

eHealth: A NEW HOPE FOR HEALTH SYSTEM SUSTAINABILITY

Innovation with information systems and technologies (IST) has been central to the transitions observed in global health.[1] The utilization of IST for the provision of healthcare and health services - **eHealth** - is a trend in health systems and disease management, which may have a significant impact on health outcomes in the near future.[2,3]

Governments across the world are promoting IST in their healthcare systems with the intention of transforming service organisation and delivery, especially in terms of resource utilisation, clinical decision making, patient satisfaction and service productivity and quality.[4] IST potential will allow to redesign traditional healthcare services, as they are able to offer the foundation for the transition between traditional institution-centred applications to patient-centred applications.[3] The perspective of a patient-centred approach to the development of a healthcare service is important to assure that the service is responsive to patient's needs, persuading them to have a more active role in disease management.[5]

The increasing prevalence of **chronic diseases** is leading to the necessity of health system reforms, with multi-disciplinary teams as models of these movements, assigning major roles for non-physicians such as nurses and community pharmacists.[6] Essential to these collaborative models is the communication between health professionals and patients. Therefore, using IST emerges as a necessity in the modern world that might have a significant impact in disease management. The use of IST will become a solution to improve healthcare efficiency, either by becoming a reliable source of information or by enabling new forms of interaction with the healthcare system.[7,8]

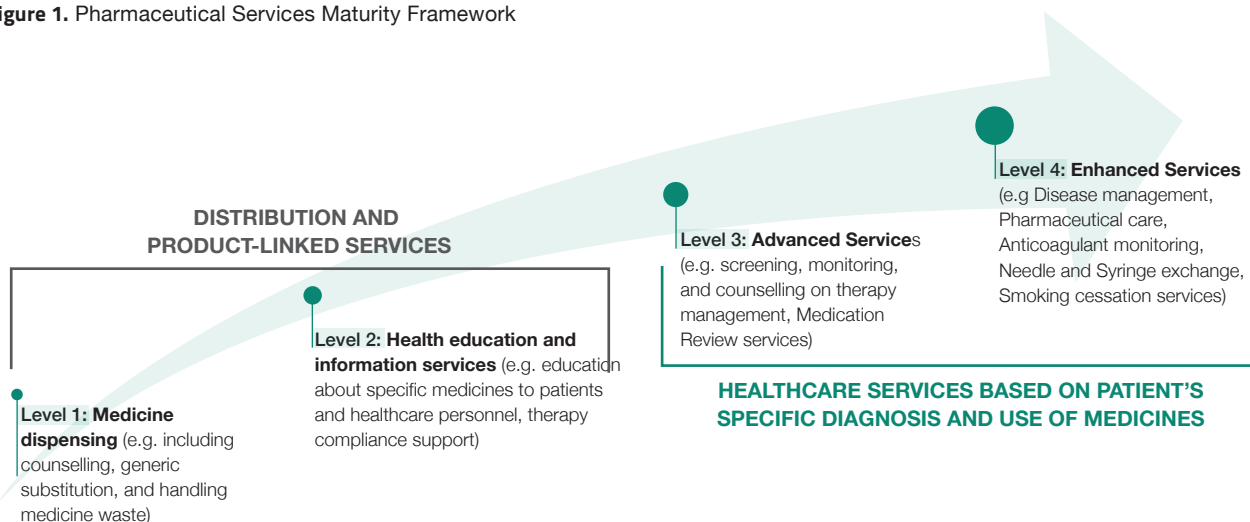
PHARMACEUTICAL SERVICES: FROM MEDICINE DISPENSING TO DISEASE MANAGEMENT

Pharmacists have experienced an expansion of their role in the last three decades, developing the scope of services offered.[9,10] This was largely the result of the work promoted by Charles Hepler and Linda Strand,[11] who initially defined the concept of **"pharmaceutical care"**. This concept involves a "process through which a pharmacist cooperates with a patient and other professionals in designing, implementing and monitoring a therapeutic plan that will produce specific therapeutic outcomes for the patient", establishing the foundations for pharmacists' interventions in **disease management**. [11] Driven by the initial work of Hepler and Strand and the consequent emergence of new roles, the pharmacy profession developed a wide variety of **pharmaceutical services** (figure 2).

