ELECTRONIC PRESCRIPTION SERVICES SYSTEM IN GREECE – PILOT STUDY

DANIELA MINARIKOVA* and ADAMOS PANAYIOTIS

Department of Organisation and Management in Pharmacy, Comenius University in Bratislava, Faculty of Pharmacy, Odbojarov 10, 832 32 Bratislava, Slovak Republic

Abstract: The aim of the work is to provide an overview of Electronic Prescription Services in Greece, to illustrate a detailed description of the Greek Electronic Prescription Services system, to evaluate how it has changed, the way public healthcare system works, to analyze major benefits and potential problems faced. The self reported questionnaire was distributed to the three main stakeholders in the medication prescription process: doctors, patients and pharmacists. The collected results have been processed in a spreadsheet application. The results have been analyzed individually but also in comparison with relevant results from each group of people. It has been identified that the major aspects of interest are the ease of use of the new system, the safety that the new system introduces regarding medication and dispensing errors, the level of service that the patient receives, the administrative and back-office workload and how it is managed, the economical aspect as far as the public expenditure is concerned but also the costs for the professionals themselves and finally, the technological aspect and how it affects the users. The new system has been able to overall improve the process of drug prescribing from the safety perspective (less medication errors), level of service (more interpersonal communication and less administrative overload with the patient), economical aspect (mainly as far as the public expenditure is concerned) and back office administration. As any other new system, it has been also identified that most users struggle to familiarize, spend more time especially at the beginning while trying to learn how to use it. There is room for improvement for the system itself but mainly for the organized, well-structured and extensive training of the users in this continuously changing and dynamic environment that healthcare is.

Keywords: electronic prescription, electronic prescription services system, benefits, drawbacks, ease of use, safety, economic aspects, technology, administration, level of services

The term "Electronic Prescription Services" (EPS) refers to the production, distribution and control of prescriptions and referrals for medical procedures, using technology and/or computers and telecommunications, in a way that ensures the validity, security and transparency of information handled. In its full range it supports processes of creation, execution, management, monitoring, validation and payment of prescription drugs and medical procedures at all points of interest (health center, doctor's office, clinic, hospital, pharmacy, diagnostic laboratory, etc.) and provides important capabilities for monitoring, research and analysis for all stakeholders. In order to replace the existing legacy systems of handwritten prescriptions and install a modern high-tech online infrastructure, a lot of complex interventions are required: a sufficient maturation period, learning period, support and maintenance. Major issues had to be resolved such as the complexity of the current procedures, lack of legislation framework, lack of up-to-date patient and medical records, the large number of involved stakeholders, their diverging interests, the protection of personal data, the geographical dispersion of points creating and executing recipes, and so on. Nevertheless, the new EPS system is currently one of the largest IT infrastructures operating in Greece, executing hundreds of thousands of transactions on a daily basis. It is a big bet in order to improve public health and reduce costs involved, especially during a fragile economic environment severely hit by the financial crisis in the country (1).

The economic crisis and the requirements for structural changes in all aspects of public administration brought a new era of reforms in the country as well as the healthcare system itself. A new system was required in order to deal with several new demands that the new fragile financial balance brought. The system should be designed to record and control the movement of medical visits / pre-

* Corresponding author: e-mail: minarikova@fpharm.uniba.sk; phone: +421 911 217 381

scriptions / referrals, settlement and payment, and was expected to bring benefits to protection of the health and reduce the suffering of the patients, reducing the cost of primary care by limiting cases of over-prescribing, promoting the use of generics and providing enhanced scientific support to health professionals, policymakers in health and medicine. The objectives of the project also included the streamlining of prescribing processes, their execution and control, the development of an open system incorporating the international best standards and practices, to give third parties the possibility to develop innovative services associated with the care providers and health system in general. According to e-Government Social Insurance, the project's success is judged primarily on the extent of use and the use of specialized capabilities, aiming mainly in the promotion of health of the insured patients (2).

The Electronic Prescribing process can be defined as the electronic creation and transmission and processing of a medical prescription instead of using traditional paper handwritten prescriptions. The doctor or the prescriber in general can electronically (using computers and the internet) create the prescription (the first or a repeated copy of it) and possibly transmit it directly to the pharmacy through a secure channel *via* the internet. In other case, the electronic prescription is created and stored in the "cloud", however, it is not transmitted automatically to the pharmacy but the patient is delivering it to the pharmacy in person. EPS is meant to reduce the risks and errors associated with traditional prescription script writing. It is also one of the major steps towards the generation of electronic medical records. The sharing of medical records and information regarding the prescription history or medication history of a patient can help the healthcare providers by giving them a robust decision making system (3).

