Patient-Pharmacist Interactions in Chronic Care: A Qualitative Study and Implications for Design

Ana Vasconcelos, Joana Couto Silva, Ruben Moutinho, Fernando Ricaldoni, Ana Correia de Barros, and Francisco Nunes(✉)

Fraunhofer Portugal AICOS, R. Alfredo Allen 455/461, 4200-135 Porto, Portugal
{Ana.Vasconcelos,Joana.Silva,Ruben.Moutinho,Fernando.Ricaldoni,
Ana.Barros,Francisco.Nunes}@fraunhofer.pt

Abstract. Chronic patients are often asked to perform measurements as part of their self-care. Some patients make measurements at home, but others resort to their local pharmacy for information and support. However, there is a shallow understanding of the role of pharmacists and pharmacies in chronic care management, which may hinder the development of tools to support patient care. To better understand the work carried out at community pharmacies for chronic care, and inform the design of these systems, we conducted an ethnographic informed study. We observed four community pharmacies and interviewed eleven pharmacists. Results show that pharmacists are essential in providing patients with information regarding their medication and support in health measurements. However, their work is restricted by a general lack of information about the patient and limited collaboration with other clinicians. Drawing on the insights from this work, we derived three implications for the design, including developing software for pharmacies that keeps track of patient measurements and shares them with doctors, and creating a pharmacist-doctor communication channel for enabling medication adjustments.

Keywords: chronic care · health measurements · pharmacy · pharmacists · chronic patients · observations · interviews

1 Introduction

Chronic conditions such as Diabetes, Hypertension, or Chronic Obstructive Pulmonary Disease (COPD) are the main causes of mortality, representing 71% of all deaths [32]. Chronic patients need to frequently monitor their condition and engage in self-care [4,9,12], however, some patients might experience difficulties transitioning to or managing autonomously, requiring the help of healthcare professionals. Given community pharmacies' proximity to patients, pharmacists can be crucial in monitoring chronic patients, releasing the burden from often overworked doctors or nurses.

D. Salvi et al. (Eds.): PH 2023, LNICST 572, pp. 151–165, 2024.
https://doi.org/10.1007/978-3-031-59717-6_11

Despite the recognised value that Information and Communication Technologies (ICT) bring to healthcare, there is still a gap when it comes to studies on the use of ICT in pharmacies [8]. Our work aims to contribute to understanding community pharmacists' interactions with chronic patients, including what tools they have access to, how they gather important disease-related data, and how they intervene in patient care. To this end, we conducted an ethnographic informed study in four pharmacies, performing observations and interviews with eleven pharmacists with different roles and experience levels. This approach allowed us to gain insights into the role of the pharmacy in the community and in the healthcare system, as well as the role of the pharmacist in supporting chronic care management.

This paper reports on the outcomes of this qualitative study and the derived design implications. Our results emphasise the importance of pharmacists in chronic care and detail how their role in medication management and measurements is essential to chronic patients. Moreover, it is also clear that pharmacists need improved tools to support their work and our results may better inform the development of solutions targeting pharmacies and their patients.

2 Background

2.1 The Role of Community Pharmacists

Pharmacists play a vital role in the healthcare system due to their close proximity to patients. They are experts in medication and are responsible for ensuring the safe, effective and rational use of drugs. The connection of pharmacists to medication development, supply and management is widely recognised, however, a shift in pharmacists' responsibilities is already taking place and evolving towards a more patient-centric approach [1]. In some countries, pharmacists already take roles previously exclusive to nurses or doctors, including supporting blood pressure, glucose and cholesterol measurement, pregnancy testing, or providing smoking cessation advice and diabetes guidance [1]. This shift was motivated by population ageing, an increase in number of chronic patients, shortages in healthcare professionals, COVID-19 demands, but it was also a necessary step to ensure the sustainability of the profession itself because medication dispensing can be automated [11].

Existing barriers to more patient-centred pharmacists include pharmacists' self-perception as "dispensers of medication" and not patient-centred practitioners coupled with the business-driven culture of pharmacies [25]. Other studies indicate that pharmacists are not used as public health professionals because of a negative attitude towards pharmacists' role in patient care, pharmacy education, standards, government policies [24], lack of interprofessional care, inadequate compensation models, and lack of a shared vision for pharmacy services [20]. Results from a Portuguese study with four pharmacies suggest that time management can also be a barrier to the optimal use of pharmacists' skills: while 50% of pharmacists' time was used in interactions with customers, close to 38% was spent ordering and storage of medicines, checking for errors in the

dispensed prescriptions, preparing prescriptions for reimbursement issues, and meetings with vendors and salespersons [14]. A study conducted in the Netherlands [29] found similar results. The time spent with secondary tasks has burdened pharmacists and prevented them from expanding their healthcare services. Technological solutions for medicine dispensing could optimise the process thus reducing pharmacists' effort and increasing available time [14].