PHARMACEUTICAL SERVICES IN PORTUGAL

After the initial experience of pharmaceutical care services,[10] the expansion of pharmacists' roles in Portugal has translated into a new regulatory framework. [29] These regulatory changes expanded the provision of services to be offered by pharmacies, such as home care support, first aid, medicines administration, immunization (particularly for influenza flu shots), clinical analysis and therapeutic services. However, **the dissemination of new services and forms of practice has been slow**. The reasons for this often mirror the same reasons found elsewhere. Among these reasons, **high workload, lack of service's demand, lack of communication between health professionals and of team work abilities**, have been frequently reported.[25,30]

Figure 1. Pharmaceutical Services Maturity Framework



eHealth pharmaceutical services linking patients, pharmacists and Physicians - current strategies and lessons learned from ePharmacare/FCT project

Pharmaceutical services have been considered extremely valuable for health systems, due to a greater efficiency, improvement in health services quality and in patient health-related outcomes.[12,13] However, community pharmacies kept a static service concept that has deeply contrasted with the developing of community pharmacists' new clinical role and of a new service-centred paradigm in customer relations.

With the necessity of frequent connections between patients, physicians, pharmacists and other care givers that arises from the process of collaborative disease management, the development of pharmaceutical services focusing on collaborative disease management will undoubtedly require the use of IST.

DEVELOPING THE RIGHT STRATEGY TO IMPLEMENT eHEALTH PHARMACEUTICAL SERVICES

The evolution of IST is having an important impact on the definition of **new roles for the community pharmacist**. [14,15] The use of properly deployed technological solutions in the medicine dispensing process will relief pharmacist's workload, leaving more free time to assume other functions while enhancing the patient-professional interaction.[8] **IST applications will be indispensable tools in pharmaceutical service provision**; Therefore, a professional strategy for community pharmacy implementation of these applications is necessary.[16]

Calabretto and Swatman,[17] studied the socio-technological implications for information technology related interventions in community pharmacy. These authors found that community pharmacies are still in the "infancy" of using IST for service provision. Pharmacists are accustomed to use IST based dispensing systems for many years, but there is a very limited use of technology-based communication tools (e.g. email or Web-based tools) to assist in patient care and disease management. The underuse of the current systems has been described as partially resulting from **a lack of IST skills**, applications inadequacy for community pharmacists' needs, **insufficient patient-oriented attitude**, privacy protection concerns, and time constraints. [16,18]

There seems to exist a dearth of research on the issue of IST utilization in community pharmacy. Overall, researchers have mainly investigated the effects of electronic transfer of prescriptions on the work of community pharmacists,[4,19] or the implementation of an internet based medication record cabinet.[17] Also, it seems the technology's potential to disrupt health professionals and users' roles represents a potential threat to the successful implementation, particularly in healthcare services.[4,15] **These difficulties in implementation seem to be mostly due to managerial and behavioural factors.**[4]

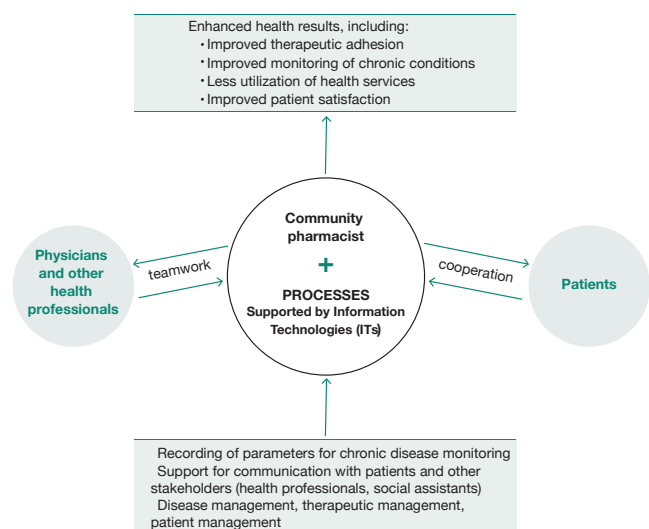
In the majority of countries, IST support for professional pharmaceutical services provision is used only locally, for record keeping, patient management and customer relations. Nevertheless, IST seems particularly indispensable in facilitating access to information needed in patient care, such as clinical patient data, guidelines, and evidence-based information. As e-prescribing, electronic medical records, and other technological advances are implemented and integrated, patients will have increased access to primary healthcare providers for diagnosis, monitoring, and triage. **Staff shortages, especially in pharmacies located in rural or suburban areas can also be mitigated with the use of IST.**[20]

