and space are actually relevant to it, and to specify a method for quantifying the impact that it has had in its area of scope. In order to ascertain the type of evaluation that would be fitting for ePrescriptions in Sweden, it is important to note that according to Anderson⁷, there exist social, ethical and legal barriers to the implementation of eHealth. As cited by physicians, these include shortage of funding for health-care providers, complex systems and absence of standardised clinical data exchange, privacy and legal issues. Moreover, for high levels of usage of eHealth services, Flynn et al.⁸ state that it is important to properly promote the service, provide proper trainings to the health care staff, and to build up an evidence base that goes in support of implementing such services. They also stated that it is important to sort out any differences in views of patients and health-care professionals regarding any service before it is implemented, but according to them, there are no such differences for ePrescriptions.

While Ammenwerth et al.⁹ concluded in their study that there is a good evidence base to suggest that electronic prescribing has a positive effect in the reduction of medication errors and adverse drug effects (ADEs), on the other hand, Reckmann et al.¹⁰ conclude in their investigation about the quality of studies claiming the medication errors reductions caused by the move to ePrescribing are not very compelling due to their modest scales and designs, and suggest for future studies to have larger samples with controls, along with reporting on the severity of errors that were or were not avoided. These contrasting views can be reconciled on the basis that there are factors that are critical for the success of any eHealth intervention and have already been mentioned in the previous section [Harisson et al.⁵], and in the next section, it will be seen how the implementation of ePrescriptions in Sweden virtually took care of all of the aforementioned issues.

So from the above, it is seen that a given eHealth intervention may face social, ethical, legal and financial barriers in its path to success, and that the range of stakeholders is very wide. Hence in order to cater to all these factors, a socio-economic approach has been taken to evaluating ePrescriptions in Sweden, which is actually the approach favoured by Stroetman et al.³ in their study.

What follows in the next chapter is a detailed description and discussion about ePrescriptions in Sweden, and how it qualifies as a “best practice” case.

2. Introducing e-recept

Handwritten prescriptions have been the method for communicating drug requirements from the doctor to the pharmacist for centuries. At the same time, they also instruct the patient on proper dosage and directions for the prescribed drugs. However, they have been plagued by a number of inherent flaws whose costs have not gone unnoticed in recent times. In 1999, the Institute of Medicine (IOM) released a report that hit the public by surprise stating that medical prescription errors claim around 7000 lives in the USA, with drug related morbidity and mortality costs hovering around an annual \$77 Billion USD¹¹.

It is not surprising that Sweden has been one of the front runners in the implementation of ePrescriptions because the first electronic prescription was transmitted in Sweden in 1983¹². In order to streamline national efforts with the “European eHealth action plan”^v, Sweden developed a national strategy for eHealth¹³ which was first presented in March of 2006. This strategy touched upon six target areas, three about making conditions in the healthcare arena more conducive to the use of extended ICT services, and three about improving and adapting eHealth solutions to the patient's needs. One of the main priorities while determining the “action areas for cooperation and coordination at national levels” was the completion of the introduction of the ePrescription module. Commonly known as “e-recept”, the Swedish ePrescription module was launched by a close collaboration between the Stockholm county council and Apoteket AB, the then national pharmacy monopoly of Sweden. Upon successful implementation in the Stockholm county, the e-recept module was spread to other counties and regions in Sweden step by step.

The implementation became a resounding success with more than 80% prescriptions today in Sweden being electronic. The responsible people, including many skilled project managers, attribute this success to the fact that they put great emphasis on developing an implementation strategy having proper requirements and expectations management, along with a sound technical solution. An integral part of the technical solution is formed by the “National Prescription Mailbox”, a database that can be accessed by all those who prescribe and dispense medicine in Sweden. This means that the patient can go to any pharmacy of their choice and pick up the prescribed medication upon production of valid ID at their convenience.

2.1 Implementation model

The implementation model for e-recept was created during the launch of the service at the Stockholm county council from the 1st of January 2002 to the 31st of December 2005, and as a collaboration between the Stockholm county council and Apoteket AB. The group of people responsible for the implementation was known as “e-recept Stockholm” and acted as a body neutral to either organisation, an important factor granting them good credibility. The model was highly acclaimed by the professionals who were targeted by the system. Throughout the project, there was a constant string of surveys and evaluations, firstly to draw up the requirements, and then to follow up on the people's views about e-recept before, during and after the implementation. This helped adapt the service and the implementation model, and to develop and refine it to better suit the needs of the users and hence, make the project successful.

Three sets of meetings form the basis of the implementation model. It launches with a start-up meeting

headed by a representative from the county council along with an official from the local pharmacies to help establish a cooperation between the two bodies. This is where the participants, which includes operations managers, project managers, system administrators and contacts from pharmacies, learn the basics about e-recept and are informed about what is required to prepare for the implementation at both, the local health-care units and at the pharmacies. Responsibilities are also divided among different participants at this point of time. Almost two weeks later, an initiation-of-operations meeting is held where all potential users are provided general training with e-recept through an hour long lecture conducted by a representative from the county council, who at the same time also responds to the queries about the basic operational procedures in the system. Doctors/nurses are also provided specific training for e-recept by system administrators for their respective EHR systems. With everything in place, it is expected that after the meeting, the health-care professionals will start using e-recept for all their prescriptions. Once three to six months have lapsed following the initiation-of-operations, an evaluation meeting is held where the positive and negative aspects of the transition to e-recept are followed up on from both perspectives, the health-care units and the pharmacies. Both parties are also informed about news and progress updates on e-recept during these meetings. The quality aspects of e-recept at the health-care units are brought to light, as well as the problematic prescriptions collected at the pharmacies are highlighted in a bid to avoid these problems in the future. It is important to note here that as a part of good practice in implementing eHealth interventions, evaluation meetings should not be a one-time affair, but must be conducted at regular intervals to continually improve both, the implementation model and the eHealth intervention itself, as was the case here with e-recept.

Before the initiation-of-operations, a questionnaire was handed out to all potential users to capture their perspectives, knowledge and expectations regarding e-recept. The same questionnaire is then handed out at evaluation meetings taking place down the road to track changes in their perceptions through time and what expectations have been met. For the nursing staff at the Stockholm county council, the number of participants viewing the service *very positively* or *positively* amounted to around 88% before implementation, and 93% after implementation. Whereas the corresponding figures for pharmacists before and after implementation were steady at 96%. The most appreciated advantage brought by e-recept for the nursing staff was the time it helped save, while for the pharmacists, it was the safety it provided, and for the patients, it was the flexibility. The flexibility for the patient means a number of things, such as choice of pharmacy, but also the fact that someone else can pick up medicine on behalf of the patient without having to physically acquire the paper prescription in person, in case e.g. a woman goes to the clinic close to home and when the prescription is transmitted, her husband can pick up the medicine close to work on his way back home in the evening.

The questionnaires also revealed the need to train the pharmacists further with the system who felt they did not know enough about it. Following more elaborate trainings, there was more efficiency in the procedures of the pharmacies and the staff was also more satisfied with the usage of the system.

Finally, the implementation of e-recept also brought the issue of the use of ambiguous abbreviations in prescriptions to light, which approximately 38 % of the times had to be clarified with the prescriber, and clearly indicates a threat to patient safety. This was one of the aspects hence discussed in implementation meetings as a quality concern for e-recept which further strengthened the need for a deeper cooperation between the local health-care units and the pharmacies. It was also proposed to bring prescribing practices in line with guidelines from Läkemedelsverket (Medical Products Agency) for more safety and making the prescriptions easier to understand. This led to a 10% reduction in the

instances needing clarification with the prescriber, along side helping improve the Apoteket Terminal System (ATS), and make the EHR systems meet Apoteket's requirements, while also promoting a better understanding of these issues at all levels.

2.2 Moving to VGR

The project for implementing e-recept all over Vastra Gotaland Regionen started officially as a collaborative effort between Apoteket AB and the regional authority on the 1st of January, 2004 and concluded on the 31st of December 2008. After the completion of implementation of e-recept, this cooperation extended to implement other related projects including a database called Läkemedelsförteckningen (LF) that stores the dispensing information in the form of name of the drug, dosage and directions for each patient for up to fifteen months, ApoDos/eDos meant for helping package and manage patient's medicine through an electronic process, etc., but a detailed discussion about these projects is beyond the scope of this research.

The implementation model was kept more or less intact when moving to this part of Sweden. Starting off with a risk and utility analysis with respect to the current situation, the aim of the project was set in stone, and the cut-off lines for responsibilities were drawn up. The implementation team, which was the local counterpart of “e-recept Stockholm”, had six members with diverse specialisations, three from Apoteket AB, and three from VGR. This team acted as a pivot for all activities pertaining to all the related issues between different stakeholders.

Meetings took place for drawing up plans between local managers of the pharmacies and VGR. Soon afterwards, the trainings and operational set ups were launched. The trainings were in the form of typically an hour long lecture along with some hands on experience, which the users continued till they were satisfied. The secretaries at each health care unit were also trained well on the system so that they can be a quick contact in case the prescriber needs help afterwards. Six months after the operational start up, evaluation meetings took place where the difficulties and problems faced in the implementation would be brought up by means of a contact person who was designated at each health-care unit and was responsible for managing the implementation at the particular facility. During these meetings, all the concerned parties would also be briefed about the benefits of using ePrescriptions.

Visits were also paid to the pharmacists to inform them about the benefits of ePrescriptions. Moreover, “Mingle in the pharmacy” sessions were held where system administrators would be invited to see how a pharmacist carries out the duty of dispensing medication. Meetings with all of the involved parties were very frequent which would help factor-in their concerns into the implementation model and ensure a smooth transition from paper to ePrescriptions. This helped yield the good results that are seen today with e-recept. Clients were also kept up to date with bi-annual progress reports about e-recept, along with monthly statistics on ePrescriptions on overall level and single health-care unit levels. Given the good progress of this project through time, it can be assumed that this also had a positive effect on all the clients while keeping the motivation high.

2.3 Writing an e-recept

The process of creating an e-recept is like writing any prescription in the EHR system, the only difference being that after completion, instead of commanding the system to print the prescription, the

prescriber would click the button specifying electronic transfer, as a result of which the e-recept would be sent. This ePrescription can then be sent forward via two routes, either through the local network of the clinic/hospital and then via “Sjunet”, or through the internet. Through either pathway, the ePrescription reaches the “National Prescription Mailbox”. It is important to note that as the patients are also able to access the “National Prescription Mailbox” online, they have the choice to purchase the medication through a pharmacy's website and have it delivered to their homes.

2.4 The highs and lows

Among the studies since carried out on the implementation of e-recept, the following are highly relevant:

In an observational study regarding prescription errors necessitating clarification with the prescriber at three mail order pharmacies in February 2006, Bengt Astrand et al.¹⁴ saw that the relative risk (RR) of ePrescriptions compared to other prescriptions was 1.7 (95% CI 1.3-2.1), with the most prevalent form of clarification being about “dosage and directions of use”. They concluded that there is a need to focus on the quality aspects of ePrescriptions. However, it must be noted that e-recept has come a long way since February 2006. An article by Hellstrom et al.¹⁵ about physicians attitude towards ePrescribing submitted in December 2008 shows that the physicians mostly considered electronic prescription with great satisfaction. The weaknesses identified were more about the implementation in their respective EHRs than the module itself, but nevertheless were areas that needed to be worked on.

Although ePrescribing potentially helps counter many problems posed by handwritten or printed prescriptions, according to Ekedahl¹⁶, they also open a whole new dimension of problems not encountered before. In case of Sweden e.g., the name of the drug is not transmitted to the pharmacy from the physician, rather a representative code from the “National Product Register” (NPR) is sent. The problem is, the values of codes for different medicines are constantly updated in the NPR, and the computers at the pharmacy are updated accordingly as well, but for different reasons, the databases at the health provider organisations are not updated automatically and needs to be done on a voluntary and regular basis (updates could be as frequent as every week). This possibly results in a wrong code or no code being sent in the ePrescription. Moreover, the doctors can only prescribe medicine from the selection provided by NPR and cannot type any medicine by hand. As the selection is made from an alphabetically ordered list in a drop down box, it is possible for the doctor to click on the alternative above and below the intended medicine (juxtaposition). This can cause either the prescription of the wrong dose/strength or of a completely different medicine altogether.

The best case scenario in the occurrence of such problems could be that the problem is detected and resolved by the pharmacist in consultation with the patient and/or the prescriber. This is nevertheless an inconvenience to all stakeholders in terms of the time and effort involved in clarifying the issue, five minutes on average according to Ekedahl. However, depending on the nature of the problem, if gone undetected and passed onto the patient could lead to e.g. adverse drug reactions that may harm him/her even to the point of death. In any case, there is a cost incurred by society on the occurrence of all such problems that need to be taken into account whenever eHealth interventions are evaluated at any stage of their time line. Hence Ekedahl rightly concluded that there is still room for improvement to realise the goal of “zero prescription mistakes” in Sweden.

At the same time, it will become evident in the later sections that all major issues pertaining to the general functionality of e-recept had been taken care of within the implementation period, and that the users of the service have a very positive perception about it. Keeping in view the robust implementation strategy that took care of all the issues raised earlier in this study, along with the high levels of user satisfaction, E-recept definitely qualifies as a “best practice” case at all levels and serves as a model for others to follow.

3. Previous Studies

Davalos et al.¹⁷ state that economic evaluations of tele-medicine are not very abundant, and only a few of those carried out are thorough in accounting an extensive range of related costs and benefits for each intervention. They also state that for an advanced economic evaluation, it is important to carry out Cost-Benefit Analyses. Limiting the scope of the evaluations further down to solely “socio-economic” impact analyses results in studies mostly from just one organisation called “Empirica Communication and Technology Research”¹⁸ of Bonn, Germany, a research and consulting company. Their areas of practice include many fields related to technology and communications, including eHealth and telemedicine.