2.2 Technology in Community Pharmacies

The community has created several technologies for pharmacies (for a review see [7,31]). Mobile applications can be implemented in pharmacy practice for varied purposes such as clinical references, order processing, communication or patient engagement [2]. Patients with chronic conditions are one of the groups that could benefit the most from the use of these technologies and a closer relationship with pharmacists, particularly with the use of condition monitoring devices (e.g. glucometers, blood pressure monitors, etc.) that can provide valuable information to equip pharmacists to assist better patients with diabetes, COPD, or congestive heart failure [17]. Different approaches to chronic disease monitoring have been successfully explored such as telemonitoring for diabetes management and education [26], or a platform with a set of devices measuring health parameters to be positioned inside the pharmacies [3]. Another mobile solution was used for diabetic and hypertension patients connected to monitoring devices controlled by the pharmacist that store measurements taken at the pharmacy and provide patients with relevant information to manage their disease while facilitating communication between patients and pharmacists [33].

While there seems to be a consensus that a technological approach to the relationship between pharmacists and patients could benefit both, having a stronger focus on the patient and their clinical status also creates an urgent need for more and better interactions between pharmacists and physicians. Both pharmacists and physicians confirm that multidisciplinary teams can improve patient care and treatment efficacy, but there is still a need to modify infrastructures, agree upon goals and educate healthcare workers to fully take advantage of such partnership [30]. A Canadian study with 19 pharmacies and nine medical clinics observed limited communication and collaboration between primary care doctors and pharmacists, with pharmacists missing prescription data and physicians missing data on adherence [19]. Even in hospitals, where pharmacists and clinicians collaborate regularly, professionals lack agreement about their specific roles and responsibilities in the medication reconciliation process, resulting in incomplete, inefficient, and duplicate work around medication regimens [15].

Technological solutions, particularly Electronic health records (EHR) can be a potential tool to aid communication between clinicians and pharmacists [19]. Countries like Canada [10] and Australia [21] are already using these systems but there are others such as the United States where the only information available to most pharmacists when dispensing medication is essentially the prescription, which is not sufficient to make informed decisions for patients [6]. With all the advantages that EHRs could bring to pharmacy practice [13] it is then paramount

to explore and understand the characteristics these solutions must exhibit to successfully implement them in a useful and sustainable way.

Pharmacists can be important in chronic care management, but little is known about how and which tools can support this. With our study we expect to better understand how pharmacists support chronic patients within the Portuguese context and derive the necessary recommendations for developing high-impact solutions that contribute to the enrichment of pharmacists' role and facilitate teamwork with physicians, ensuring the best care for their patients.

3 Methods

We conducted an observation and interview study to understand pharmacies' role in managing patients with chronic conditions. The ethnographic fieldwork was conducted between May and July 2021 by six researchers, who were grouped in pairs to observe pharmacies and interact with pharmacy workers (pharmacists and pharmacy assistants) in different settings. Notes, photographs, drawings, and interview transcripts were shared and discussed among the research team. The analysis was supported by the Affinity Mapping method [5], whereby six researchers in the team summarised, grouped, and discussed the main insights of the study individually as well as in three group sessions, around a digital whiteboard supporter by Mural [22] software.

3.1 Observations

We used non-participant observation at pharmacies [27], complemented with informal interviews with pharmacists. Observations had three main *foci*: pharmacist-patient interactions, health parameter measurement, and interactions with the existing software. Researchers did not directly interact with pharmacy clients.

The observation sessions, which ranged from 1 h to 3 h, were always conducted by two researchers simultaneously and took place in five separate locations. During observations, researchers chose different locations in the pharmacy, including being next to pharmacists, behind the counter, or standing next to shelves or near clients being attended to. In total, researchers spent 14 h in observation sessions, with some sites receiving multiple observation sessions. Data from observations were collected mainly using fieldnotes, occasionally complemented with photographs and drawings.

3.2 In-Depth Interviews

To understand pharmacists' perspectives about their role in supporting patients with chronic conditions, we conducted in-depth interviews [16]. The interviews were qualitative, and semi-structured, to touch on specific topics while giving space for participants to bring other topics to the table. We recruited pharmacists, pharmacist assistants, and technical directors, as they contacted directly

with patients. We chose to involve pharmacists with different levels of experience and from different settings, to gain access to diverse experiences and backgrounds. The interview guide touched on three main topics: (1) Interactions with chronic patients, (2) Dealing with regular clients, and (3) Role of the pharmacy and pharmacist in the healthcare system. We also inquired participants about demographics, formal education, and previous experience. Before starting the interview, participants received information about the study and data privacy.