The main functions that should be carried out by the EPS system are creating an up-to-date list of medicines the patient is taking; printing, selecting and transmitting prescriptions, making all the necessary safety checks, integrating decision support systems; checking patients' current medication list and medication history information within the practice; giving information related to the availability of lower cost, therapeutically appropriate alternatives; working with an existing medication within the practice; prescribing or adding new medication and selecting the pharmacy where the prescription will be filled; sending the information to the Transaction Hub, where information on the patient eligibility, formulary, and medication history/fill status is sent back to the prescriber; giving information on formulary or tiered formulary medications, patient eligibility, and authorization requirements received electronically from the patient's drug plan; patient-specific information capabilities (e.g., current patient medication list, access to patient historical data, patient identification); system integration capabilities (e.g., connection with various databases, connection with pharmacy and pharmacy benefit manager systems); learning and educational capabilities (e.g., patient education, provider feedback) (4-6). The basic components of the EPS system are the doctor or prescriber, central server infrastructure, pharmacy with implemented electronic prescribing software and pharmacy assistive software.

It's clear that EPS system can have a major and positive impact on clinical practice and patient care. Experience shows that EPS systems are most effective when front line staff have been involved at every stage of their design, development, testing and

Table 1. The most common prescription errors in handwritten prescriptions.

Type of error	Appearance [%]
Dispensing different medicine than the one prescribed	66.0
Drug barcode unique identifier different that the medicines list	9.9
Number of drug packages dispensed different than the prescribed	3.8
Not correct processing of repeated prescription	3.7
Dispensing of more than 2 packages even though not allowed according to instructions	3.3
Dispensing drugs that exceed the maximum allowed value without authorization	3.1
Various other errors	10.2

Table 2. Key fields of national level e-Health activities in the EU 27 countries, 2007 and 2010.

Reported e-Health activities	Total 2007 e-Health ERA*	Total 2010 e- Health Strategies	Δ
Legal activities	14	22	8
Evaluation	5	21	16
EHR Patient Summary	27	27	0
e-Prescription	16	22	6
Tele-health	23	27	4
Patient ID	24	26	2
Professional ID	13	22	9
Citizen card	22	25	3
Professional card	7	18	9
Standards (technical/semantic)	19	27	8

* ERA = European Research Area in e-Health

implementation (7). More specifically, the benefits for the patients as well as the prescribers include better safety and quality of care for the patient, reducing delays and time spent for clarifications, alerts and warnings are provided at the point of care, access to medical records, automating the prescription renewal request and authorization process, enhancing medication compliance, benefits from lower cost drug substitutions, improving prescriber mobility – geographical dispersion and better drug surveillance (8).

Despite the fact that EPS is able to increase speed and efficiency in all the processes, the extended use of such a system has also some important drawbacks. Some of the difficulties that have to be overcome are resistance to change, user training and seminars, hardware and software selection, erroneous alerts, integrity of data input, security and privacy, system downtime (9-11). The previous handwritten prescriptions system introduced several risks and errors as quantified in Table 1, using data from the major social security fund IKA (Social insurance in Greece) in 2003 (12).

In order to cope with those problems and make a giant step towards the reform of the Greek healthcare system, a new fully electronic and state-of-the-art system was introduced in 2010. The EPS is a complex system that supports all doctors, clinics, hospitals, pharmacists and patients in a big and geographically dispersed country like Greece. It is reported that by June 2012 more than 10,500 pharmacists and 37,500 doctors were using the new EPS (13). Based on the data supplied by the operator IDIKA S.A., the EPS system is currently used by the majority of the healthcare providers for supporting almost all medication prescriptions in the country, making it the largest on-line system in Greece today (14).

The EPS system will manage most economic and medical evidence under a high security regime that is dictated by its sensitive character. The procedures and functions are dictated by the institutional and regulatory framework and the rules and practices of good prescribing and referral. Still, it provides the entire Management Information System (MIS) that is required in a reformed modern healthcare system. In terms of functionality, the system should cover all the functions involved in the process of medical visit / prescription / referrals of laboratory tests, and monitor their status until the payment of the final beneficiaries (reimbursement).

Today, most European countries surveyed have more detailed documents published outlining concrete policies / strategies on electronic health goals, measures and/or implementation objectives and achievements. Based on such documents, the overview in Table 2 identifies key fields of national level e-health activities and demonstrates the considerable increase recorded between 2007 and 2010 (15).