For the purpose of this research, their most relevant project is titled “EHR Impact”¹⁹, carried out on behalf of European Commission. In this project, they have carried out evaluations on the socio-economic impact of EHRs and ePrescribing systems at eleven sites that have been identified as “Best Practice cases” based on several criteria, including but not limited to existent operation, routine and effective use of the systems implemented, etc. One of these sites is the EHR and ePrescription implementation at the county of Kronoberg, Sweden, which is a direct parallel to this research, titled “The socio-economic impact of the regional integrated EHR and ePrescribing system in Kronoberg, Sweden”. A detailed summary of this study is as follows:

In line with the recommended solution by Davalos et al.^{xvii}, the study at Kronoberg conducted by Dobrev et al.²⁰ (from here-on referred to as the “Kronoberg study”) also employed a Cost-Benefit Analysis, with the datasets including statistics, costs and benefits over the time span 1999 – 2010. The statistics included information about the population affected by the EHR and ePrescribing system, number of users, eHealth related transactions, and the changes in healthcare activity. Data on these indicators was only partially available from the HPOs over the whole time span and a lot of expert estimation using existing data was involved in filling-in the holes of information. Unit costs of various resources had been estimated at a constant level through-out the life-cycle of the project. Estimations relied on time allocation to activities related to the system, such as the doctor's time on the system, away from his/her normal routines, new project teams etc. Estimates for overall ICT costs depend on the base costs paid out to the ICT supplier.

In order to calculate monetary values, several different methods were employed. Indicators such as reduction in number of tests, or time saving for the staff, along with quality gains such as avoided hospital admissions were estimated using unit cost calculations. For intangible indicators such as value to patients and organisations, willingness to pay (WTP) was used based on stakeholders behaviour. WTP was also used for other intangible indicators such as irritation and inconveniences caused. Reductions in risk-exposures was calculated using insurance models. Benefits such as increased activity was estimated with actual cash returns after measuring the increased activity that can be charged, and multiplying it with the price. Details on the cost and benefit indicators are shown in an appendix to their study.

After applying contingencies that reduce the value of benefits and increase the value of

costs to compensate for estimations, and discounting the cumulative values to the net present values, they show that first annual benefits are there in the third year of implementation of the project, and cumulative benefits are shown in the fourth year of implementation. It was also seen that the bulk of the costs go to the county council, which is understandable with a centralised healthcare model such as that of Sweden, where costs are normally borne by the public sector. Benefits are distributed over the county council, the HPOs, and the doctors, nurses and care-givers in the capacity of individuals, instead of employees.

They also state that it is important to note that the cash back benefits are a modest 15% and should not be the motivation behind taking up such a project, rather the greater good of the society is the main focus. Re-deployable finance is one of the major forms of return on the project but is a daunting managerial challenge to actually utilise it, because it is in small and dispersed pockets.

Overall, they conclude that the socio-economic assessment is very positive and robust, and the Kronoberg EHR and ePrescription implementation while being under way at the time, still serves as a role model for others to follow in Europe and beyond.

A further two sites that are similar to the case above and were a part of the “EHR Impact” study include the implementation of EHRs and ePrescriptions in Andalucia, Spain²¹, and in Lombardia, Italy²². For the former, they have written a separate report about the ePrescription module, named “Receta XXI”, which is what will be considered for the purpose of this study due to its higher relevance. For both of these studies, the methodology remains the same as described for the study in Kronoberg, Sweden.

Technically speaking, “Receta XXI” is pretty similar to e-recept, but there are other differences that are considered a part of it that are not a part of e-recept, which include but are not limited to generic prescribing, and Decision-support systems. This is important because these parts are included when evaluating its benefits, and hence does not allow for direct comparisons between the two implementations. The bulk of the gains are credited to improvements on the fronts of Quality, in terms of safer prescribing and dispensing by preventing Adverse Drug Effects, and in terms of efficiency, by means of fewer GP visits by patients with chronic conditions and through generic prescribing by active ingredients. The level of usage is rather low at 46% by the end of 2008, which in turn slows down the returns from the system. But in their study, they showed that the annual benefits curve lied significantly ahead of the annual cost curve, as a reflection of increased usage of the system. Similar to the case at Kronoberg, Sweden, the net benefits are not cash returns, rather it is re-deployed finance and non-financial gains. The cash returns that are reported, are attributed to generic prescribing, which is not something that will manifest itself as a benefit from e-recept in Sweden. Most of the benefits go to the health-care provider organisations, and they have a big share of the costs as well, but the costs are most burdensome on the regional health-care authority.

In Lombardia, Italy however, it was seen that the majority of the benefits in the EHR system called SISS are derived from data sharing among health care provider organisations and eBooking to save time for both, health-care providers and patients, while also cutting down travel costs and improving scheduling activities. Net annual benefits and cumulative benefits were realised a little slower in this case than others. Again, most of the benefits and costs go to the Health-care Provider Organisations. 63% of the total costs are based on ICT and form 67% of the costs to the HPOs, and the remaining one

third of their costs are a result of the disruptions and inconveniences caused as a result of the introduction of SISS. Round about 66% of the benefits are credited to redeployed finance, and 31% are non-financial, that all the stakeholders stand to gain from. These benefits materialise through improved quality in health care provision for the patients through higher safety and efficiency, higher level of professionalism for the Health-care providers, and increased capability of the region to meet the health care demands.

Another study of relevance was that carried out by Gartner Inc.²³, an information technology research and advisory company with its headquarters in Stamford, Connecticut, U.S.A. This study, titled “eHealth for a Healthier Europe!”²⁴ was carried out on behalf of The Ministry of Health and Social Affairs in Sweden. The purpose behind launching this study was to investigate the role of technology in helping achieve improvements in health-care and how the technologies are related to the aims normally associated with improving health-care, that they refer to as “political goals”, including Patient Safety, Quality of Care, Availability of Care, Empowerment and Continuity of Care. The countries involved in this study were Czech Republic, France, the Netherlands, Sweden, Spain and the United Kingdom. What follows is a brief summary of the methodology and findings of the study:

The model was developed by analysing 60 clinical studies, along side identifying benefits associated with 11 different enabling technologies related to health-care, including ePrescriptions. They started by establishing the current situation of health-care in the member states by weighing them up over 300 unique clinical points over metrics such as utilisation, performance, costs, staffing levels etc. and also determined the current level of implementation of various technologies in the member states through high level self assessments carried out by officials in the respective central health agencies. This helped them estimate the potential benefits that can be realised through completed implementation of the technologies in the member states.

With the above data at hand, the model can help establish the link between “political goals”, technologies, and the associated potential benefits. This information can help compare different eHealth interventions or technologies that can be implemented and what benefits will be materialised through them, and hence, which given intervention will yield the maximum return on investment for a particular member state.

In their results, they concluded that there are huge potential benefits to be gained by implementing eHealth technologies, as the current level of adoption in the member states for the specified technologies lies below a modest 30%. They managed to quantify the potential for numerous possible improvements through eHealth interventions. Among them was their estimate about moving to ePrescriptions for outpatients in the member states, which they state would potentially reduce 5 million annual prescription errors. It is worthy of note however that when calculating benefits for various interventions, they choose not include the costs of implementation, which as seen in the study carried out as a part of the “EHR Impact” project are one of the major costs to figure in the life-cycle of an eHealth intervention, and one that takes years to offset.

One of the biggest challenges they identify in the process of conducting this study was

acquiring reliable data. This is because data related to the usage and performance of eHealth interventions, or general data related to health-care that can help evaluate eHealth interventions is usually recorded in a scattered manner, and that too is a practice seldom followed.

They conclude with a number of recommendations, such as the need to prioritise the implementation of eHealth interventions based on their potential to fulfil various political goals, and to record health-care statistics in a systematic manner to monitor the performance of these endeavours through-out their life-cycles. For the states that are more of followers than innovators are recommended to start off with implementing the technologies that are identified as yielding the highest returns, namely EHRs, Computerized Physician Order Entry (CPOE) and Clinical Decision Support System (CDSS).

Last but not least, there is a Europe wide initiative, called EPSOS²⁵, spanning twelve member states represented by 27 beneficiaries including national health ministries, centres of excellence and other companies. Its aim is to investigate the future of inter-operability of national patient summaries and ePrescription modules of different countries with each other. They try to come about studying the implications of such projects by launching pilots that interconnect national solutions. Although this is typically an initiative focused on implementation, they have divided the task into “work packages” that includes those for assessing the present scenarios and conditions related to legal, technical and security related aspects of such an endeavour involving the member states, and emulate an environment that can help attain findings which facilitate moving the project from pilot phase to an actual full-scale solution. This of course involves evaluations, work package 1.2 to be specific, from various points of views regarding the kind of services provided and their content, their design, as well as evaluations through the operational phases of the project. The latter portion is relevant to the subject at hand as it seeks to, among other things, evaluate the impact EPSOS has had on the member states in terms of e.g. cost and quality of care, organisation of health-care etc. However, the document that sheds light on the evaluation model, titled “D1.2.1 evaluation methodology and plan” has not been made available, and the final results of the project evaluation are expected to be made available after project completion in 2012.

4. Aim

The aim of this study is to specifically evaluate the impact e-recept, as an eHealth intervention, has had on the wider society. Just like all other counties and regions in Sweden, VGR was the authority responsible for implementing e-recept in their region with the assistance of Apoteket AB in line with a national directive. Anything related to health-care always involves everyone in society directly or indirectly, especially in a country like Sweden where health-care is state-funded. This evaluation will thus include the regional health authority, the health-care provider organisations, both public and private, the health-care professionals, pharmacies, pharmacists and patients. However, according to the “Kronoberg study”, the costs and benefits share of patients is around 1% and 7 % respectively. Due to this small impact, this section of society has been left out of the study.

In more general terms, this study also seeks to provide an evaluation method or model to assess the feasibility of a proposed, or an implemented eHealth intervention, and to be able to compare several initiatives at a given time to see which of them would yield the greatest net benefit from a societal point of view. Hence the outcome of each evaluation should be directly comparable to other outcomes for the sake of assisting regional or national decision makers in safeguarding public interests with a short term and long term vision.

5. Methodology

Similar to Dobrev et al.^{xx}, a cost-benefit analysis is carried out with the available information for the specified stakeholders to see the post-implementation picture at VGR for e-recept.

A Cost Benefit Analysis (CBA) is a commonly used tool in economics meant for measuring the costs against the benefits of making a change or introducing an intervention²⁶. This is done by first limiting the scope of the tool to the area/group etc. that the intervention is intended for, and then identifying all the possible effects in terms of costs and benefits, both direct and indirect, that this intervention may have in its “circle of influence”. After collecting the required data, each of these costs and benefits must be assigned values with a common unit of measurement, such as SEK for the purpose of this study. It is also a common practice to adjust the values for inflation and “time value of money” over the evaluation period as the economists say that a dollar tomorrow is not the same as a dollar available today. Moreover, any practice for assigning monetary values to different benefits should be based on real market values. In order to do this, it is most preferable to observe what people are usually paying for a particular service/product etc. in the real world scenario (revealed preferences), because it can be safely assumed that if a customer is paying a particular price for a specific service/product, this price is the minimum worth of this “benefit” to the customer. Ideally, the evaluation should also present a picture of the landscape with and without the intervention in place. At the end of the whole exercise, after the respective values have been assigned to all the identified costs and benefits, the CBA is completed by adding all the costs and benefits together to one value. If this value turns out to be positive, it means that it is favourable to implement this intervention, and vice versa. A number of different interventions can be compared side-by-side with the one having the highest positive value being the most favourable.

It should be noted at this point that for the sake of simplicity, inflation is not brought into account for the duration of time studied in the context of this study. Also, because the object at hand is an eHealth intervention and not a product/service that can be purchased off a shelf in the market, “revealed preferences” are replaced by “stated preferences” as a source of data, obtained through “Willingness to pay” exercises, that will be described later in this chapter.

Dobrev et al.^{xx} state that the sources of information for their work was based on open interviews with the stakeholders, and internal statistics coming from the regional health-care authority, their IT wing, and the health-care provider organisations' systems. These statistics mostly serve to ascertain the amount of utilisation around the eHealth intervention at hand. This proved to be a major limitation in the context of this study as access could not be gained to the aforementioned statistics, as will be seen in the sections to come.

5.1 The Stakeholders

The stakeholders were briefly identified in the “Aim” of this study. What follows is a description of each of these stakeholders, including their involvement and importance as a source of information in the scope of this study:

VGR: The regional health-care authority, as mentioned before had part of the responsibility for the implementation of e-recept in the region. It is of course in their interest for all health-care practice to be running smoothly and efficiently at all times. They maintained regular contact with the prescribers through-out the life-cycle of the implementation of e-recept and through the evaluations they carried out during that period, they obtained important information on the perspectives of the prescribers. The

implementation on their part involved commitment of resources, including working time from their employees, among other expenses. They sum up these different pieces of information in the form of internal reports, some of which were kindly provided for the purpose of this study, along with an opportunity to interview one of their employees who was involved with the implementation of e-recept.

VGR-IT: They are the IT wing of the regional health-care authority and are responsible for providing the IT functionality in all public health-care organisations. This includes not only equipment at the premises of the organisations, but also inter-connectivity within and between different organisations. In the context of this study, the most important inter-connectivity is between the health-care organisations, the National Prescription Mailbox, and the pharmacies. They are the ones with the information for the cost of infrastructure and software licensing that was incurred as a result of the implementation of e-recept on behalf of VGR. Moreover, they are also expected to have statistical information on the usage of e-recept in the region from the prescriber's side. Unfortunately, the relevant representative from this organisation could not spare the time to provide the information required from them as a part of this study.

Apoteket AB: As mentioned before, this organisation used to be the national pharmacy monopoly. It was of course in their interest for the dispensing of medicine to be carried out in the most smooth and efficient manner at all times. They formed the other part that was responsible for implementing e-recept in VGR. They were also responsible for providing trainings to all the users of the system, including prescribers and dispensers of medicine. They are also expected to maintain statistics of their own related to the dispensing of medicine. After the deregulation of the national pharmacy, the IT side of Apoteket AB became Apotekens Service AB and serves all of the pharmacies operating in Sweden as a neutral body. Unfortunately, due to this organisational change, there seem to be holes in accounts of information from the implementation period, but they managed to provide some useful information, including statistics on the number of prescriptions from the period starting at the beginning of 2008, to the first quarter of 2011.