ePHARMACARE PROJECT – DESIGN AND DEVELOPMENT

The **ePharmacare project** (FCT reference: PTDC/CCI-CIN/122690/2010) was designed to explore the development of online pharmaceutical services. This project aimed to **develop a prototype of a web-based patient management service model**, establishing its acceptability, feasibility, sustainability, and adaptability to future changes.[21]

Firstly, the project's team developed a conceptual model allowing the analysis of the different stakeholders' positions towards the use of such technological solution and the possible outcomes (figure 2).

Figure 2. Conceptual model for the use of IST and eHealth in the community pharmacy setting [ePharmacare Project (FCT reference: PTDC/CCI-CIN/122690/2010)]



This model highlights **the necessity to involve the end users in the development** of IST applications. A user centred approach may be more useful to be certain that the system will be satisfying to the users' needs, and that they will be enthusiastic with its use perceiving the system as useful.[5,22] Considering this, the research team choose **Design Science Research Methodologies (DSRM)** as the methodology to drive the design of platform to support pharmaceutical services.[23] The goal of DSRM is to create and study artifacts that define ideas, practices or products through which information systems can be analysed, designed and implemented.

The ultimate purpose of technology and innovation in healthcare is to improve quality of life. However, it is frequent that the introduction of new tools is decided by policymakers and experts without involving future users.[24] Therefore, the need to use a methodology that allows the design of an **innovation** with the end user's input is evident.

KEY MESSAGES

- There is a need for IST support, in developing an extended role for community pharmacists to include the valuable interaction with patients and better understand their needs.
- Community pharmacies have the potential to provide remote disease management services assisted by IST. These are low cost services, which translates to high value to the patient, pharmacists and health systems. However, there is a need to improve pharmacy management, with clearer roles for the different professionals.
- Electronic communication between GPs and community pharmacists has shown better results than paper based communication. Telepharmacy services were established in rural areas and have demonstrated success in improving the delivery of pharmaceutical care.
- Home telemonitoring of chronic diseases seems to be a promising patient management approach that produces accurate and reliable data, empowers patients, influences their attitudes and behaviours, and potentially improves their medical conditions
- Studies show that the use of IST by healthcare professionals may be a burden when the systems are not developed considering the needs of professionals in practice settings, hence the necessity of using highly iterative methodologies such as Design Science.
- There is the potential to use a web-platform to provide education and capacitation to practicing professionals, with game-based learning or practicing cases from daily activities.

LESSONS LEARNED: THE EXPERIENCE OF ePHARMACARE/FCT PROJECT

ePharmacare's efforts focused on the correct problem definition and on studying an IST solution that will bring benefits to eHealth pharmaceutical services:

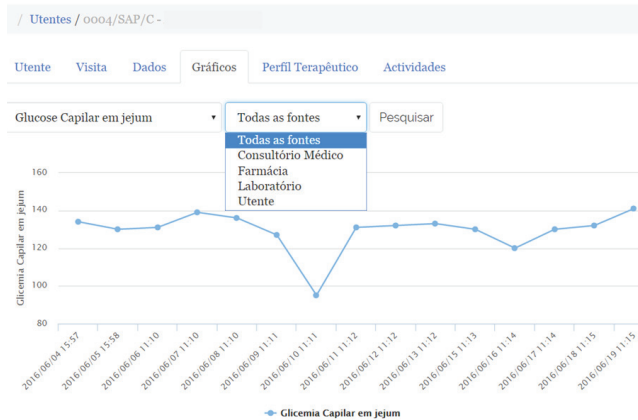
- A survey on the use of IST in Portuguese pharmacies found that pharmacies' IT system is mainly used for dispensing medicines and administrative tasks, as expected. Moreover, 38% of pharmacies already reported a social network presence (e.g. Facebook®) and 15% of pharmacies reported using email to answer patients' queries no more than 5 times per month. All the survey respondents claim that **no financial incentive** for the implementation of eHealth solutions and **insufficient support and guidance** from professional organizations are the most important barriers to the implementation of eHealth solutions in Community Pharmacy.

- An observational study was designed to assess the feasibility of eHealth pharmaceutical service provision, by studying pharmacists' workload and current patterns of pharmaceutical service provision.[25] Although some free time was also found, it seems that the **re-organization of pharmacy work**, with clear roles assigned to different professionals, and the possibility of using IST to improve pharmacy and patient management will be critical steps in the way to eHealth **pharmaceutical service implementation** across the pharmacy market.

- A costing study was developed to assess the potential value of new services compared to the traditional ones.[26] In this study, validation and dispensing of the prescription, together with managing of inventory and other records, were found to be the **highest-cost activities**. These findings suggest that managers could resort to automation of some part of the processes, applying IST to lower the time spent in some activities, leading to the re-organization of processes and the internal functioning of the pharmacy.

- The main focus of the platform was **therapeutic management and monitoring** of several biochemical and physiological parameters (figure 3). Patients using the platform would register these parameters (e.g. blood pressure; fasting glycaemia; etc.) on a daily basis, allowing for the close monitoring of medicines' effects by the pharmacist. The frequent **communication between patient and professional** allowed the early identification of possible adverse reactions and showed some signs of possible impact on health outcomes that need to be further explored.

Figure 3. Web-platform screenshot of a patient's fasting blood glucose graph



- Overall, the use of the **platform by pharmacists has shown no signs of possible impact on their workload.** Moreover, the management and social abilities that these professionals do have may be used as complementary tools to better interact with patients in a new web-based service. However, whether these professionals do have the necessary education regarding the provision of pharmaceutical care services, is an aspect that needs to be considered [27]. **Capacitation of practising pharmacists** will be crucial for the diffusion of new ways of pharmacy practice, and IST will also have an important role in providing education.

