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Reference


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Using Design Science Research to develop Online Enhanced Pharmaceutical Care Services

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Abstract. The ePharmaCare project aims at assessing the potential of eHealth services for the provision of pharmaceutical services interacting actively with patients. The results presented here focus on the first three steps of Design Science Research Methodology. A mixed methods approach was used with an online survey to collect data on use of information technologies in community pharmacy, followed by an exploratory observational time and business processes study, which use the shadowing method to identify and assess the opportunity to lunch online services. Combining this with the Service Experiment Blueprint and the Dáder method an enhanced pharmaceutical service was designed. Next, an artifact is developed and a prototype is implemented to demonstrate the value of online pharmaceutical services’ delivery. This new service could represent a new perspective for pharmaceutical services integration within the health system.

Keywords. eHealth, pharmaceutical care services, design science research methodology, community pharmacy, service experience blueprint.

Introduction

The ePharmaCare project aims at assessing measurable health gains in efficiency and in quality from the development of online pharmaceutical services (PS); and estimating the potential of eHealth in the provision of PS by actively interacting with patients. The easy accessibility and the perceived affordability that positions pharmacists at the first line of contact within the healthcare system are important advantages [1].

A clear demographic and epidemiological transition in Europe is leading to a growing burden on chronic diseases. The orientation towards the patient is the new paradigm of pharmacy practice, and has led to the PS concept and a higher role for patients, as devised by the Dáder method [2]. It can be considered very valuable due to economic savings, to larger service efficiency and better patient’s health outcomes [3].

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Costa et al. [4] have described the status and outlined the trends of community pharmacy (CP) services in Portugal. Investing in information technologies (IT) and modernizing the architecture of pharmacies was envisioned as a necessary step. Recent political changes seem to reinforce the need to expand to a wider range of services, but this process has been very slow [5]. There is a need for IT to support the extended role of CPs to include the interaction with patients [6]. Calabretto et al. [7] found out that CPs are still in the “infancy” of IT usage. Gregório & Lapão [8] explored different scenarios for the future of CPs, and eHealth emerges as one approach that may develop in next years to harvest the full potential of these professionals. eHealth uses “IT to support health service provision, complying with the needs of citizens, patients, health professionals and other providers” [9]. It promises a better access to information by patients and providers leading to a safer health [10]. The main problem addressed by this research is to understand how online PS could improve patient management and how to improve PS’s quality, thus establishing its feasibility and sustainability.

1. Methods

A mixed method approach is used. A literature review was performed using MEDLINE and Google Scholar for searching strings like “pharmaceutical services”, “pharmacist role”, etc. The online survey was sent to 323 pharmacies associated with the Portuguese Association of Pharmacies to collect data on PS and to diagnose IT usage in CP.

The Design Science Research Methodology (DSRM) was used to link between research and professional practice by designing and evaluating artifacts that address a specific need. Hevner et al. [11] established the DSRM rules in the form of guidelines with six main activities. Here, the first three activities of the DSRM are studied: identify the problem relevance and solution aims, design and develop an artifact. To design the online service the Service Experience Blueprint (SEB) [12] was applied (combined with Dáder method [2]) to ensure a customer driven design perspective through actual service experience [13]. Dáder method was used as a reference to create an operative procedure that allow for pharmacotherapy follow-up to be carried out on any type of patient, in any setting and by any pharmacist [2]. These procedures include activities like monitoring response to therapy, etc., according to patients’ individual needs.

A set of four CPs (serving the population at high-street) was selected by convenience to study the patterns of PS provided to evaluate clinical services value [14]. An exploratory observational time and motion study (weekday full 8 hour shift) was done using the shadowing method [15]. Informed consent was formally obtained. An Excel database (Microsoft Corporation®) spreadsheet on a laptop PC and a stopwatch were used to record the duration of each activity, as well by who, where and how it was performed. To apply SEB a set of 50 qualitative interviews was performed in health-centers and hospitals. These interviews sought information regarding the current service concept offered by CPs but also what desired outcomes customers would enjoy to see implemented within existing or new services. The prototype was implemented using rubi-on-rails open-source software. The Trello was used to manage implementation and the website was SSL certificated. Data and Statistical analysis was conducted in Excel® and SPSS® Software Package for Social Sciences; Version 20.0. All data were kept anonymous and confidential. This study was performed in strict accordance with the good research practices and code of ethics of Instituto de Higiene e Medicina Tropical, and approved by the Committee on the Ethics (Permit Number: 7-2012-PN).
2. Results

2.1. Online Survey

The online survey (with response rate of 4.76%, comparable with other pharmacy research surveys [3]), from which the following results can be highlighted:

- The installed information system (IS) is mainly used for dispensing medicines and administrative tasks (stock management, reimbursement activities, etc.);
- All pharmacies claim to check their email daily, although only 15% use it to answer to patients’ queries, and do so less than 5 times a month;
- 23% of the pharmacies have a website and 38% use a social network.