Health-care Provider Organisations: It is in their interest that their employees provide uninterrupted and efficient services to as many patients as possible at any given time. In the initial phases of implementation of e-recept, there were problems in the module that could affect the performance of the prescribers in terms of time. Moreover, time was lost in trainings, even though this was a one time cost. Finally, they were also responsible for bearing the cost involved in implementing e-recept at their premises. Unfortunately, the chiefs that were interviewed in the context of this study were unable to provide information on the economic aspects that are mentioned above, claiming that this information is also maintained by VGR-IT.

Prescribers: It is in their interest to have a faster and more efficient process for prescribing. The cost to them as individuals is the time and effort that they put in training for the system, the initial inconvenience they faced with problems in the system, and the ongoing inconveniences post implementation, most of which got rectified within the implementation period. The benefit they get from the module is expressed in their “willingness to pay” for the system.

Pharmacists: It is in their interest to have a faster and more efficient process for dispensing medicine. The cost to them as individuals is the time and effort that put in training for the system, the initial inconvenience they faced with problems in the system, and the ongoing inconveniences post implementation, most of which got rectified within the implementation period. The benefit they get from the module is expressed in their “willingness to pay” for the system.

5.2 Tools for gathering information

Data from the stakeholders could be gathered in a number of different ways including surveys/questionnaires or interviews. Questionnaires have a number of advantages over interviews due to the fact that it includes objective questions that need not be answered in person. In fact, questionnaires can easily be sent out over electronic media to a very wide audience, creating the possibility of having a sample size of statistical significance. However, at the same time, there are very serious issues with questionnaires if not designed very carefully. Because the questions are objective, it is not possible to capture the qualitative aspects of the stakeholders perceptions due to their vastly different experiences. Designing a questionnaire to cater to all these differences in a wide audience is a very complex task, which would probably result in a very large number of questions, resulting in a low response rate and was deemed not feasible for the context of this study. Finally, there is also the risk of misunderstanding the questions, especially in the case of this study where the medium is English, which happens to be second language to everyone involved in this study. All of these issues were experienced first hand in the context of this study by using a questionnaire developed specifically for doctors and two sessions were held in person with 2 senior doctors at Sahlgrenska University Hospital. It became clear in a few moments time that the wording of the questions was rather ambiguous, and many issues raised were irrelevant to e-recept, or to general prescribing in Sweden altogether. Although the clarification of numerous issues took place in the span of these 2 sessions with the doctors, what also became clear was that a common set of questions will not be able to explore the depth of experience for a large number of stakeholders and will miss out the minor details sought in a socio-economic evaluation. Hence these two sessions stand to have given the methodology a recursive approach, which was thus adapted. As a result, questionnaires were dropped in favour of open interviews carried out in person.

As mentioned before, ideally the evaluation should be carried out before, during and after the implementation of an intervention to track the progression of perceptions and effects it has on the stakeholders. This is obviously not possible for this study as the implementation of e-recept already completed on 31-12-2008, but it has been attempted to bring the past into perspective as much as possible to help the stakeholders create this comparative picture in their minds and then have them state what value e-recept brings to them. This was done as a part of the open interviews carried out that varied in length from 35 minutes to around an hour, depending on how much time was allotted, and how much off-topic a discussion might stray. The interviewees were initially asked about their respective practice when handwritten prescriptions were the norm, what they felt about their move to printed prescriptions, the medical record system they used, their general attitude towards computer systems and technological innovation, and their experience with e-recept, including the things they like and dislike about it. They are also asked about other issues and numbers which determine usage of the service by them and their colleagues. This is done in an attempt to make up for the lack of access to internal statistics mentioned earlier. Towards the end, when the interviewees have all of the things related to e-recept in scope, they are then asked to participate in a thought experiment called “willingness to pay”, which is a measurement technique in economics for putting in monetary terms what a person is willing to pay to acquire a good or service²⁷. To start, a value round one fifth of the salary of the particular interviewee is stated and they are asked if this is an amount they would be willing to pay to be able to use e-recept on a monthly basis. If they agree, the value is increased one notch and the question repeated, till the point that where they refuse to pay the given amount in order to be able to use e-recept. In case they disagree to pay on the first value, then it is decreased one notch to the point where they agree to pay the particular amount on a monthly basis. In any case, the resulting amount is the maximum “willingness to pay” that the interviewee has for the intervention at hand.

Using the numbers thus collected, an attempt has been made to put monetary values on the “likes” and “dislikes” identified by the interviewees, which are part of the benefits and costs respectively. The “willingness to pay” expressed by the interviewees counts towards ongoing benefit of e-recept. Additionally, some internal reports provided by representatives of regional authorities and emails from different organisations were also used to elicit different cost and benefit indicators, along side useful statistics that help in calculating costs and benefits.

It must also be noted at this point that because health-care in Sweden is state-funded, access to health-care has always been a hotly debated issue where appointments for patients could be offered weeks or months later, and naturally, the health-care professionals are being worked to their limits. As a result, getting time for academic interviews, especially when they can be an hour long and yield the interviewee nothing in return was found to be particularly difficult. Nevertheless, a total of 15 interviews have been conducted in the scope of this work, including the two sessions carried out with doctors at Sahlgrenska University Hospital and in addition to other written correspondence with people who have worked with or are somehow related to e-recept. The later interviewees include one project manager from VGR who was part of the team responsible for implementing e-recept in Vastra Gotaland, seven doctors including two chief administrators, another chief administrator who is a nurse, and four pharmacists including two Chief pharmacists. Even though the number of interviews is rather small, the diversity offers views from a wide spectrum of stakeholders, including that of the regional healthcare authority, the health-care professionals and the administrative views of the health-care provider organisations, the pharmacies and the pharmacists. The following section will go into the detail of these interviews and manifest the numbers that have been collected in an attempt to make up for the lack of internal statistics as a data source.

6. Interviews

We start off with the doctors at Sahlgrenska University hospital who helped shape up the methodology in its present form. It is important to note that because these were initial and open interviews, there were discussions that were off topic but useful nonetheless. Because the following two interviews helped shape up the methodology, they are considered to be the first phase of this study, and the remaining interviews were then carried out in the second phase with the adapted methodology.

Phase 1 – Pre study:

Doctor 1:

This person is a Haematologist at the internal medicine department of Sahlgrenska University Hospital at Gothenburg, Sweden.

Before actually starting the interview, he was kind enough to demonstrate the working of e-recept from his terminal. He stated that doctors have access to all EMRs at Sahlgrenska University Hospital. In order to access a patient's entire history, a verbal consent is required that need not be recorded, but it is a good practice to record it. In case there is a conflict between a patient and a doctor after the patient's medical record has been accessed, the doctor is not likely to be held liable for any perceived damages in the prevalent system over here.

He was mostly satisfied with the e-recept and had just one suggestion for improvement. It is currently not possible for doctors to prescribe drugs from home, in case he/she needs to help out a family member or a neighbour etc. and he would like to see the functionality of e-recept being extended in this manner.

Extensive and updated information on drugs can be found online through fass.se .

According to him e-recept might not have helped the doctor treat more patients than before, but it has certainly made the job easier.

While discussing the patients privacy issues concerning their medical records, he said that the doctors generally enjoyed a high level of trust here in Sweden from the patients. On the other hand, if we talk about the USA for example, the doctors are not really well trusted over there. People either don't think they are professional enough, or that they are plain greedy, and hence ask for second opinions from other doctors very often. Here in Sweden, he only sees a request for a second opinions as often as once a month.

As the discussion progressed, he also noted that it is not just medical records but there is whole lot of other information about each individual that exists today in electronic format anyway, and can be accessible with their personal numbers. He feels that people generally do not have problem with this today because Sweden is politically stable, even though there may be a lot of debate around privacy with eHealth related applications.

Regarding the safety of prescriptions, he said it might actually be easier to make mistakes with e-recept

because we make choices from drop down boxes.

In the initial stages of this study, the pharmaceutical industry was thought to be an important stakeholder as well, due to the fact that only the cheapest alternative of any medicine is actually dispensed to the patient. However, it turned out to not be the case as he clarified that this piece of legislation was in place far before the implementation of e-recept. Nevertheless, he iterated that the pharmaceutical companies' marketing strategies have changed over the past decade or so. The doctor is able to prescribe the patient other medicine that may not be the cheapest, but the patient would have to pay the difference in price. In light of these developments, the pharmaceutical companies do not stand to gain much by targeting the doctors in their marketing campaigns. Instead, they target the patients through focused advertising on TV, radio, newspapers, or even through posters in waiting rooms. Doctors may be invited to large scale conferences where the pharmaceutical companies present comparative studies between competing solutions, or may even add to the existing scientific knowledge. However, the quality of these comparative studies and scientific knowledge can be questionable at times. The pharmaceutical companies may also pull in national or international figures to speak on their behalf at these conferences, but even the neutrality of these figures can be doubtful. In short, the reputation of people marketing is not so high before him. These kind of marketing techniques may be common to most of the developed world now.

That said, the actual strategic decision makers in this regard are the patient unions, the hospital administrations and the politicians, and the pharmaceutical companies try to target all of them. The patient unions really have the patient's ears and thus, the strongest influence that the politicians have to confirm to. The hospital administration may have some influence over the doctors.

Looking at e-recept generally as an advancement in eHealth, he said that it has been a very good experience. The training only took about half an hour to an hour, and because he is working for a university hospital, he is always used to learning and trainings. He also said that e-recept's first incarnation looked like an actual prescription and hence was easy to fill out for the doctors. At the same time, he also noted that being a senior doctor now, he can sometimes feel tired of all the changes being thrown around all the time, some of which can be relatively outrageous or over ambitious.

The interview ended with a discussion about the de-regulation of the national pharmacy monopoly, which he viewed very favourably. Previously, he felt that the services were not so good and there was no need to improve due to the lack of competition. He noticed positive changes the day the de-regulation was implemented, where walking into a new pharmacy, he was now welcomed by the multiple staff members who asked him how he could be helped.

Doctor 2:

This person was, at the time, head of internal medicine at Sahlgrenska University Hospital and was kind enough to spare an hour for this interview. We started off generally talking about e-recept, where he said that electronic prescriptions are easier for the patient to manage, they save time, especially during renewing prescriptions that can now be done with a few clicks. Previously, the doctor had to call a particular pharmacy and inform them about renewing the prescription, which was understandably a cumbersome process. Moreover, because the doctor was calling a particular pharmacy, the patient could not obtain the required medication from any other pharmacy.

He said that the accessibility of Health care is not so much an issue here in Vastra Gotaland any more as a short while ago, a lot of general practitioners have started practising on a private basis. In fact, he felt that there are so many now, that some of the private clinics might actually close down.

According to him, e-recept has not had any effect on the requirement of staff. On average, it might be saving the doctors round about 20 minutes a day.

Paper practice has been abandoned all over, except in cases of foreign patients who do not have a personal number.

He also spoke about the EMR system they were using. It is called "Melior" and is based on a very old platform, and he feels that it does not provide a lot of convenient features available to others today, including the ability to read blood samples directly, moving data between different departments, such as from internal medicine to surgery etc. The reason why they have stuck with it so long is because they are a very large organisation and changing such complex software systems is a big issue.

He notified that Vastra Gotaland takes care of the IT systems in health care, and that there are several solutions in the works regarding telemedicine. This is another misconception that was clarified, as it was assumed that the individual health provider organisation was responsible for implementation of e-recept on their premises. This is where it became clear that vital information on the usage, budget, implementation procedures etc. should originate from VGR IT.

He feels that e-recept has made prescriptions much safer than before, and has fixed the much dreaded issue of illegible handwriting, due to which previously the pharmacists had to call back the doctor quite often, just to verify what he/she had written.

Towards the end of the interview, he shed some light on the economic aspect of his duties. He said that the spending at his department grows every year by around 10 %. This year, he has around 550 MSEK for his department. He said that around 43% of this is spent on drugs and 40% on staff salaries. Looking back ten years, the staff salaries formed around 90% of the budget! This is mainly due to new drugs in different fields of medicine that are very costly. Even though there have been reductions in the number of beds in Sweden due to advances in health care and inpatients have been converted to outpatients, it has not been able to offset this huge economic burden.

In case of prescription mistakes, the cases are covered by government funded medical insurance and managed by Socialstyrelsen, contrary to the USA where all such cases usually end up in court. This was another point of note as the questionnaire consisted of questions directed at doctors and health-care provider organisations related to litigation in cases of malpractice in prescribing and medicine in general. But because they do not need to manage these issues themselves, such questions would be better directed at Socialstyrelsen.

Phase 2 – Adapted study:

Västra Götaland Regionen, Project Manager:

This person provided various pieces of information over almost the entire span of this study, which includes several emails, some phone calls, and an open interview. She also provided two internal documents about the implementation of e-recept, the information wherein was used for defining the technical description and implementation strategy of e-recept in this study, among other sources. The internal report mentioned here was also instrumental in defining cost and benefit indicators for various stakeholders, as will be seen in the next chapter.

Moreover, attempts to gather information from VGR IT did not succeed as the contact person over there found the questions sent to her too time consuming to answer. They were then directed to this contact again, who was kind enough to try and answer as many of them as possible in her own capacity.

What follows is a summarised form of the information provided by her in all forms of correspondence that has not already been mentioned elsewhere in this study:

Introduction and current engagements: She worked as a nurse in the health sector for several years, and worked simultaneously with drug issues. She had special interest in promoting IT functionality to health care professionals in their everyday practice. She was then asked to be a part of the team implementing e-recept and to continue working with it post implementation, and hence she is overlooking the projects today that extend its functionality.

Perceived benefits with e-recept: The implementation of e-recept has helped clarify what doctors and nurses require with their prescribing practice. VGR provides comprehensive support to all the users of the service and work both regionally and nationally with issues pertaining to it. She feels this is one of the defining factors for saving resources and costs at all levels.