The aims and objectives of the work were to provide an overview of EPS and how they apply to the Greek healthcare services market. Work evaluates its acceptance under the perspective of the 3 major stakeholders: pharmacists, patients, doctors / prescribers. It analyzes and discusses how it has changed the way public healthcare system works under 6 major pillars: ease of use, safety, economy, administration, level of service and technology. It discusses

major benefits and potential problems faced from the overall perspective of the healthcare professional or patient, and how improvements can be made.

MATERIALS AND METHODS

The methodology followed, was based on a survey using structured questionnaires according to the type of responders (16). The pharmacists, patients, doctors / prescribers were reached personally or through telephone interview in the city of Athens, Greece, municipalities of Helioupolis, Argyroupolis, Glyfada, in the time period 17th November 2013 through 17th March 2014.

RESULTS

The questionnaires have been delivered to a segment of pharmacists (29 pharmacist questionnaires), patients (56 patient questionnaires received) and doctors / prescribers (11 questionnaires). The results were gathered and consolidated using relevant spreadsheet software in order to generate comprehensive outcomes (MS Excel, SPSS 13) (17).

Group - pharmacists

Demographic data of pharmacists: 13 men, 16 women; 11 age 18-34, 15 age 35-64, and 3 age 65 and more.

Ease of use - usability perspective and ease of use

The vast majority of the pharmacists (93%) find it easier to read the electronic prescription compared to the older handwritten form, 86% find it faster to execute an e-prescription compared to the past, 76% are able to service the patients faster using the e-prescription system and the customer throughput (customers per hour) have increased. More than 90% of pharmacists find it easier to choose among the appropriate drugs in order to best suit with the patients needs.

Safety - e-prescription system from the safety perspective

Ninety percent of the questioned pharmacists feel totally safer regarding any possible medication error, the vast majority of the pharmacists are able to confirm that they feel much safer that they will receive the correct medication since they know that the errors are far less probable to happen. Almost 100% of the pharmacists were totally confident that they are doing less dispensing mistakes now with the e-prescription system compared to the old handwritten prescription forms.

Administration - the administrative and back office work

Most of the pharmacists find it easier to do the back-office work and the majority (71%) of pharmacists find it faster to perform these back-office monthly tasks.

Economy - economical aspects of the new system

Eighty percent of pharmacists questioned believe that the overall health spending has been rationalized now with the e-prescription system and 72% believe that their cost of doing business (the costs associated with the processing of an e-prescription) has increased instead of decreasing.

Technology - technological perspective

Many of pharmacists (45%) not to feel very confident using the new system so far because all the new IT systems were introduced at a very short period of time and pharmacists did not have the time to attend seminars and other training necessary. In the case of internet outage, or computer malfunctions, almost all of the pharmacists questioned (96%) are certain that they would not be able to do their job properly. Most of the individuals questioned (66%) found it difficult to get familiar and learn how to use the new system.

Group - patients

Demographic data of patients: 29 men, 27 women; 16 age 18-34, 21 age 35-64, and 19 age 65 and more.

Ease of use - usability perspective and ease of use

Almost 3/4 of the asked patients (71%) say that it is not faster for their doctors to prescribe them their medication now with the new e-prescription system. Each newly introduced system and process has a learning curve (18), which means that it takes some time for the users to learn how to use the system, gain experience and then start to be more productive (produce more prescriptions per hour). Eighty-six percent of the patients can tell that their pharmacist is able to execute the prescription and dispense the medicines much faster than in the past.

Safety - e-prescription system from the safety perspective

Fifty-five percent of patients think that it is better for them to be able to read the prescriptions themselves. The vast majority (98%) of the patients are feeling much more confident that the pharmacist will prescribe the correct medication now with the computerized system and this is because they are aware that IT systems minimize the errors.

Level of service - level of service changed with the newly introduced system

Almost all of the patients (over 90%) say that they are satisfied with the amount of time they spend in the pharmacy and are being serviced fast enough. Most of the patients (more than 60%) find the level of service they receive increased compared to the past.

Economy - economical aspects of the new system

The majority of the patients (77%) answered that they are not spending less money for their monthly medication prescriptions. Most of the questioned patients believe that the newly introduced system has helped the insurance funds save money. Some patients believe that they receive the correct amount of medication they need, some patients believe that they receive probably less medicines than they need.