In total, 11 participants were interviewed (7 female, 4 male). Three interviews were conducted via videoconference and recorded. The remaining interviews were conducted face-to-face, inside the pharmacies, and were not recorded. Each interview lasted between 30 and 60 min, and the participants were all pharmacists, with responsibilities of customer attendance and/or technical direction of the pharmacy. Experience varied from 1 to over 30 years of experience.

3.3 Recruitment and Ethics

The four pharmacies were recruited through Associação Nacional de Farmácias, the portuguese association of pharmacies, who called potential pharmacies from a convenience sample, considering variety in terms of size, context, and innovation attitude. All pharmacies were based in Porto, Portugal, and one pharmacy had more than one physical site. Once pharmacies agreed to take part in the study, researchers called pharmacies' technical directors for arranging visits. Technical directors introduced the research team to the pharmacists, be them on site or online. In some instances, pharmacists were asked to indicate colleagues from their pharmacy to participate in the interviews. Participants were all volunteers and received no monetary compensation.

All participants provided informed consent after receiving information about the project, goals of the study, data management and security.

3.4 Portuguese Healthcare Context

In Portugal there is a national health service - Serviço Nacional de Saúde (SNS) – that is the main health service, based on universal and equal health access for people living in the country. Community pharmacies however are not part of the SNS; they are privately owned, subject to government-issued requirements (e.g. staff must be comprised of at least two pharmacists) but not directly connected to SNS entities such as hospitals or primary care clinics. There is also a national pharmacy association – Associação Nacional de Farmácias (ANF) that represents pharmacy owners, and whose mission is to support pharmacies and initiatives that value their services. In 1999, ANF created a department to develop pharmaceutical care programs that promoted the integration of pharmacists in patient care, monitoring and follow-up, thus enriching pharmacists' role. The first pilot was launched in 2001, focused on supporting the care of patients with diabetes, hypertension and COPD, and since then, more pharmacies have adhered to these programs [18].

Technology-wise, Portuguese pharmacies currently have access to software that registers the medication sold to customers, and identifies potential medication interactions. Despite its recognized usefulness to pharmacists, the system does not take into account that customers frequently buy products for members of their household, registering these under the same customer id. As such, medication interactions or dosage alerts may result from wrongful information. Moreover, customer data is separated for different pharmacies, which means that pharmacists can only act on purchase information from their own pharmacy.

4 Results: Current Practices of Managing Chronic Patients

Pharmacists are highly sought-after mediators, who repeat medical advice, listen to patients' concerns, and help them reflect on medication side-effects and interactions. They do not replace primary care services, but have a fundamental role in this ecosystem, which is sometimes underestimated. As we observed, pharmacists' role entails teaching the treatment (ongoing or about to start), explaining posology, following medical attention, considering medication interactions and medical exams, and giving advice. To exemplify the role of pharmacists, one technical director said that pharmacists often teach asthmatics how to use the expansion chamber (asthma inhaler), advise patients about a balanced diet and associated medication, or in cases of constipation to "drink water as treatment".

4.1 Support Medication Starting and Correct Usage

Pharmacists spend a considerable amount of time dispensing medication to both the general public and chronic patients. The first step is usually to understand the products that patients want to take. In a country that has adopted electronic prescription, it is common for patients to hand their smartphones to pharmacists so they can access the prescription dispensing codes (similar practices were described in [23]). We also observed patients showing medication packages or photographs of medication packages to indicate their preferred medication brand.

The most relevant chunk of the time in dispensing medication is invested in explaining how to properly take the medication. According to our participants, patients have many doubts about their medication, as doctors spend less time explaining how to take medication. As a result, patients resort to the support of their pharmacist, who seems to have more time or availability to address their doubts. An additional issue has to do with the health literacy of the patients. Clinicians often use concepts that patients do not understand which can lead to ignoring important information. For example, one pharmacist referred that clinicians sometimes ask patients to avoid anti-inflammatory medication, but that it is extremely common for patients not to know what those medications are, and thus pharmacists provide this information to support patients.