Technical description: At the level of the health care provider organisation, the company providing the medical record system is responsible for building the e-recept module into the system, and VGR IT was responsible for the technical operation and management of communications at the regional level, i.e. for connecting the health care provider organisations, the pharmacies and the National Prescription Mailbox. The National Prescription Mailbox was previously owned by Apoteket AB, and after the deregulation of the national pharmacy monopoly, it is now owned by Apotekens Service AB, who define the format for sending e-receipts and procedures for testing. Actual testing on a regional level is then carried out by VGR IT.

Economic aspects: It is hard to determine the cost of man-hours for the implementation of e-recept in VGR because many of the people involved were working only part time with this project. Furthermore, the cost in terms of hardware, infrastructure and services is also hard to determine due to the changing manner in which this information and related procedures are recorded and managed by VGR IT. Because e-recept was the first project of its kind that involved so many different actors at a time, the procedures were in their “trial and error” phase. For projects after e-recept, there has been compensation from the state for reaching certain levels of utilisation, such as with sending medical certificates electronically.

Important statistics:

- △ The three employees at VGR that were a part of the implementation team were involved 50%, 75% and 100% with this project, and had a combined salary of 1.2 MSEK/year. This means that

all three were on average engaged 75% with e-recept, that means there is an annual expense of 900,000 SEK/year through appointing these two employees over the span of five years it took to implement e-recept.

- ⤴ There was a combined budget between Apoteket AB and VGR for information materials, travel, workshops etc, that amounted to 400,000 SEK/year.
- ⤴ There are a total of 4.7 million visits to medical institutions in VGR per year.
- ⤴ There are around 6,500 prescribing health-care professionals in VGR.

Doctors:

Doctor 1:

Age: 38

Gender: Male

Experience: 6 years

Specialisation: General practitioner

Electronic Medical Record system: Journal III Profdoc

Organisation ownership: Private

This doctor stated that he has not had to resort to hand written paper prescriptions, but has used printed paper prescriptions. Just like hand written prescriptions, only two medicines can be prescribed at a time, but at least the issue of bad hand writing is taken out of play. He started using e-recept in 2008.

The lectures and trainings conducted by Apoteket AB lasted a couple of hours and gave him the opportunity to gain confidence with using the system. Apoteket AB seemed very keen to provide assistance. The fact that as many medicines can be prescribed as required in one go with e-recept makes him happy. Another added benefit for e-recept is that previously a different form of prescription needed to be used to prescribe sensitive substances, like anti-depressants. This form of prescription required the doctor to provide additional information as part of regulatory controls defined by the authorities. But no such controls are required when e-recept is being used as all of the information is being transmitted in any case, and any kind of medicine is prescribed in the same manner.

There are times when the system is not functioning, and he has to resort back to printed prescriptions, which is a little more time consuming. One possible scenario is that the prescription did not get transferred at all, which is tricky for the pharmacy and the doctor to detect and makes the patient anxious and doubtful whether the doctor sent the prescription or not. Or sometimes, there could be a delay of up to three hours for the prescription to get to the pharmacy, and it is not uncommon for the patient to walk out of the clinic and into a pharmacy around 10 to 15 minutes after visiting the doctor. In either case, if the issue is not resolved within a couple of hours, the doctor has to provide a printed or

hand written prescription, which gets even more inconvenient when this patient may come back to the doctor when he/she is treating another patient. All that said, it is important to note that such incidences according to him might occur once or twice a month. However, such incidences may lead to the patient getting the medicine dispensed twice at the pharmacy, an issue especially prevalent in the case of pain killers and sleep inducers.

He has a salary of around 37000 SEK and treats around 10 patients a day.

A prescribing exercise was then carried out where he wrote down just one painkiller and all of the associated information for each prescription in all three formats, and the time it took to complete the task was recorded in each case. Following are the results:

Hand written prescription: 101 s,

Printed prescription: 51 s

e-recept: 35 s

Unfortunately, an attempt to evaluate his “Willingness to Pay” for the service of e-recept did not succeed because he felt unable to separate himself from many expenses associated with running the clinic, to which e-recept was secondary. Hence he felt that he was not willing to pay anything for it, and would do fine if he had to fall back to printed prescriptions for good. He went on to explain that VGR pays a fixed amount per patient and the clinic is then responsible for remunerating the expenses of the dispensed medicine to the pharmacy for this patient. In case of patient with chronic diseases, the clinic may actually suffer losses because of this. He knows of several clinics that closed down because of this.

Doctor 2:

Age: 66

Gender: Male

Experience: 35 years in medicine

Specialisation: occupational healthcare

Electronic Medical Record system: Journal III Profdoc

Organisation ownership: Private

This doctor has used paper prescribing quite extensively. And started using e-recept just around one and a half years ago. He did not receive any formal training for it. Instead, he just asked his colleagues to show him how to use it and he was good to go. Systems like Apodos/Edos, however, he notes are not so easy to use, and he described how it took almost an hour to go through it earlier in the day for one patient.

Among the benefits with e-recept for him is that all medication can now be prescribed in the same simple manner.

According to him, the problem with e-recept and similar systems is that you have to rely on electronic systems, which should have redundancy. Another problem is the kind of support offered by Apotekens Service AB where he has to talk to machines for a long time, which he really doesn't like.

He treats around 25-30 patients per day, and his "willingness to pay" for e-recept is around 6000 SEK per month.

He then went on to reiterate that when he was young, there were no services like Apodos, just a lot of nurses giving the patients their medications, which he finds more preferable. He feels that as time has passed, a lot of administrative tasks have fallen on the doctors that previously were handled by the nurses, which he understandably finds inconvenient.

Towards the end, he also said that he is in favour of generic prescribing but feels that there are too many names to remember now, and the list is growing.

Doctor 3:

Age: 61

Gender: male

Experience: 35 years

Specialisation: Family Medicine

Electronic Medical Record system: Medidoc

Organisation ownership: Public

This doctor stated that he stopped using paper prescriptions in 1996, and started using e-recept in 2004.

Speaking of the medical record system, he stated that when you prescribe, you have a history of prescriptions for each patient, and you don't have to fill them out repeatedly. It is good to copy from the past to make sure you got it right, and avoid making mistakes when the patient is talking to you and concentrate on writing correctly. The prescription module he said was easy to learn and use, where learning to use it should not take more than ten to fifteen minutes.

He recalled that the patients were rather confused in the beginning of the implementation of e-recept, and it took them a year or two to get used to the practice of not getting paper in their hand from the doctor. The patients would also complain to the doctors, and the pharmacists about only being able to have medicine prescribed for three months at a time. For the doctors, it looked very good from the onset and they were generally very positive about it.

The only issue with e-recept is the downtime the system sometimes suffers from, and then you have to write on paper. This becomes all the more inconvenient, when you have to write special prescriptions

for e.g. narcotics.

He would like to see e-recept work for all patients, including those who don't have a personal number.

E-recept is good also because repeat prescriptions can be made without an effort of communication between secretaries, pharmacies etc. The prescription just goes straight to the pharmacy.

On average, he treats around 15 patients a day with 5 to 6 repeat prescriptions. And doctor with his experience typically earns around 65000 SEK per month. He stated that his "willingness to pay" is around 5000 SEK a month for this service.

In the end, he also expressed his feeling that e-recept is more admirable for the quality improvement in health-care provision i.e. in terms of safety and convenience, than it is for efficiency i.e. in terms of saving time while prescribing.

Doctor 4:

Gender: Female

Experience: 28 years

Specialisation: skin and sexually transmitted infections

Electronic Medical Record system: Journal III Profdoc

Organisation ownership: Private

The doctor started on a general note saying that the use of computers has put administrative burden on the doctors, maybe because the applications are not very well organised with the procedures of healthcare. She felt that it is particularly inconvenient that hospitals cannot communicate with each others medical record systems.

She said that she has been using printed prescriptions since 1993, and the first time she came around using electronic prescribing was in 1995. She was trained for using e-recept by some IT groups and took around 2 hours. She added that paper prescriptions are only used when patients are non citizens. And this has only happened twice in one and a half years in the clinic where she is working today. Other people for whom e-recept cannot be used are people with protected identities. She also said that she has mostly used printed prescriptions through her practice.

One of the benefits with e-recept is the fact that renewing prescriptions is much faster now. She also stated that it would not be possible to fall back to hand written prescriptions today because the staff employed within health-care provider organisations and at the pharmacies would not be able to read it, as opposed to their predecessors who would be used to putting up with illegible hand writing.

Among her desired improvements in e-recept include the ability to prescribe food items, and devices that are provided for free. Recalling the initial days of implementation, she just said that every new

system is expected to cause trouble in the beginning. The nature of the problems was diverse.

Another inconvenience she brings to light is related to implementation of the prescription module in the medical record system where the record of prescriptions in the journal will not be updated to remove the prescriptions that have already been dispensed. Records could be for decades, and no doctor has the time to sift through all that info, or to manually remove the dispensed prescriptions.

Generally speaking, she feels that the shift of responsibilities is an important factor hindering the spread of new technology in the health-care sector.

In the end, she stated that her “willingness to pay” for e-recept is around 7500 SEK per month.

Doctor 5:

Age: 59

Gender: Male

Experience: 30 years in medicine

Specialisation: GP/Primary healthcare

Electronic Medical Records system: Medidoc

Organisation ownership: Public

This doctor started using printed prescriptions in 1993, and did not receive formal training for e-recept. He trained himself, and did not find it so difficult, as the procedure is quite similar to printing prescriptions.

One of the major benefits for him with e-recept is renewing prescriptions, especially when the patient is not there in person. Having to call up a particular pharmacy in the past for the same purpose was an inconvenience. E-recept makes prescribing fast and the flexibility of having the medicine dispensed any where is also a much appreciated advantage. He feels that e-recept may have helped eliminate fake prescriptions, but he also said that printed prescriptions had already taken care of that to a large extent.

The main drawback he saw with e-recept is that it is not working sometimes, albeit for short periods of time. He also noted that the alternative service offered for e-recept over the internet is very slow. Other than that, his organisation is used to changes, so it was not so bothersome to live through the implementation.

However, he said that when the patient is there, he prefers printed prescriptions, where e-recept may only account for 5% of his prescriptions. This is because the patients treat the yellow paper more carefully, and they can also give feedback if there is a mistake in the prescriptions. So it is like a control mechanism. Most of his patients prefer printed prescriptions. He also added that sometimes he is working in the emergency ward, or is visiting patients, and at this point, he is prescribing by hand.

On electronic medical records, he said that it is difficult for doctors to deal with all the data it makes available on a given patient, though it might be good for other staff members like nurses. Even generally, it is easy to get overwhelmed with many emails and information, making it hard to distinguish between things that are important or not, which could result in a person ending up not treating anything with respect.

He treats around 10 to 15 patients a day and said that his “willingness to pay” for e-recept is around 3000 SEK a month.

He went on to add some general information such as, doctors prescribe around 1.5 million prescriptions per year in general. On generic prescribing, he said that the names of generics can be difficult to pronounce and remember, which could be a hindrance. Coming to the IT side of health care, he said that there is a license for every computer making use of the electronic medical record, and that there is a common system for VGR. Finally, he said that there is no problem in managing IT issues as VGR IT over looks all of the issues themselves, including the computer systems that are leased out to be used in the health-care provider organisations.

Doctor 6:

Gender: Male

Experience: 5 years

Specialisation: Training to be a cardiologist

Electronic Medical Records system: Melior

Organisation ownership: Public

This doctor is a fresher, who just passed out in June 2006, started with an intern-ship at Skovde, and had substitutional practice for a brief period.

Currently he works in three different places, vard, emergency vard, or out patient clinic. In a regular week at the vard, he works for half a day, and is responsible for 12 beds, where it could be possible for a patient leaving in the morning and another coming in the afternoon. 30 to 40 patients in a week could be treated at the vard. At the emergency vard, the turnover is much higher at 12 to 20 per day. However, he prescribes only around 5 medications in a day, which might include antibiotics or anti-allergics. In the cardiology vard, if the patient at hand has had a heart failure, he/she could be prescribed 5 to 6 medications on average.

He has had training in hand written prescriptions for two hours during his education. And he attended a lesson where he was trained to use e-recept using a test patient in around 2008. He finds e-recept most beneficial when renewing prescriptions at the in and out vard. E-recept also helps eliminate scenarios where there are misunderstandings regarding what is prescribed, and hence, something different maybe dispensed.

During his experience at Skovde, sometimes the system shut-down once or twice during a year. Every now and then, he comes across people without personal numbers, when he has to resort to the older system for prescribing.

He stated that his “willingness to pay” is around 2000 SEK per month for e-recept.

Doctor 7:

Gender: Female

Experience: 24 years in practice

Specialisation: General Practitioner

Electronic Medical Records system: Medidoc

Organisation ownership: Public

In this current organisation, she previously worked as a doctor for 2 years, and has been working as the chief since the last 5 years.

She did receive trainings for e-recept in the form of a lecture, and it is not so difficult to use anyway. She also appreciated the fact that there is a possibility to prescribe remotely by calling 0771 210210. It is also very convenient, both for the prescriber and the patient that when renewing prescriptions, you do not need to call a particular pharmacy any more, saving time for the doctor and providing flexibility to the patient in choice of pharmacy. Only a few senior patients may ask for printed prescriptions over e-recept.

A problem she felt with e-recept is regarding the codes changing in the National Product Register, where a representative code for the prescribed medicine is sent to the pharmacy, but because the code at the pharmacy's side are updated more frequently than the clinic's, a “no code” may show up where there should be information on the prescribed medicine at the pharmacy, but she says that the issue is more or less fixed now. Another possible problem is when medicine is prescribed to the wrong patient in the e-recept module, an issue that can only be rectified by calling up the support at Apotekens Service AB, which is a time consuming process where you are met with numerous recordings. Moreover, it would be useful to be able to see what other doctors have prescribed. What's also inconvenient is the fact that people without personal numbers cannot be prescribed medicine with e-recept.