The dispensing of medicines and the collection of used medicines are the only services that all the pharmacies provided. 38.5% of the pharmacies refer that about 60% of the customers have chronic conditions. The services related with the provision of information (SMS alerts, etc.) were the ones that pharmacies are more open to provide in the future. Most CPs use SIFARMA IS, provided by pharmacy owners’ Association. Patients’ data is located in each pharmacy, and only information regarding the national prescription system is shared with the Ministry of Health.

2.2. Observational Study

The observational study took place in four pharmacies, with 108 hours of working time (and 894 tasks) recorded. The average total aggregated time observed per pharmacy was 27h10min. Pharmacist performed 85% of the tasks (65% of total time). An average of 481 min/pharmacy (76 min/employee) was not used in any tasks. Almost 50% of pharmacists’ time is used in interaction with customers and 38% is used in administrative tasks, including ordering and storage of medicines and checking for errors in the dispensed prescriptions. Since 20% of the idle time is considered socialization, an average of 38min. of available time per pharmacist was estimated. In 44.6% of the observed dispenses, at least one chronic use medicine was dispensed. The pharmacy’s IS was used in 95.6% of medicine dispensing processes, in 80.4% of patients queries about medicine availability and in 27.2% of administrative tasks.

2.3. Qualitative research

The SEB qualitative research was undertaken in the hospitals and health centers. The interviews involved 24 males and 26 females (mean age: 44.4 years). The interviewees reported an average interval of 45 days between visits. 46% of the participants admitted that they sought healthcare provision within the CP for minor issues before going to a doctor. The main service failures identified were the lack of medicines, lack of professionalism and an overall dissatisfaction with the service provided. The SEB highlights the guidelines responsible for the service theater identifying the various actors and the flow of possible actions throughout the service. It is also defined where the service takes place and how is the customer interacting with the service provider, as well as possible waiting points and fail points.
2.4. ePharmaCare Prototype design and implementation

The 3rd step of DSRM addresses the design of an artifact. This artifact resulted from 5 months of work with people from various backgrounds. The prototype aims at helping to capture patients’ commitment and to teach them how to be content generators. This will support pharmacies’ work on patients’ monitoring and assistance. Trello assured a better fitting between the online service design requirements and the implementation. The patient’s unique therapeutic profile is made from all medicines taken by each patient (validated throughout the process). The prototype is able to calculate the therapeutic profile’s end date and warn the pharmacist when the date is approaching. In cases such as diabetes, missing a medicine dose can create very serious problems.

![Image](image_url)

**Figure 1.** ‘Maria Lopes’ (non-real name) therapeutic profile view at ePharmaCare.

In figure 1, one can see patient Maria Lopes’ therapeutic profile with 3 different medicines, each one has its own dose and regime, and therefore duration (until new prescription is needed). Each medicine is tagged as chronic or not. This ability is useful for pharmacies to be aware of the medicines that a patient needs to continue to take even when medicines do not strictly belong to the therapeutic profiles. This information could be also helpful when trying to detect conflicts between medicines.

3. Discussion

The results show thus far allow for a good characterization of today’s PS’ provision. The pharmacists’ available time we have accounted for is an indication that there may be an opportunity to develop PS. This challenges the usual barriers pointed out by pharmacist to this development, which is “lack of time” [15, 16]. This is probably due to miss perception on the use of time.

The observational study also points out the eventual necessity to reorganize the internal functioning of pharmacies, with more clear roles for each of the professionals. The social abilities that these professionals do have may be used as complementary tools to better interact with patients in a new web-based service. There is the necessity to rethink the CP business model in order to effectively and coherently integrate it into
future health system models. Currently, the ePharmaCare is on the 4th phase of DSRM, demonstrating the platform usage and educating patients and pharmacist on interacting with each other, collecting data on the value of services for patients and health system. To validate patient data completeness patients should visit their community pharmacist monthly. However, pharmacist can also inquire patients about it interactively.

We believe that ePharmaCare prototype is offering participating pharmacies a way to better monitor their patients. By bringing to life a useful tool it fulfills the detected need for IT and opens to patients a way to interact with their data and actively contribute to their own therapy. These first interactions with patients show that ePharmaCare prototype is also facilitating patients to learn how to better manage their medications. More comprehensible results will be presented at the end of the project, which will also address other issues like security, data privacy, and incentives.

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