Group - doctors / prescribers

Demographic data of doctors / prescribers: 6 man, 5 women; 4 age 18-34, 5 age 35-64, and 2 age 65 and more.

Ease of use - usability perspective and ease of use

It is interesting that 64% of the doctors asked, find it more difficult to prescribe an e-prescription compared to the past. This is mainly because the system is relatively new and the users are not familiar with it yet. Moreover, most of the doctors were not properly trained. More than 50% of the individuals asked, find it slower to complete an e-prescription compared to the old handwritten form.

Safety - e-prescription system from the safety perspective

The majority of the doctors asked (82%) believe that the errors during prescribing have decreased significantly now with the new system and more than 90% of the doctors are confident that the pharmacist will eventually dispense the correct medication.

Economy - economical aspects of the new system

More than 80% of the prescribers believe that the overall healthcare publics spending for the medicines prescription have been rationalized now with the new system. The new system allows the central administration and authorities of the Ministry of Health to monitor the prescription volume on a monthly (and even daily) basis and forecast accordingly. Almost 90% of the doctors said that their cost-of-doing-business has increased now with the new system. This is since the doctors had to purchase the necessary equipment (computers, printers, etc) without any funds from the state.

Technology - technological perspective

Almost 45% of the doctors asked, feel confident to use the EPS systems for their daily tasks while the rest don't feel so confident. All of the individuals asked, find it impossible to operate their business without computers and the internet. Most of the users (64%) found it very difficult to learn how to use the new system mainly because they did not receive the proper training. The newly introduced system is quite complex and the doctors had to learn how to use it in a very short period of time (a couple of months only).

DISCUSSION

The results and discussion of the three types of questionnaires, for the pharmacist, the patient and the doctor are based on the sections: ease of use, safety, administration, economy, level of service and technology (19).

From the ease of use perspective, even though the doctors / prescribers find it somehow more difficult to create the e-prescription, the pharmacists find it easier to execute the prescription. This shows that the most effort has been made to design a straightforward system for the final user (pharmacist) while there is room for improvements at the prescriber's end. Probably, some extra automations or filters (e.g., automatic suggestions based on previous month's prescription for the same patient) could be implemented to help the doctors prescribe easier. Time-wise, again the pharmacists are able to execute the prescription much faster with the new e-prescription system compared to the past. Moreover, they are able to service more patients per hour, decrease the time spent on the administration tasks and increase the interpersonal time with the patient, explain them how to use the medicine, give them advice, listen to the patient's problems and suggest solutions. The impact on staff and professionals is crucial in most implementations and this has allowed the staff more flexibility over planning their time (20). The patients themselves are confirming that their waiting time in the pharmacy has decreased and they feel that the level of service is better than it used to be. This is mainly because the pharmacist has more time to spend with them, they are able to consult the pharmacist for other issues they may have, it is much more easy for the patient to read the prescription themselves and then discuss

with the pharmacist on whether they would choose to get a generic medicine, which one, how much money would this cost, etc. An analysis of a similar system for the NHS in the UK showed that the average time spent per prescription has been decreased from 70 seconds (paper version) to 53 seconds (electronic version) (21). A demographic analysis of the results also shows that younger patients are more certain that the level of service has increased with the new e-prescription system while younger pharmacists and doctors find it easier and faster to use all the new systems. This makes sense because younger professionals are much more confident using new computerized systems compared to their older colleagues.

Looking at the results from the safety perspective, one can easily tell that the new electronic system has made a significant breakthrough regarding safety. Prescription and dispensing errors have been decreased to a minimum because the doctors and pharmacists are employed with an arsenal of computerized safety mechanisms to help them do their job: provide the right medicine to the patient in a timely and convenient way. The doctors and pharmacists, aided by their computer systems are able to compare with previous medication that the patient took, keep, search and find historical data of previous prescriptions (22). This decision support system, helps the health professional choose the right medication for the patient. Then, in case the pharmacist accidentally tries to dispense the wrong e.g., dosage form, the computer will automatically generate an alert. It is therefore commonly accepted by all three basic stakeholders (pharmacists, patients and doctors) that the medication errors have significantly decreased, while the level of confidence that the patient will receive the appropriate medication at the right cost has increased. These findings are in line with most implementations of electronic prescription systems where medication errors have also been significantly reduced as far as prescription errors and pharmacist interventions are concerned, with more than 62% reduction (141 errors before compared to 53 errors after) (20).