She recalls the problems faced when e-recept was introduced, as being consistently characterised by transmitting issues for the prescriptions, which was very often attributed to problems in coding. Afterwards, the National Product Register problems started springing up, especially during prescription renewals.

Generally speaking about the medical records, she said the systems are very closed regarding the information. Not only is information limited to the particular facility where it is implemented, but even within one clinic, the staff working in the evening will not have access to what was prescribed during the day, and vice versa.

About this particular clinic, there are 16 doctors and 3 district nurses, so a total of 19 prescribers. This clinic takes care of around 80 to 100 patients a day, and maybe 20% of them do not receive an e-recept. The average number of medicines prescribed per prescription may be between 2 and 3. The average salary for a doctor may be around 60,000 SEK, and that for a nurse may be around 29,000 SEK per month.

Being the chief of the clinic, she naturally found it difficult to separate herself from the running expenses of the clinic. Nevertheless, she stated that her “willingness to pay” for e-recept may be around 4000 SEK per month, albeit rather reluctantly.

She explains that she does not feel that the clinics should be made to pay for such services. This perception is shaped by the fact that the clinic has to pay 6.50 SEK per day per patient using Apodos/Edos. For the patients visiting this clinic, around 10% of the patients need Apodos/Edos.

The major expenses for the clinic are for payments to the pharmacies and diagnosing the patients. The clinic can be paying about 6 million to the pharmacies annually, which accounts for about 20% of the total expenses.

She also said that in the event of a Vardcentral running into losses, they would be on their own and would not be bailed out by VGR. However, this particular clinic was doing rather well.

She stands in favour of generic prescribing, as there is confidence in Lakemedelsverket taking care of the quality aspects of drugs.

Pharmacists:

Pharmacist 1:

Age: 35

Gender: Female

Designation: leg; Apotekare

Experience: 5 years

Organisation ownership: Public

This person has had prior experience of working at pharmacies as an internee during her education

before full employment and fully understands the issue of illegible handwriting in handwritten prescriptions. She states that she only dealt with paper prescriptions back in 1997. Currently, besides being an Apotekare, she is also the chief of the pharmacy.

The trainings for e-recept, she recalls were conducted in groups, where the sessions lasted around two to three hours. They were also provided with bulky compendiums to read up for instructions, should the need arise later on.

About her daily duties, she said that sometimes patients with chronic diseases come back to ask about what they were prescribed, so that they can get another prescription from the doctor. For this, prescriptions have to be viewed for up to one and a half years, with patient consent of course.

Normally with printed prescriptions, for a patient with his/her first visit to the pharmacy, it takes around 10 minutes to dispense medication as all the data has to be manually entered into the system. On the second visit however, things are faster by making use of bar codes and it takes around 5 minutes to dispense the medicine. With e-recept, the average dispensing time is around 5 minutes in any case. According to her, the average number of medicines prescribed per patient are around 2.

The only complain she has with e-recept is when the system crashes, which brings things to a stand still at the pharmacy. She also does not feel that there is a reason to believe that e-recept is safer than paper prescriptions.

Speaking of the pharmacy where she works, there are a total of 7 pharmacists, and the average experience is around 7 years. The average salary for a receptarie might be around 25,000 SEK, whereas for an Apotekare it might be around 40,000 SEK.

Pharmacist 2:

Gender: Female

Designation: Receptarie

Experience: 1 year

Organisation ownership: Private

This person did not graduate very long ago and had 2 months of training with dispensing medication at Gothenburg Univeristy in a pharmacy as a part of her education. After three weeks of working with fake paper prescriptions, she started using e-recept. Training to use e-recept was a good experience for her.

About her regular duties, she said that this pharmacy deals with around 60 to 70 clients a day, and the average number of medicines per patient may be around 3. She feels that e-recept is convenient, saves her time and is safer.

There are times when the system is down, for around 1 to 2 hours possibly, but these occurrences are very rare for her.

The normal time for dispensing a prescription with three medications is about 3 minutes. Or when the

system is slow, it may take around 4 to 5 minutes.

Paper prescriptions still form a part of her daily practice, where every 5 out of 100 prescriptions may be hand written.

She stated that her “willingness to pay” for using e-recept is around 7000 SEK.

Pharmacist 3:

Gender: Female

Designation: Chief pharmacist

Experience: 6 years

This person has not received formal training for using e-recept, but was trained for using “recept registeret”.

Speaking about the pharmacy where she works, she said that they have to deal with a lot of paper prescriptions. This is because some customers, usually of an older age group, still insist on using paper prescriptions. Previously, she said that may be around 60% of the prescriptions were electronic, but it has now increased to 70%. According to her, the maximum a pharmacy has achieved in this region is around 90% electronic prescriptions being dispensed at their premises.

There are a total of 7 pharmacists including herself working at this particular pharmacy.

She does not feel there is anything wrong with e-recept, and states that her “willingness to pay” for this service is around 9000 SEK per month.

Pharmacist 4:

Gender: Female

Designation: Leg. Apotekare

Experience: 2 years

Organisation ownership: Private

This person has also graduated fairly recently, recent enough for the training for e-recept to be incorporated into her education, and she generally found it easy to use. Otherwise, she says that IT pedagogues representing Apoteket AB may come to the pharmacy to train the staff for a couple of days, each session lasting a couple of hours.

She feels that e-recept is very convenient for the pharmacists, as all the details entered by the prescriber

make it into the system by themselves, so unlike paper prescriptions, there is no need to manually enter the information. She also feels that it is safer in terms of mitigating the threat of fake prescriptions, and helps eliminate the factor of human error on her end while dispensing medicine. In terms of efficiency in dispensing, she stated that Apoteket AB trains the pharmacists to be able to dispense a prescription within 5 minutes. According to her, on average, dispensing a paper prescription can take around 4 minutes, but this time comes down to 2 minutes in the case of e-recept.

About her daily practice, she says that there are 4 pharmacists, including her, at this pharmacy, where they are dispensing anywhere between 70 and 120 prescriptions. Paper prescriptions have a share of around 20%. Usually they get them because either the clients are older in age and are not comfortable with moving to the new system, or the prescriber still does not have access to the system, or at least, has not adapted to it. The veterinarians also are only using paper prescriptions, around 2 to 5 of which are dispensed at this pharmacy every day. She also noted that the average number of prescriptions per patient here is around 2.

Among the things she does not like with e-recept is the down time, something which happens around once three months. And around twice a week, there may be problems with the National Product Register codes being inconsistent between the pharmacy and the prescriber's system.

In case she comes across paper prescriptions having errors, she says that they can be clarified with the patients because they are communicating with the doctor and have a good general awareness about what they have been prescribed. Nevertheless, a contact for clarification with the prescriber is necessitated every other day in her experience.

Currently, this pharmacy is using the Apotekets Terminal System (ATS), but they were scheduled to replace this system with another system in the month of May. The IT hardware is rented from Apoteket AB, and according to her, the cost for rent may be around 800,000 SEK annually for a pharmacy, though this figure will vary with the number of computers in use.

The average salary of a pharmacist may be around 26,000 SEK. She stated that her “willingness to pay” for this system is around 10,000 SEK.

Following the deregulation of the monopoly of the national pharmacy, people from different circles sometimes complain about the fact that patients now have to go to different outlets to get different medicine and cannot get everything at one stop. She disagrees however, and feels things are not very different than they were before. There was always a rule in place that a pharmacy should be able to procure and dispense any prescribed medicine within 24 hours of receiving the prescription, as is the case today. And she is unable to understand why people raise this issue.

HPO Administrator:

This person is actually a nurse by qualification, and is now working as the chief of a vardcentral. Because her role is purely administrative, she does not use e-recept herself. She also clarified that all matters pertaining to the IT functionality in providing health-care are taken care of by VGR IT, including the maintenance of statistics at all levels.

At the same time, she feels that e-recept is simple to use and is saving time for her staff. However, that does not translate into treating a larger number of patients.

She does not have any complains about the system besides the fact that it suffers from downtime every now and then.

The medical records system they are using on their premises is Medidoc. Among the staff she has that prescribe medicine as a part of their daily practice are 5 doctors, and 2 district nurses. The doctors are being visited by around 15 patients a day, while the nurses may see 6 to 7 patients a day. The average salaries for doctors and nurses would be around 65,000 SEK and 27,000 SEK respectively.

On the topic of adverse drug effects (ADEs), she says that she does not recall any such occurrence, except once when a 4 year old boy was prescribed pills instead of syrup as medication.

Apotekens Service AB:

In an email, some detailed questions were sent to the contact in this organisation that were similar in nature to those asked from VGR and VGR-IT, such as the costs of man hours for the involved employees, the equipment and infrastructure etc. However, the response was that data for the particulars from that time frame are not available now. Furthermore, it was also stated that the implementation of e-recept was not treated as a separate project *per se*, and hence data specific to it does not exist. At the same time, they provided a detailed data sheet for the amount of prescriptions that were dispensed starting from the first quarter of 2008 to the first quarter of 2011. Another useful piece of information they provided was that they charge a combined fixed price of 2.21 SEK per prescription dispensed from the pharmacies for providing their services such as National pharmacy register, Register over dispensed drugs, register of Prescribers and National Product register. Unfortunately, they still do not maintain separate data for e-recept. It is important to note that the services listed above are quite closely related to e-recept, and hence the price per prescription they provide is somewhat useful.

7. Results drawn from the interviews

7.1 Types of costs

For an eHealth intervention of the nature of e-recept, the costs are of two distinct characters. One is a mostly one-time cost, or possibly spread over a limited span of time incurred for launching the project. This cost includes the design, development, deployment, initial troubleshooting, infrastructure, trainings, salaries of the people involved in the implementation etc. Unfortunately, as has become clear from the previous sections, most of the information required to estimate these costs could not be acquired through contacts and interviews with the concerned parties. The second part of the cost encompasses the running costs for maintaining optimal use of the system. This cost includes that of malfunctions, time lost by the users as a result of the malfunctions, use and depreciation of infrastructure, data-traffic etc. Information regarding this series of costs was although not directly available either, but was relatively easier to estimate through the various interviews and contacts made in the process of conducting this study.

Among the costs that were a part of the implementation that were made available are the salaries of the three personnel involved in the implementation of e-recept on behalf of VGR. Factoring in the ratio of the working time that was allotted to this project, this amount summed up to be 900,000 SEK/year. Furthermore, there was also a joint budget between VGR and Apoteket AB for various purposes, amounting to 400,000/year. However, these costs are minuscule compared to what the costs for implementation for the National Prescription Mailbox and interconnecting the health-care facilities and pharmacies with it, for implementation of the e-recept module in the various EMRs that are commonly used in VGR etc. Therefore, a credible estimate for the costs incurred in the implementation phase is not possible in the context of this study.

As a result of the above, an attempt will be made in this section to calculate the costs and benefits of making use of e-recept in VGR in the post-implementation era, i.e. for the years 2009 and 2010 with all of the data that is available. It should be noted, however, that in order to capture the benefits and costs of transition of various forms prescriptions to e-recept, the benefits and costs calculated in this section are progressive, rather than cumulative, with 2008 as the base year. This gives an idea of how every coming year materialises new benefits realised as a result of increasing use of e-recept.

7.2 Vital Statistics

Considering 250 working days in a year, and 8 working hours in a day, average salary figures at the age of 35 from www.saco.se have been used below to calculate the hourly wages for Doctors, Receptarier and Apotekare:

Specialist doctor median wage = 50200 SEK/month ==> $50200 * 12 / (250 * 8) = 301$ SEK/hour

Apotekare: 35400 SEK/month ==> $35400 * 12 / (250 * 8) = 212$ SEK/hour

Receptarier: 26800 SEK/month ==> $26800 * 12 / (250 * 8) = 161$ SEK/hour

The number of pharmacies in VGR according to the website of Swedish Pharmacy Association is 378. From the interviews conducted as a part of this study, the average number of pharmacists per pharmacy are around 6. Therefore, the number of pharmacists in VGR = $378 * 6 = 2268$. In an email from the “Swedish Pharmacy Association”, they stated that among the pharmacists employed at pharmacies,

8.5% were Apotekare, and 49.7% are Receptarier. From this, the ratio of Apotekare to Receptarier can be calculated, which is $8.5/(8.5 + 49.7) = 0.146$. This means that 14.6% of the pharmacists dispensing medicine at pharmacies are Apotekare, and the rest of the 85.4% are Receptarier. At 14.6%, the number of Apotekare working in VGR would be $2268 * 14.6/100 = 334$, whereas the number of Receptarier would be $2268 - 334 = 1952$.

An additional source of information used in this study is an internal report, titled “PENG-analys E-recept” (from here-on, referred to as the “internal report”), conducted on behalf of VGR regarding the implementation of e-recept in 2005, that presented costs and benefits in either direct monetary terms, or in terms of working time saved or lost by the various users of the systems. A similar method was also applied for patients and the people related to them but with a flat rate for everyone regardless of their situations. This report, thus, also became a source of statistical figures and cost/benefit indicators for the purpose of this study. According to this internal report, the number of doctors prescribing medicine in VGR are around 6500.

In summary:

The number of Prescribing staff working in VGR = 6500

The number of Apotekare working at pharmacies in VGR = 334

The number of Receptarier working at pharmacies in VGR = 1952

Using data provided by Apotekens Service AB, following is a table that provides a summary of the annual number of dispensed prescriptions in VGR in the years 2008, 2009 and 2010:

Year	Registrering saknas	Pappers Recept	Fax Recept	e-recept	Telefon Recept	Grand total
2008	4,725,160	4,689,191	4,323	9,418,966	15,108	18,852,748
2009	4,248,031	2,467,941	3,132	12,270,688	15,558	19,005,350
2010	3,769,545	1,646,716	2,181	13,446,067	10,755	18,935,727
2011 Q1	831,267	357,007	477	3,459,670	2,118	4,650,539

Table 1: The number of dispensed prescriptions in a year according to type of prescriptions.

According to the “internal report”, two thirds prescriptions are repeat prescriptions. Hence:

For 2009, first time e-receipts dispensed at pharmacies in a year are $12270688/3 = 4,090,229$.