Another important task of pharmacists while dispensing medication is to screen potential medication interactions. During this search, pharmacists perform a great deal of "guessing work", as patients, which usually are older adults,

lack complete information about their condition and treatments. Looking at prescriptions, pharmacists can get an idea of the reason for taking the medication, but it is not guaranteed, because, for example, a medication for diabetes could be used for losing weight. Another tool they use is the records available in the information system that can show them medication previously purchased by patients but this information is often unreliable: a patient can have on record medications that were purchased by them but not for them or they may have purchased medications in another pharmacy. The absence of data enables a lack of trust and extends the process of achieving trustworthy information, but participants argue that if they could access more data, they would have more confidence in the credibility of the information they convey to patients.

Pharmacists also supported their patients in successfully taking medication, mobilising resources that could be useful to them. One example we observed while at the pharmacy was how a pharmacist offered the patient to take a pill box for putting their medication. Noticing that the patient was having difficulties in remembering the medication they took, the pharmacist thought about potential solutions for the issue and decided to suggest the patient to try using a pill box. Even though thinking about where the patient would place the medication exceeded the pharmacist's role, she intuited that the patient would benefit from having a medication box which they could fill in daily and know when they had taken a certain medication.

The work of pharmacists is further supported by long-term relationships with their patients.

> **Pharmacist 3**: "There are affinities with certain clients. (...) We [pharmacists] create a friendly relationship, some [pharmacists] with more, others with less, but happens with all colleagues."

A trusted pharmacist will often become the preferred professional for a specific patient, and be the person with who they share illness episodes, questions, or even the news and pictures from their family. While pharmacists try to avoid people being attended only by one pharmacist, when pharmacists have close relationships with patients they are able to pay more attention to the patient's general health and detect acute illness episodes, which can be very useful.

4.2 Performing Measurements at the Pharmacy

Pharmacies are important health parameter measurement sites for patients with chronic conditions. They possess the devices to measure blood pressure, weight, and, in some cases, blood testing equipment that can serve to understand the state of the patient's cholesterol or diabetes. In addition to equipment, making measurements at the pharmacy has the added benefit of having the pharmacist operate measurement devices or, at least, provide feedback on the values. Most patients that made measurements at the pharmacy did not have a device for performing the measurement at home. Patients who had their own device sometimes went to the pharmacy to check if the measurement of their device

was correct, or because they had abnormal values and wanted to know what they could do about them. To illustrate the measurement practices occurring in pharmacies, we present a vignette of measuring blood pressure in a "self-service" blood pressure monitor machine at Pharmacy 1.

> *Pharmacist positions the patient arm in the machine and adjusts their back. Pharmacist enters the coins in the machine. Pharmacist and patient await the measurement. When the machine ends, pharmacist picks up the receipt paper with the measurement.*
> **Pharmacist 2**: "Everything is fine. Systolic is at 16; lets see if it keeps like that [or if it lowers]. Come back in 2-3 days again to see".
> **Patient**: "Is drinking coffee [before coming] bad?"
> **Pharmacist 2**: "Try avoiding coffee and then we test [to see if values change]".

As shown in the example above, pharmacists were the ones responsible for the setup of the blood pressure monitor device at pharmacy. They adjusted the position of the bench to fit the patient, they helped place the patient's arm into the inflatable cuff, and even operated the device's software. After choosing whether to perform a blood pressure measure, a weight measure, or both, pharmacists also entered the coins of the patient into the device. When asked about why pharmacists took such an active role in the setup of the blood pressure monitor device, participants explained that it was the way to obtain quality measurements. Patients were likely to have elevated blood pressure if they saw an error in the machine, so pharmacists were careful with the setup, to make sure the chances of errors by inappropriate measurement conditions stayed minimal. At the peak of COVID-19, pharmacists supported patients in performing a second measurement, adjusting the arm in the cuff or any other condition that could have caused the error in their perspective, but prior to COVID-19 they would take the patient to a separate room, sit them down, give them some minutes to relax, and only then would they perform a manual blood pressure measurement. These conditions supported the acquisition of measurements that were faithful to the patients' state and thus had clinical value.

When the machine performs the measurement, pharmacists stay close to the patient for noticing errors, might they arise. Once measurements are finished, pharmacists picked up the paper slip from the machine, read the value out loud to the patient, and explained to the patient if it was positive or negative. In case of abnormalities, pharmacists inquired patients about circumstances that could have elevated their blood pressure, including anxiety, salty food, or the recent start of a new medication. If the values obtained were concerning, they might ask the patient to return later to make a new measurement or suggest them to go see their doctor. Moreover, if values deviated considerably from standard values, they would call patients' relatives or emergency services. When asked if calling family members or emergency services was part of their responsibilities, one pharmacist explained that they had an ethical duty as healthcare professionals to care for their population, most especially in acute cases of regular clients they

closely accompany. Additionally, a pharmacist shared that when communicating with emergency services, their knowledge allows them to explain patients' condition better than the patients themselves or other person outside the healthcare field. This shows a strong commitment to patients, and an active role in enabling the healthcare system to work.