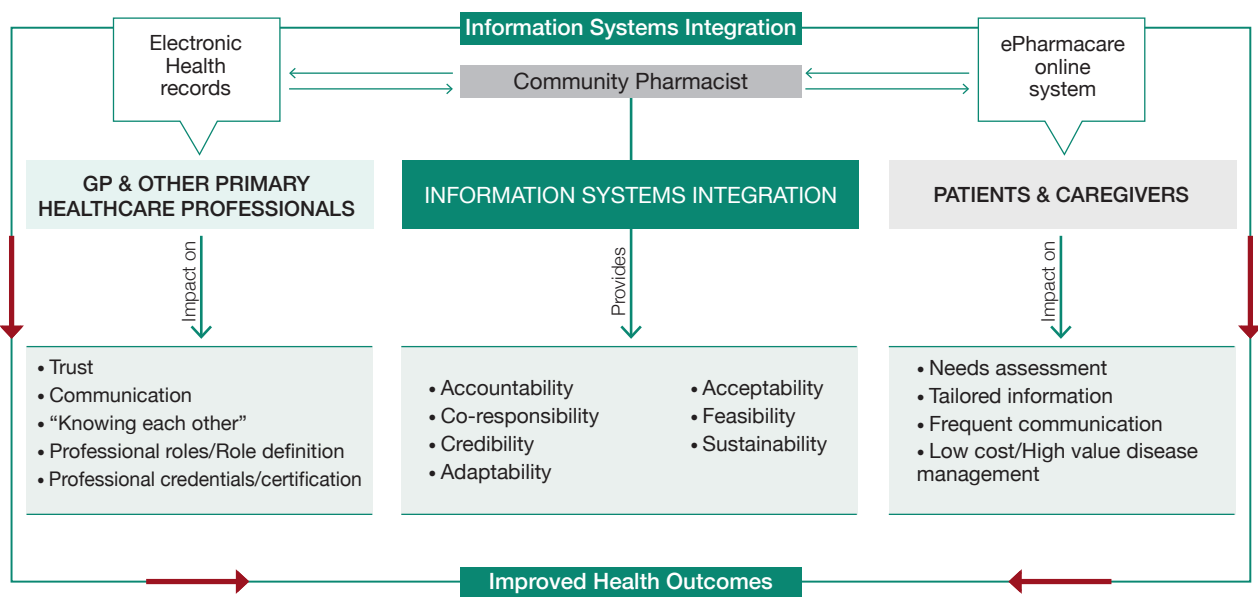
HEALTH INFORMATION SYSTEMS INTEGRATION: A MODEL OF DIMENSIONS TO ASSESS

With the development of the work done in **ePharmacare**, the need to integrate several health information systems from the different healthcare providers became evident.

Figure 4 intends to depict a possible scenario for **Health Information systems integration**. With the integration, data sharing portals such as the online platform developed in ePharmacare will receive data validated by the primary healthcare professionals that are useful to pharmacists' provided disease management in the community. In a reciprocal way, data gathered by patients and caregivers in the same portal, will be validated by community pharmacists before entering it in the electronic health record managed by primary care professionals. An integrated information system that provides the stakeholders of disease management with mechanisms that assure accountability, credibility, acceptability among other dimensions, would have the potential to impact on several factors.[28] On the professionals' side, the dimensions of trust, communication, role definition and professional recognition and certification will surely benefit of such a system. On patients and caregivers' side, an integrated system may improve professionals' needs assessment, while providing tailored information through more frequent communication on a low cost service, yielding a **high value disease management**.

Future research that focus on the impact of information systems on these dimensions will greatly contribute to the advancement of knowledge in the field of health information systems, eHealth, and pharmaceutical services provision.