For 2010, first time e-receipts dispensed at pharmacies in a year are $13446067/3 = 4,482,022$.

Figure 1 on the next page shows the information presented in table 1 in graphical format. It can be seen that fax and telefon receipt are fairly insignificant as compared to other forms of prescriptions. It is also seen that the number paper prescriptions are declining steadily, though the rate of decline is also decreasing, whereas the number of e-recept is increasing fast, albeit with a declining rate.

Furthermore, figure 2, shows this distribution for the first quarter of 2011. It can be seen that after all the progress has been made, e-recept accounts for 74% of all prescriptions and that paper prescriptions

have been reduced to 8%.

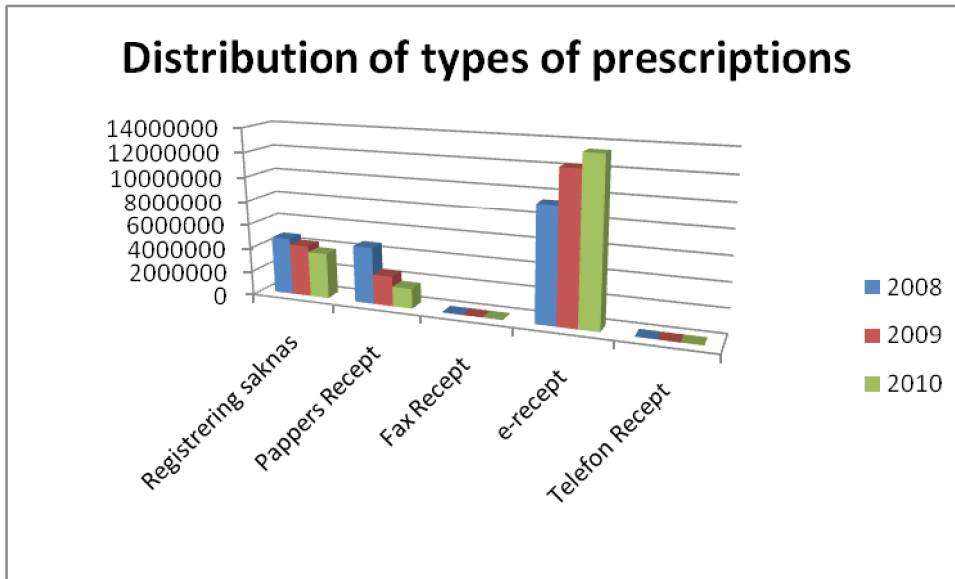


Figure 1: Type of prescriptions against number of prescription for three years.

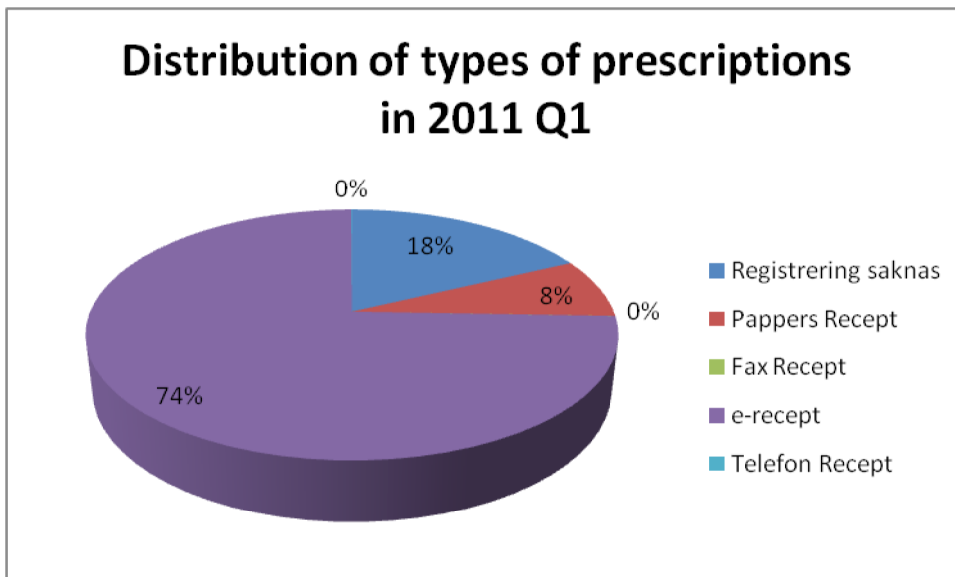


Figure 2: Distribution of types of prescriptions dispensed in the first quarter of 2011.

7.3 Costs and Benefits for Doctors and Pharmacists

This sub-section aims to capture the socio-economic impact of e-recept on its direct users strictly from their personal perspective as health-care professionals, separate from their responsibilities as employees of their respective organisations. The costs would encompass anything they disliked about e-recept, including the inconveniences they faced while the system was being implemented, and the inconveniences either through lacklustre service or lack of features they continue to face. Unfortunately, data on the nature and rate of errors was not made available by the respective

organisations, and the users themselves did not recall any initial inconveniences strongly enough to be able to attach a value to them. On the positive side, almost all users expressed great satisfaction with the use of e-recept, which means the continuous inconveniences are probably non-existent. The benefit is connected to what the users like about the service, and hence, the value they attach to it. This value was solicited using the “Willingness to pay” exercises mentioned several times in this study.

An obvious nature of the benefits is evident from all research regarding e-recept, including the interviews conducted as a part of this study, is that it is saving time for the users and making the job more convenient. “e-recept Stockholm” have estimated the saved time to be around 30 minutes for both, doctors and pharmacists in a regular working day. The time saved according to the interviews conducted is mostly due to the following factors:

- ♣ Saved time for Doctors encompasses:

Sending prescriptions electronically as opposed to printing.

Can prescribe as many medicines in one prescription as opposed to printed prescriptions, where the number is limited to two.

The same format for prescribing normal and sensitive drugs, as opposed to separate forms for sensitive drugs for handwritten and printed prescriptions that are more tedious to fill out.

Renewal of prescriptions done with a few clicks, instead of phone calls to particular pharmacies.

- ♣ Saved time for pharmacists encompasses:

Automatic entry into the system, as opposed to manual entries with handwritten or printed prescriptions.

Lesser instances of calling the prescriber to clear out what is written as compared to handwritten prescriptions.

The users were asked to recall some or all of the above benefits in accordance with their experience with the service, after which the thought experiment of “Willingness to pay” was carried out. The average value for doctors stands at 4250 SEK per month, whereas the same figure for pharmacists is valued at 8666 SEK per month. Hence, the total value of this benefit on an annual basis is:

For Doctors: $4250 * 12 * 6500 = 331.5$ MSEK

For Pharmacists: $8666 * 12 * 2268 = 235.9$ MSEK

7.4 Costs and Benefits for Health-care Provider Organisations and Pharmacies

“e-recept Stockholm” and the interviews conducted as a part of this study reveal that there was a one time training that was a part of the implementation of e-recept, and lasted around an hour. Using the statistics already mentioned in this section, following is a calculation of the monetary cost of time lost in training for e-recept:

- ♣ Assuming one hour of training:

Cost for training Apotekare = $334 * 212 * 1 = 70.8$ KSEK

Cost for training Receptarier = 1952 * 161 * 1 = 314.2 KSEK

Cost for training Doctors = 6500 * 301 * 1 = 1.9 MSEK

It must be noted however that although the above cost is actually borne by the pharmacies and the Health-care Provider Organisations that employed the professionals who received trainings, these costs are specific to the implementation period and hence, will not be included for the years 2009 and 2010.

Following are a number of cost and benefit indicators either previously identified or taken out from the internal report but calculated using statistics gathered as a part of this study, unless otherwise stated:

At the health-care provider organisations:

- ⤴ There are **cost reductions** on the side of primary care with the **elimination of the need for printed prescriptions**. 95% of the prescriptions are ordinary prescriptions, with a cost of 0.40 SEK/prescription, and the remaining prescriptions are special prescriptions with a cost of 2 SEK/prescription.

From the year 2008 to 2009, there is a reduction of 2,221,250 paper prescriptions. The cost savings as a result amount to:

$$2221250 * 0.95 * 0.40 + 2221250 * 0.05 * 2 = 1.0 \text{ MSEK}$$

Going into 2010, the overall reduction then reaches 3,042,475 prescriptions. The cost savings as a result amount to:

$$3042475 * 0.95 * 0.40 + 3042475 * 0.05 * 2 = 1.4 \text{ MSEK}$$

- ⤴ From an interview conducted with a doctor in this study, it was shown that the **time saved** from the **move to e-recept** from printed prescriptions is around 15 seconds.

For the year 2009, this amounts to a time-saving of $2221250 * 15/3600 = 9255$ hours. The cost saving as a result amounts to:

$$9255 * 301 = 2.8 \text{ MSEK}$$

Going into 2010, this amounts to a time-saving of $3042475 * 15/3600 = 12677$ hours. The cost saving as a result amounts to:

$$12677 * 301 = 3.8 \text{ MSEK}$$

- ⤴ Changes in the amount of **Telefon Recept** also reflects on the **cost of phone calls**, with the cost per phone call being 0.36 SEK.

From 2008 to 2009, there was a slight increase in Telefon Recept by 450 prescriptions. The associated cost will be:

$$-450 * 0.36 = -132 \text{ SEK}$$

Going into 2010, there was an overall reduction in Telefon Recept by 4353 prescriptions. The associated cost will be:

$$4353 * 0.36 = 1.6 \text{ KSEK}$$

- ⤴ Moreover, changes in the amount of **Telefon Recept** also changes the time assigned to prescribing, with every **transition to e-recept saving five minutes**.

For the year 2009, due to an increase in Telefon Prescriptions by 450, the cost of working time is $-450 * 5/60 = -38$ hours. And the associated cost will be:

$$\mathbf{-38 * 301 = -11.4 \text{ KSEK}}$$

Going into 2010, due to an overall reduction of Telefon Receipt by 4353 prescriptions, the cost of working time is $4353 * 5/60 = 363$ hours. And the associated cost will be:

$$\mathbf{363 * 301 = 109.2 \text{ KSEK}}$$

- ⤴ **Prescriptions** are also **sent in by mail** by doctors in primary-care, estimated in the “internal report” at 5 per day per prescriber. For a year, it the number of envelopes would be $5 * 6500 * 3/5 * 250 = 4,875,000$. For inpatient care, the number of envelopes is estimated in the “internal report” to be one per doctor, which would amount to $1 * 6500 * 2/5 * 250 = 650,000$. The grand total of envelopes is 5,525,000 , and with a cost of 0.4 SEK/envelope, the total **cost saving** would be $5525000 * 0.4 = 2.2 \text{ MSEK}$.
- ⤴ The **postage** per item is 4.80 SEK, and with 5,525,000 items, the **cost saving** would be $5525000 * 4.8 = 26.5 \text{ MSEK}$.
- ⤴ The “internal report” states that according to an internal study, over a 14 day period in which 411,606 prescriptions were dispensed, 2718 were erroneous, yielding an **error rate** of around **0.65%**. In 60% of these erroneous prescriptions, the dispensers need to contact the prescriber, costing the prescriber ten minutes of his/her working time.

From 2008 to 2009, there is a **reduction** of 2,221,250 **paper prescriptions** and a greater **increase in e-recept**. So it is reasonable to assume that these prescriptions were converted to e-recept. 0.65% of 2,221,250 = 14,438 prescriptions. 60% of 14,438 is 8,663 prescriptions. The time-cost of these contacts with the prescribers is $8663 * 10/60 = 1,444$ hours. Hence, the associated cost will be:

$$\mathbf{1444 * 301 = 434.6 \text{ KSEK}}$$

Going into 2010, the overall reduction becomes 3,042,475 , and 0.65% of this figure is 19,776 prescriptions. 60% of 19,776 is 11,866 prescriptions. The time-cost of these contacts with the prescribers is $11866 * 10/60 = 1,978$ hours. Hence, the associated cost will be:

$$\mathbf{1978 * 301 = 595.3 \text{ KSEK}}$$

- ⤴ One of the biggest means of **saving time** for the prescribers is when they make **repeat prescriptions**, which according to the “internal report”, is around two-thirds of all prescriptions. Each incidence of repeat prescriptions where the doctor does not need to call a particular pharmacy but instead, just sends it through e-recept is expected to save around four and a half minutes per prescription. This is because a normal telefon recept takes around 5 minutes to prescribe, whereas a normal e-recept prescription takes around 35 seconds. Even though the doctor will not be prescribing from scratch, he/she will still need to look for the relevant receipt after entering the personal number of the concerned patient, which might take around 30 seconds.

From 2008 to 2009, with an increase of 2,851,722 e-recept, two-thirds of this count is 1,901,148 expected repeat prescriptions. This would give rise to an expected saving of time-cost equal to $1901148 * 4.5/60 = 142,586$ hours. The associated cost will be:

$$\mathbf{142586 * 301 = 42.9 \text{ MSEK}}$$

Going into 2010, the overall increase of e-recept count is 4,027,101 , two-thirds of which is equal to 2,684,734 prescriptions. This would give rise to an expected saving of time-cost equal to $2684734 * 4.5/60 = 201,355$ hours. The associated cost will be:

$$201355 * 301 = 60.6 \text{ MSEK}$$

- Finally, there is now an **increased dependence on technology**. In the initial stages, there were frequent events where the transmission of e-recept was either delayed or failed altogether, it causes a loss of confidence among the users, and the necessity of making contacts that are not a part of normal practice. An overall figure has been drawn up at 790,000 SEK to account for “total shut-down of service”, “increased risk if prescription errors”, “use of backup services” etc., with each type of malfunction valued at 100,000 SEK. Furthermore, an hour of downtime for the system amounts to a loss of 5000 SEK in every incidence. An estimate based on figures from the interviews can roughly put these incidences at around 6 times a year for the later years.

For the year of 2005, the “internal report” estimates a downtime of about 4 hours each month, making the total cost of these incidents to be $5000 * 4 * 12 = 240,000$ SEK. Hence, for that year, the total cost in this context was $790,000 + 240,000 = 1,030,000$ SEK.