From the administration perspective, the new e-prescription system together with each pharmacy's Point of Sales Software system has changed the way the back-office administration tasks at the end of the month are being made. For the younger professionals it is easier to consolidate the data, make and print summary tables and lists of the monthly prescriptions. These data are being submitted at the end of each month to the public insurance fund in order for the pharmacy to get reimbursed. In the past, all these data had to be handwritten in long sheets of paper and all the calculations had to be made by hand. As one can easily understand, this was a very time consuming process which also included many calculation mistakes if a digit was misspelled or miswritten. With the introduction of the computerized system, all these have been made much more straightforward. However, since the users are not yet familiar with the new systems completely, the older professionals don't seem to realize how they would benefit from all these at some extend. It is more than certain however, that as time passes, the users will find it easier and faster to perform all these tasks using the computer.

From the economic perspective, all stakeholders agree that the new system will be able to rationalize the public expense on health care and medicines in particular. Over the past years, extensive cases of fraudulent over-prescription have been identified and this is mainly the reason that the national healthcare expense had been at the all-time high before the economical crisis of 2010. Healthcare expenditure cuts together with all the other major national reforms were necessary and the electronic prescription system was one of the major infrastructures developed towards the rationalization of the expenditure. Pharmacists, doctors and patients, believe that this is happening as it was originally expected. The system makes it very easy now to identify any abnormal deviation from the average daily or monthly prescription volumes and auditors can easily target the prescribers responsible for those abnormal or strange activity. On the other hand, for the health professionals themselves it appears that the newly introduced changes have increased their monthly cost of doing business mainly because all the necessary equipment had to be purchased by the professionals. This perception is in line with the financial findings from the period of operation of the EPS in Greece, according to the officials: "The average cost of each prescription has been reduced by 30% from January 2012 until today, resulting in savings of 30 million euro per month, or an annual 300 million euro cost saving" (23).

From the technological perspective the new system made it impossible for the doctor or pharmacist to operate without the use of computers or internet. Moreover, the professionals were actually forced to start using the system in a very short amount of time even though it had problems at the beginning. This is the case in other EPS systems (e.g., in the UK) where users also appeared frustrated during the problem of the first period of operation

(21). All these problems together with the difficulties that older (usually) professional have use the computer efficiently and fluently, decreased the level of confidence that the professionals will manage to make it through this labyrinth of changes. The main reason that this happened is the fact that there were no official trainings or seminars (probably because of time limitations or insufficient budget) for the users, pharmacists and doctors. Moreover, many of the professionals who didn't feel quite comfortable with the IT systems maintenance had to employ technical support or even secretarial support to help them with the extra workload. This is closely connected with the previous section analysis that showed an increase of the cost-of-doing-business. However, since the younger professionals appear to be more confident with the new technology, it can be said that in the future these problems will become less and less.

CONCLUSION

In the days of the economical crisis in Greece, the national public heath expenditure has been one of the major discussion fields and very high at the political agenda. It was more than obvious that reforms should be made in order to rationalize those expenses. One of the major reforms that were introduced in the country was the Electronic Prescription System operating at the national level. The whole prescription process from the time the patients visits the doctor, to the time the patient receives the medication and the pharmacy is being reimbursed from the insurance fund, has been analyzed in its full complexity. The new electronic system has been developed taking into consideration all these requirements and prerequisites. The new system has been able to overall improve the process of drug prescribing from the safety perspective (less medication errors), level of service (more interpersonal communication and less administrative overload with the patient), economical aspect (mainly as far as the public expenditure is concerned) and back office administration. As any other new system, it has been also identified that most users struggle to familiarize, spend more time especially at the beginning while trying to learn how to use it. Definitely, there is room for improvement for the system itself but mainly for the organized, well-structured and extensive training of the users. Pharmacists find EPS easier and faster to process an e-prescription, feel safer regarding medication and dispensing errors and are able to provide more time for advising and communicating with the patients. Patients feel safer from potential medication errors,

are better satisfied with the level of service and the time spent with their pharmacists and believe the whole system in financially more efficient and saves their insurance money. Doctors, despite struggling with the new system's various complexity, feel much safer that their patients will receive the correct medication at the right price. All of the groups agree that the EPS system is a major step towards medication safety, can modernize and eventually save the health professional some significant time which will then result in improved interpersonal communication of the patient with his/her doctor or pharmacist. The EPS has significantly rationalized the total healthcare costs and unnecessary expenditure and there is room for improvement regarding the training and readiness of the health professionals to better use the new system.

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