Figure 4. Conceptual model for the Integration of Health Information Systems



REFERÊNCIAS

1. Gardner CA, Acharya T, Yach D. Technological and social innovation: A unifying new paradigm for global health. *Health Aff.* 2007. p. 1052–61.
2. Neuhauser L, Kreps GL. eHealth communication and behavior change: promise and performance. *Soc. Semiot.* 2010;20:9–27.
3. Kuhn KA, Giuse DA, Lapão L, Wurst SHR. Expanding the scope of health information systems: From hospitals to regional networks, to national infrastructures, and beyond. *Methods Inf. Med.* 2007. p. 500–2.
4. Petrakaki D, Barber N, Waring J. The possibilities of technology in shaping healthcare professionals: (Re/De-)Professionalisation of pharmacists in England. *Soc. Sci. Med.* 2012;75:429–37.
5. Armstrong N, Powell J. Preliminary test of an Internet-based diabetes self-management tool. *J. Telemed. Telecare.* 2008;14:114–6.
6. Kennie-Kaulbach N, Farrell B, Ward N, Johnston S, Gubbels A, Egale T, et al. Pharmacist provision of primary health care: a modified Delphi validation of pharmacists' competencies. *BMC Fam. Pract.* 2012. p. 27.
7. Santana S. Tendências na utilização da internet: Para questões de saúde e doença em Portugal 2005-2007. *Acta Med. Port.* 2009;22:5–14.
8. Kreps GL, Neuhauser L. New directions in eHealth communication: Opportunities and challenges. *Patient Educ. Couns.* 2010;78:329–36.
9. Anderson S. The state of the world's pharmacy: a portrait of the pharmacy profession. *J. Interprof. Care.* 2002;16:391–404.
10. Costa S, Santos C, Silveira J. Community pharmacy services in Portugal. *Ann. Pharmacother.* 2006;40:2228–34.
11. Hepler CD, Strand LM. Opportunities and responsibilities in pharmaceutical care. *Am. J. Hosp. Pharm.* 1990. p. 533–43.
12. Nkansah N, Mostovetsky O, Yu C, Chheng T, Beney J, Cm B, et al. Effect of outpatient pharmacists non-dispensing roles on patient outcomes and prescribing patterns (Review) Effect of outpatient pharmacists ' non-dispensing roles on patient outcomes and prescribing patterns. 2011;1–3.
13. Berenguer B, La Casa C, de la Matta MJ, Martín-Calero MJ. Pharmaceutical care: past, present and future. *Curr. Pharm. Des.* 2004;10:3931–46.
14. Fox N, Ward K, O'Rourke A. The birth of the e-clinic. Continuity or transformation in the UK governance of pharmaceutical consumption? *Soc. Sci. Med.* 2005. p. 1474–84.
15. Katz SJ, Moyer CA. The Emerging Role of Online Communication Between Patients and Their Providers. *J Gen Intern Med.* 2004;19:978–83.
16. Westerling AM, Haikala V, Airaksinen M. The role of information technology in the development of community pharmacy services: visions and strategic views of international experts. *Res. Soc. Adm. Pharm.* 2011;430–7.
17. Calabretto J, Swatman PMC. Sociotechnical implications for Information Technology related interventions in community medication management – a case study. 2010;5:1–12.
18. Velez Lapão L. Survey on the status of the hospital information systems in Portugal. *Methods Inf. Med.* 2007. p. 493–9.
19. Astrand B, Montelius E, Petersson G, Ekedahl A. Assessment of ePrescription quality: an observational study at three mail-order pharmacies. *BMC Med. Inform. Decis. Mak.* 2009;9:8.
20. Collins B, Borders TF, Tebrink K, Xu KT. Utilization of prescription medications and ancillary pharmacy services among rural elders in west Texas: distance barriers and implications for telepharmacy. *J. Health Hum. Serv. Adm.* 2007;30:75–97.
21. Gregorio J, Pizarro A, Cavaco A, Wipfli R, Lovis C, Mira da Silva M, et al. Online Pharmaceutical Care Provision: Full-Implementation of an eHealth Service Using Design Science Research. *Stud. Health Technol. Inform.* 2015;210:261–5.
22. Demiris G, Afrin LB, Speedie S, Courtney KL, Sondhi M, Vimarlund V, et al. Patient-centered Applications: Use of Information Technology to Promote Disease Management and Wellness. A White Paper by the AMIA Knowledge in Motion Working Group. *J. Am. Med. Informatics Assoc.* 2008;15:8–13.
23. Hevner AR von, March S, Park J, Ram S. Design science in information systems research. *MIS Q.* 2004;
24. Fried LP, Piot P, Spencer HC, Parker R. The changing landscape of global public health. *Glob. Public Health.* 2012;7 Suppl 1:S1–4.
25. Gregório J, Cavaco AM, Lapão LV. How to Best Manage Time Interaction with Patients? Community Pharmacist Workload and Service Provision Analysis. *Res. Soc. Adm. Pharm.* 2016;In press.
26. Gregório J, Russo G, Lapão LV. Pharmaceutical services cost analysis using time-driven activity-based costing: A contribution to improve community pharmacies' management. *Res. Soc. Adm. Pharm.* 2016;12:475–85.
27. Gregorio J, Cavaco A, Lapao L V. A scenario-planning approach to human resources for health: the case of community pharmacists in Portugal. *Hum. Resour. Health.* 2014;12:13.
28. Bradley F, Ashcroft DM, Noyce PR. Integration and differentiation: A conceptual model of general practitioner and community pharmacist collaboration. *Res. Soc. Adm. Pharm.* 2012;8:36–46.
29. Martins L, Queirós S. Competition among pharmacies and the typology of services delivered: The Portuguese case. *Health Policy (New York).* 2014;
30. Gastelurrutia MA, Benrimoj SIC, Castrillon CC, De Amezua MJC, Fernandez-Llimos F, Faus MJ. Facilitators for practice change in Spanish community pharmacy. *Pharm. World Sci.* 2009;31:32–9.