However, given the mostly positive perceptions expressed by the users of the service, it is relatively safe to assume that the major issues related to e-recept's general functionality are resolved in the post-implementation era. From the interviews conducted as a part of this study, it can be estimated that the system may be going down as frequently as once in two months, for about two hours. This would give an annual cost of around:

$$5000 * 2 * 6 = 60.0 \text{ KSEK}$$

At the pharmacy:

- As a paper with **details about dosage and directions** for the prescribed medicine is now **issued by the pharmacy** to replace the prescription itself, it is an **additional cost** to the pharmacy. At 0.10 SEK per paper, this cost amounts to:

$$\text{For 2009, } 4090229 * 0.10 = 409.0 \text{ KSEK/year}$$

$$\text{For 2010, } 4482022 * 0.10 = 448.2 \text{ KSEK/year}$$

- The **increased cost of printer toner usage** as a result is roughly equal to the increased cost of paper usage, and hence is around:

$$\text{For 2009, it is } 409.0 \text{ KSEK/year}$$

$$\text{For 2010, it is } 448.2 \text{ KSEK/year}$$

- Another cost for all prescriptions dispensed at the pharmacy are the charges due to Apotekens Service AB in return for the services they provide to the pharmacies at 2.21 SEK. It is important to note that this cost includes all services, such as National Pharmacy register, National Product register, register of prescribed drugs, register of prescribers etc, and e-recept is expected to be a small part of this cost. Hence this cost stands to present the absolute upper limit for the cost actually associated with running the e-recept service at the pharmacy.

From 2008 to 2009, an additional 2,851,722 e-recepts were dispensed, with an associated cost of equal to $2851722 * 2.21 = 6.3$ MSEK

Moving on to 2010, an additional 4,027,101 e-receipts were dispensed, with an associated cost of equal to $4027101 * 2.21 = 8.9$ MSEK

- ⤴ The “internal report” states that according to an internal study, over a 14 day period in which 411,606 prescriptions were dispensed, 2718 were erroneous, yielding an **error rate** of around **0.65%**. Assuming that these errors will be taken care of by the introduction of e-recept, and that each error costs 15 minutes of time:

From 2008 to 2009, there is a **reduction** of 2,221,250 **paper prescriptions** and a greater **increase in e-recept**. So it is reasonable to assume that these prescriptions were converted to e-recept. 0.65% of 2,221,250 = 14438 prescriptions. The time it takes for the pharmacist resolve the problem for these many prescriptions is $14438 * 15/60 = 3610$ hours. Recalling the statistic quoted earlier in this section that 85.4% of all pharmacists are Receptarier, while the rest are Apotekare, the cost of this time is:

For Receptarier, $3610 * 85.4/100 * 161 = 496.3$ KSEK

For Apotekare, $3610 * 14.6/100 * 212 = 111.7$ KSEK

Going into 2010, the overall reduction becomes 3,042,475 , and 0.65% of this figure is 19,776 prescriptions, that cost $19776 * 15/60 = 4944$ hours of working time. The cost of this time is:

For Receptarier, $4944 * 85.4/100 * 161 = 679.7$ KSEK

For Apotekare, $4944 * 14.6/100 * 212 = 153.0$ KSEK

- ⤴ In addition to avoiding erroneous prescriptions, the move to **e-recept** also **saves time** by **alleviating the need** to **manually register** the particulars of a prescription into the system at the pharmacy, as the details already reach the system through the transmission of e-recept. The interviews with pharmacists taken as a part of this study reveal that on average, 2 minutes may be saved through the move to e-recept.

As mentioned in the point above, from 2008 to 2009, there is a reduction of 2,221,250 paper prescriptions, which results in a time-saving of $2221250 * 5/60 = 185,104$ hours. The cost of this time is:

For Receptarier, $185104 * 85.4/100 * 161 = 25.5$ MSEK

For Apotekare, $185104 * 14.6/100 * 212 = 5.7$ MSEK

Going into 2010, the overall reduction becomes 3,042,475 prescriptions, which results in a time-saving of $3042475 * 5/60 = 253,540$ hours. The cost of this time is:

For Receptarier, $253540 * 85.4/100 * 161 = 34.9$ MSEK

For Apotekare, $253540 * 14.6/100 * 212 = 7.9$ MSEK

- ⤴ According to the “internal report”, the **conversion** of **Fax Receipt** and **Telefon Receipt to e-recept** also saves 5 minutes a piece at the pharmacy.

From the year 2008 to 2009, Fax Receipt is reduced by 1191 prescriptions, resulting in a time cost of $1191 * 5/60 = 99$ hours. The count for Telefon Receipt is slightly increased by 450 prescriptions, possibly due to the NPR code errors in repeat prescriptions, which is why this figure will have a negative sign for $-450 * 5/60 = -38$ hours . The combined cost of these two conversions is:

For Receptarier, $99 * 85.4/100 * 161 - 38 * 85.4/100 * 161 = 8,387$ SEK

For Apotekare, $99 * 14.6/100 * 212 - 38 * 14.6/100 * 212 = 1,888$ SEK

Going into 2010, the total reduction in Fax Receipt becomes 2142 prescriptions, resulting in a time cost of $2142 * 5/60 = 179$ hours. The count for Telefon Receipt is overall reduced by 4353 prescriptions, resulting in $4353 * 5/60 = 363$ hours. This positive development can be attributed to fixing the issue of NPR for good, and hence all repeat prescriptions are now converted to e-recept.

The combined cost of these two conversions is:

For Receptarier, $179 * 85.4/100 * 161 + 363 * 85.4/100 * 161 = 74.5$ KSEK

For Apotekare, $179 * 14.6/100 * 212 + 363 * 14.6/100 * 212 = 16.8$ KSEK

7.5 Summing up the Costs and Benefits:

This sub-section shows what the overall cost-Benefit outlook is for each class of stakeholders, along with the combined impact on all of them put together:

For the users as individual professionals, the overall outlook was solely based on the “Willingness to pay” they expressed for using the system, which was as follows:

Sum of benefits and costs for **doctors** in 2009 = 331.5 MSEK

Sum of benefits and costs for **doctors** in 2010 = 331.5 MSEK

Sum of benefits and costs for **pharmacists** in 2009 = 235.9 MSEK

Sum of benefits and costs for **pharmacists** in 2010 = 235.9 MSEK

And following is the sum of all the cost-benefit indicators listed in the previous sub-section for health-care provider organisations and pharmacies:

Sum of benefits and costs for **HPOs** in 2009 = $1.0k + 2.8m + (-132) + (-11.4k) + 2.2m + 26.5m + 434.6k + 42.9m - 60.0k = 75.9$ MSEK

Sum of benefits and costs for **HPOs** in 2010 = $1.5m + 3.8m + 1,567 + 109.3k + 2.2m + 26.5m + 595.4k + 60.6m - 60.0k = 95.3$ MSEK

Sum of benefits and costs for **Pharmacies** in 2009 = $-409.0k - 409.0k - 6.3m + 496.4k + 111.7k + 25.5m + 5.7m + 8,387 + 1,888 = 24.7$ MSEK

Sum of benefits and costs for **Pharmacies** in 2010 = $-448.2k - 448.2k - 8.9m + 679.8k + 153.0k + 34.9m + 7.8m + 74.5k + 16.8k = 33.8$ MSEK

Finally, following is what the overall outlook is for society in view of the selected stakeholders:

Overall sum of benefits and costs for **all stakeholders** in 2009 = $331.5m + 235.9m + 75.9m + 24.7m = 667.9$ MSEK

Overall sum of benefits and costs for **all stakeholders** in 2010 = $331.5m + 235.9m + 95.3m +$

33.8m = 696.4 MSEK

7.6 Share of Benefits for each stakeholder:

Following are the percentage shares of benefit distributed over the identified stakeholders:

Share of Doctors for 2009 = $331.5\text{m}/667.9\text{m} * 100 = 49.63\%$

Share of Doctors for 2010 = $331.5\text{m}/696.4\text{m} * 100 = 47.60\%$

Share of Pharmacists for 2009 = $235.9\text{m}/667.9\text{m} * 100 = 35.31\%$

Share of Pharmacists for 2010 = $235.9\text{m}/696.4\text{m} * 100 = 33.87\%$

Share of Health-care Provider Organisations for 2009 = $75.9\text{m}/667.9\text{m} * 100 = 11.36\%$

Share of Health-care Provider Organisations for 2010 = $95.3\text{m}/696.4\text{m} * 100 = 13.67\%$

Share of Pharmacies for 2009 = $24.7\text{m}/667.9\text{m} * 100 = 3.70\%$

Share of Pharmacies for 2010 = $33.8\text{m}/696.4\text{m} * 100 = 4.85\%$

Figure 3 shows all of the above information in graphical format.

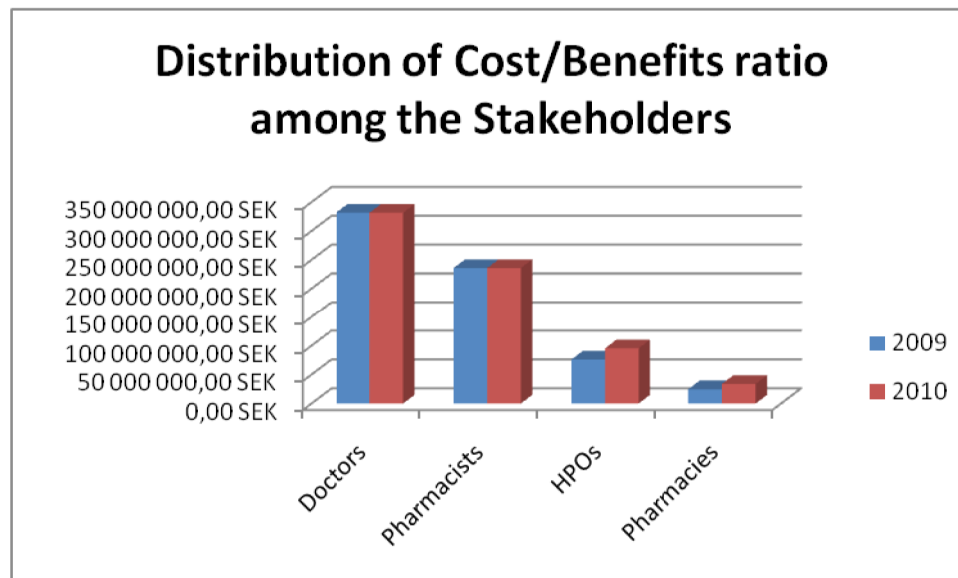


Figure 3: Distribution of Cost/Benefits ratio among all the identified stakeholders

For discussions sake, because the absolute values of benefits for HPOs and pharmacies are much

smaller than those for Doctors and Pharmacists, figures 4 and 5 show direct comparisons between HPOs and Pharmacies for the years 2009 and 2010 respectively.

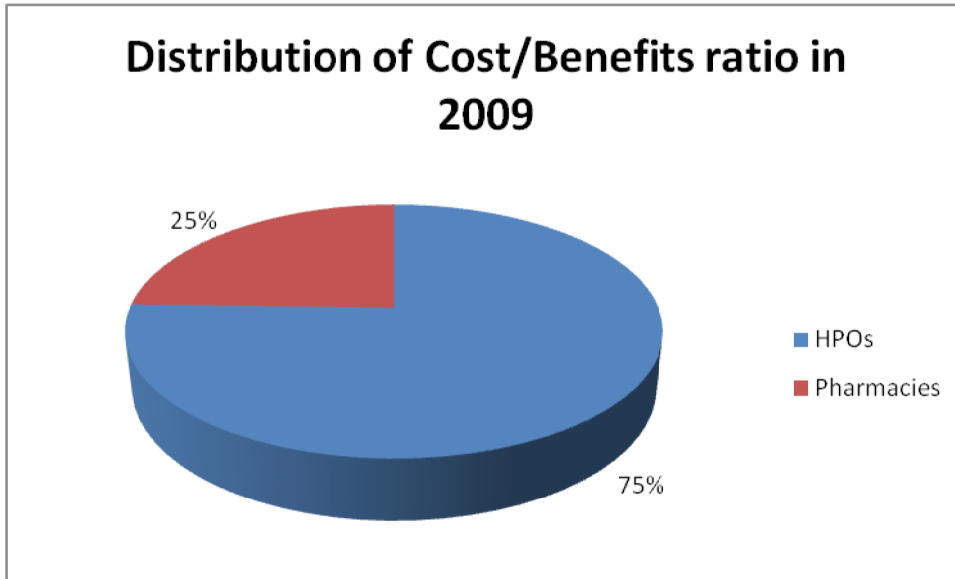


Figure 4: Distribution of Cost/Benefit ratio between HPOs and Pharmacies for 2009.

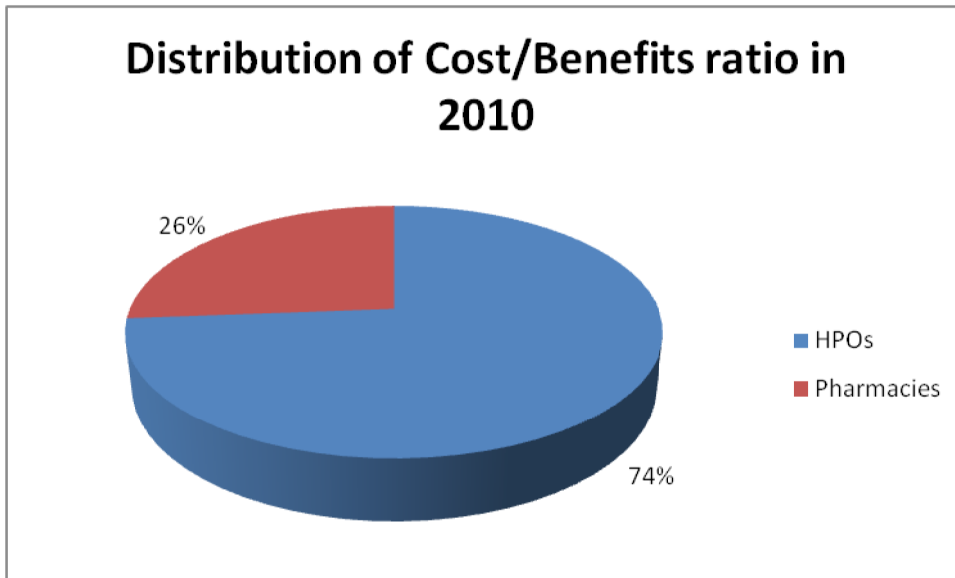


Figure 5: Distribution of Cost/Benefit ratio between HPOs and Pharmacies for 2010.

7.7 Estimating the time saved by the users:

As previously mentioned, "e-recept Stockholm" estimated both doctors and pharmacists saving 30 minutes per day on average through making use of e-recept. Following is an estimate of the time-saved by both classes of users based on the cost-Benefit indicators identified in this section:

Total time saved by pharmacists in 2009: $3610 + 1.85k + 61 = 188.8k$ hours

Time saved per pharmacist on a daily basis = $188.8k / (2268 * 250) = 1/3$ hours or 20 minutes

Total time saved by pharmacists in 2010: $4494 + 253.5k + 542 = 258.6k$ hours

Time saved per pharmacist on a daily basis = $258.6k / (2268 * 250) = 0.45$ hours or 27 minutes

Total time saved by doctors in 2009: $9255 - 38 + 1444 + 142.6k = 153.2k$ hours

Time saved per doctor on a daily basis = $153.2k / (6500 * 250) = 0.094$ hours or 6 minutes

Total time saved by doctors in 2010: $12.7k + 363 + 1978 + 201.3k = 216.3k$ hours

Time saved per doctor on a daily basis = $216.3k / (6500 * 250) = 0.133$ hours or 8 minutes

As can be seen, the 30 minute estimate seems to be valid in the case of pharmacists, but the time saved for the prescribers is probably more modest.

7.8 Estimating the impact of moving from paper to e-recept:

By looking at the cost/benefit indicators specific to paper prescriptions that have been identified, an attempt will be made to evaluate what impact does the transition of one paper prescription to an e-recept has from the Health-care Provider Organisations and Pharmacies point of view.

From 2008 to 2009, the sum of the relevant cost and benefit indicators = $1.0m + 2.8m + 434.6k - 409.0k - 409.0k - (2.2m * 2.21) + 496.3k + 111.7k + 25.5m + 5.7m = 30.3$ MSEK

With a reduction of 2.2m paper prescriptions, the impact per prescription would be $30.3m / 2.2m = 13.66$ SEK

This means that every time e-recept was chosen over paper prescriptions, the HPOs and pharmacies together potentially gained 13.66 SEK. Moreover, the ratio of benefits for each are calculated below:

Percentage benefit gained by HPOs for every transition = $(1.0m + 2.8m + 434.6k) / 30.3m * 100 = 14.13\%$

Percentage benefit gained by pharmacies for every transition = $(-409.0k - 409.0k - (2.2m * 2.21) + 496.3k + 111.7k + 25.5m + 5.7m) / 30.3m * 100 = 85.87\%$

This shows that the pharmacies have the most major gains for every transition made from paper to e-recept.

Repeating the same exercise for the year 2010, the sum of the relevant cost and benefit indicators = $1.5m + 3.8m + 595.4k - 448.2k - 448.2k - (3.0m * 2.21) + 679.8k + 153.0k + 34.9m + 7.9m = 41.8$ MSEK

With a reduction of 3,042,475 paper prescriptions, the impact per prescription would be $41.8m / 3.0m =$

13.74 SEK

Hence it can be assumed that the benefit per transition is quite stable from 2009 to 2010. The ratio of benefits for each stakeholder for 2010 are:

Percentage benefit gained by HPOs for every transition = $(1.5\text{m} + 3.8\text{m} + 595.4\text{k}) / 41.8\text{m} * 100$
= 14.05%

Percentage benefit gained by pharmacies for every transition = $(- 448.2\text{k} - 448.2\text{k} - (3.0\text{m} * 2.21) + 679.8\text{k} + 153.0\text{k} + 34.9\text{m} + 7.9\text{m}) / 41.8\text{m} * 100 = 85.95\%$

The ratios are also almost identical from 2009 to 2010, hence the information in this sub-section is shown just once in figure 6 below.

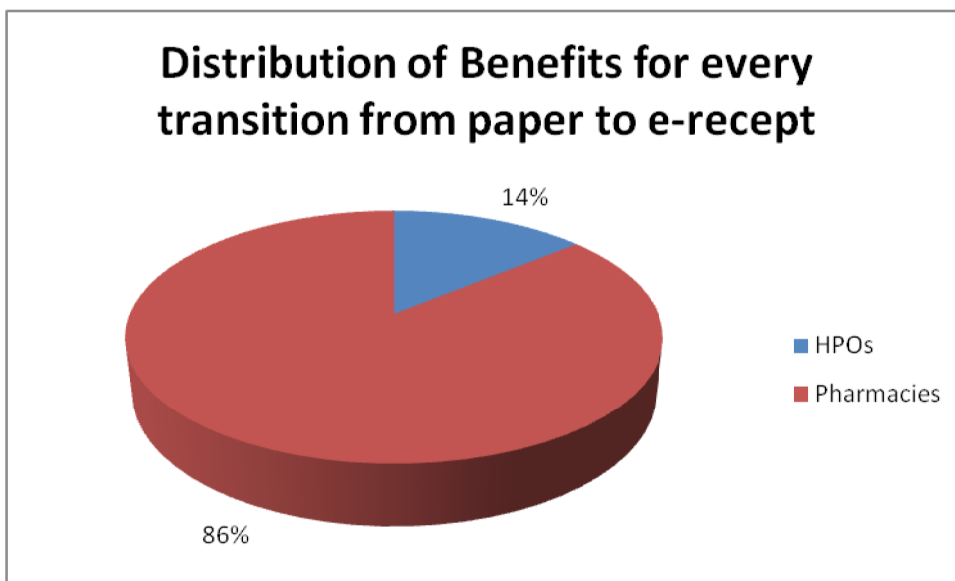


Figure 6: Distribution of Benefits over the HPOs and the Pharmacies for every paper prescription that is converted to e-receipt.

8. Discussion

The interviews and the numbers stand to confirm the fact that the implementation of e-recept is indeed a success with all the stakeholders, especially the direct users i.e. the prescribers and the pharmacists have gained a lot out of the service in their daily practices. It must be noted that the nature of the benefits is not financial return, and are mostly comprised of the working time saved and the user's perceived value of the system expressed through their "willingness to pay". The value of time saved through the use of e-recept presents an "opportunity benefit" that may or may not be realised. Such benefits usually occur in pockets and it is a managerial challenge to utilise these pockets. The perceived value expressed in terms of "Willingness to pay" is also not a very solid statistic in this study due to the small sample size of doctors. Moreover, the interviews where the interviewees expressed their "willingness to pay" included just one doctor working at a hospital, and due to their smaller use of the application, they obviously have significantly smaller perceived value for the system, which would bring down the average below its current value. Even though the number of pharmacists is even smaller, their circumstances are not expected to vary as much as those of the doctors, granting more credibility to their average "Willingness to pay" in this study. Hence the estimates on "Willingness to pay", especially those expressed by the doctors are most likely over estimated.

Nevertheless, even if the hypothetical "Willingness to pay" figures are excluded from the equation of overall cost-benefit outlooks, the net values for the years 2009 and 2010 come out to be 100.5 MSEK and 129.1 MSEK respectively. These annual benefit figures are indeed a remarkable achievement for those who contributed to the success of e-recept at all levels.

The shares of benefits, as expected, favour the doctors and pharmacists due to the overestimated "willingness to pay" figures. Although the share of the pharmacies seems to be lower, but this can be explained by the fact that they are the only stakeholders whose actual cost of operating the e-recept system is included in their evaluation. The shares would balance out to a great extent among all the stakeholders if their respective costs were included. Moreover, these shares are drawn up in absolute terms, and while comparing HPOs and Pharmacies, it should be noted that there are three times as many prescribers, as there are pharmacists, and the hourly wages of doctors are much higher than those of pharmacists, which explains the smaller share for the pharmacies. However, ground reality manifests itself when the comparison is made on a unit basis, the unit being one prescription. For every paper prescription that is converted to e-recept, a grand total of around 13.70 SEK is saved together by the HPOs and the pharmacies, where the later take 86% of the share at around 11.65 SEK. And thus, it makes sense why Apoteket AB should have been taking the initiative for launching e-recept in Sweden ahead of everyone else.

Furthermore, the sub-section about the time saved by the users through making use of e-recept nearly confirm the claims made by "e-recept Stockholm" about the pharmacists saving nearly half an hour a day, but the in case of the doctors, this estimate seems to be over estimated. Although the value of time saved for doctors calculated in this study is also a bit low, considering the inability to factor in the time saved by eliminating the need for special prescriptions for sensitive drugs, and the fact that as many medicines can be prescribed in e-recept as required, as opposed to printed prescriptions having two per prescription, it is not very likely that the estimate of 8 minutes saved per prescriber in 2010 will increase to anything considered close to half an hour. Moreover, the interviews conducted with pharmacists in the context of this study state that on average, there are two to three medicines prescribed per patient visiting the pharmacy, a fact that does not grant the skipped time saving variable a lot of credit.

It is also important to reiterate at this point in the study that the nature of this socio-economic evaluation is not complete due to lack of information from VGR-IT and Apotekens Service AB, and the fact that the patients were not involved in the study. However, the exclusion of both of these perspectives can be accounted for with the following debate:

VGR-IT & Apotekens Service AB: As is observed in the “Kronoberg study”, with an eHealth intervention that is well implemented and utilised, for the benefits to be realised is only a matter of time. This means that any investment in equipment, infrastructure etc. can only serve to be a temporal offset for cumulative benefits to manifest themselves, i.e. the bigger the investment, the later the benefits will be realised. This is of course subject to the assumption that the scale of the benefits is not minuscule compared to the investment required to make the implementation viable. And as we can see in this study, the cost benefit ratios seen as a result of this evaluation show that the benefits are by no means minuscule. Hence it would be reasonable to assume that bringing in the costs incurred by VGR-IT and Apotekens Service AB for the implementation of e-recept would at worst, delay the realisation of cumulative benefits by two to three years. The costs for ensuring the proper functionality of e-recept in the region are a more interesting statistic as it would give a more realistic view of running costs against benefits. But even this value is also expected to not be very large, because on the side of the Health-care Provider Organisations, the only commodities coming into use for this service are the prescription module within the EMR, and the data-traffic sent to the National Prescription Mailbox.

Patients: First of all, as mentioned before, the share of costs and benefits that the citizens, which mostly included the patients, in the “Kronoberg study” stood at 1% and 7% respectively, which is not very significant. Secondly, because the nature of the patients varies so much in terms of the illness, whether it is chronic or not, whether they require narcotics often or not, the distance to the clinic and pharmacies and the related travel expenses, whether they have mobility related disabilities, the value of their working time, whether they have personal numbers etc., it would be very difficult to catch a representative sample in the context of this study with meaningful parameters and statistics keeping in mind the aforementioned issues. Finally, both the doctors and the pharmacists are undertaking intense customer facing roles. This means that if the customers, i.e. the patients were not satisfied with the service the doctors and pharmacists were providing them through the use of e-recept, this would seriously impact their experience and would significantly reduce the value they attach to it. Hence it is safe to assume that including the patients in this socio-economic evaluation would add more benefits than costs.

9. Conclusion

A number of very useful conclusions can be drawn from this study. For a socio-economic evaluation to yield meaningful results:

- ⤴ It is imperative to commit necessary resources, in terms of the required number of people with the necessary skill-set, travel expenses etc.
- ⤴ It is also necessary to involve the stakeholders from the onset for the evaluation to have them commit the required time and effort for recording and providing timely information for the purpose of the evaluation. Specifically, the time of the interviewees and the internal operational information and economic metrics maintained as a part of normal practice, which could not be obtained in this study are crucial for such research.

In the study conducted by Gartner Inc., one of the issues they raised is that while there is a lot of talk about having evidence based practice, it does not reflect in the drive, or the lack thereof, for properly recording appropriate information that could be critical to performance evaluations. This is an issue that can only be fixed through an impartial national initiative enforced by the authorities with proper guidelines and procedures governing the relevant practices.

These evaluations are a good way of showing objectively what each stakeholder can expect from a given intervention. Specifically looking at shares of benefits in this study, which even though are not very accurate in their current state, still are able to show that each stakeholder has a lot to gain from the implementation of e-recept. What is most surprising, as seen in the results of this study is that although in absolute terms, it is the HPOs that gain the largest share of benefits, coming down to unit terms for each prescription shows how much the pharmacies stand to gain from ditching paper practice. And the fact that following this study, it can be said to stubborn prescribers or patients that every time they dump paper in favour of e-recept, they save society around 13.70 SEK makes for a much more compelling argument, that was not possible without the knowledge gained here.

Another important recommendation that Gartner Inc. make in their study is to define goals that need to be achieved through electronic health-care, and then weigh up the different eHealth interventions against these goals as to which of these interventions meets these goals to the greatest extent. “The eHealth Action plan” is a good starting point for any country to define these goals, which should be then tailored according to the national state of Health-care in terms of what is most necessary in the current scenario, or what changes are expected to yield the maximum benefit. Weighing up interventions against goals will of course require evaluating each one of them. As mentioned earlier in this study, the far reaching effects of health-care on a society would be best captured by socio-economic evaluations, which should thus be a part of initiatives taken by the relevant authorities for monitoring the performance of current interventions in place, and for decision making regarding the choice of interventions that should be implemented on priority in the future. Carrying out these evaluations on a regular basis will also help develop a local expertise, granting them more credit. It will then also be possible to conduct these evaluations more efficiently, and possibly will help keep the relevant stakeholders at their toes to maintain a good level of professionalism by having the knowledge that they are being watched, and may be rewarded or penalised according to their performance. Evaluations, therefore form an integral part in a drive to achieve excellence in the field of eHealth.

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