Interviewed pharmacists considered that their measurement devices should save patients' values, similar to a prior study [33]. Frequently, sometimes twice a day (morning and afternoon), patients go to the pharmacy to measure blood pressure due to medical instructions and preserve a piece of paper (Fig. 1) to present to the doctor to monitor their status. However, if the machine could record and save patients' values, it could facilitate communication or collaboration with clinicians. It could also enable pharmacists to know the usual values for a specific patient. According to our participants, pharmacies could have regular patients' informed consent, for example, to save and share data within a cross-disciplinary platform accessible to both pharmacists and clinicians.

4.3 Discussing Prescription Issues with Clinicians

In some rare occasions, pharmacists spot issues with the prescription that need to be discussed with clinicians. Examples include potential interactions between medication, very high doses prescribed, or unconsidered patient characteristics that might make the prescription unsafe. In these situations, pharmacists may contact clinicians to discuss potential issues and devise an adjusted medication plan, however, communication channels are far from ideal.

> **Pharmacist 1**: "The patient needs to wait one or two hours at the pharmacy before I can get information that I need from the clinician".

Since pharmacists do not usually have direct phone numbers to healthcare units, they are usually left with general phone numbers, which may not prioritise their question. This means that, as stated by Pharmacist 1, waiting periods can be long before the pharmacist can contact the clinician, which is not desirable for neither the patient nor the pharmacist. When direct communication is not possible, pharmacists mainly give the information to their patients so they can discuss it with their clinicians. Still, pharmacists find this compromise unsatisfactory because some information can be lost, misunderstood or misinterpreted.

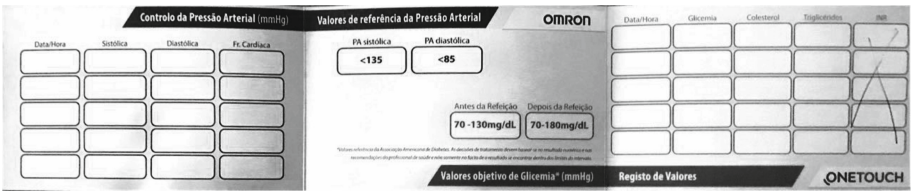

Fig. 1. Paper slip for recording blood pressure measurements currently in use in one of the pharmacies observed.

> **Pharmacist 1**: "There could be a triangulation between clinicians, pharmacists, and patients, thinking about the benefits that those interactions could bring, even though dealing with the challenges of sensitive data protection could occur".

A more appropriate approach would be, as envisioned by Pharmacist 1, to have a more direct communication channel between clinicians, pharmacists and patients, where information could be safely shared. For this pharmacist, there are clear benefits in having access to this information despite its sensitivity and more importantly, it can avoid the long waits or misunderstandings that currently occur. As an example, they mention a mobile service connecting doctors, pharmacists and patients. Another participant referred that, in the case of patients with yearly medication subscriptions, the pharmacist could report observations about how patients are taking or reacting to the medication, which could inform medication adjustments. Another pharmacist described that, ideally, there should be an initial appointment in the pharmacy, where the pharmacist would get to know the patient's clinical conditions, medications, and medical recommendations. Currently, pharmacists only see patients when they purchase medication or perform measurements, which does not allow them to perform the role they envision. Another pharmacist emphasised that being able to accompany patients more would be ideal because pharmacists are the first healthcare professional which patients appeal to.

5 Discussion

The main goal of this study was to understand how pharmacists support patients with chronic diseases in their management, and the interactions with healthcare professionals, to inform future technology design. While performing observations in pharmacies, we noted that, in accordance to previous studies [14,29], the work carried out by pharmacists exceeds medication dispensing and includes not only contact with the public but also a significant amount of time spent with administrative tasks. It became clear that medication dispensing is a far more complex task than simply following a prescription. The process includes instructing patients, making sure they clearly understand the instructions and have the conditions to follow them while screening for possible medication interactions. As such, even when reducing the role of pharmacists as medication dispensers, as mentioned by [25], it is important to acknowledge the amount of expertise entailed.

With their current lack of involvement in the prescription phase, pharmacists are left in a position where they can provide the prescribed medication but are often unsure if they are providing the best available option for the patient, as also reported by [6]. In the opinion of our participants, there should be a clear legal definition of the pharmacist role, and a cultural shift in health services where collaboration between different services and professionals is valued in practice. These barriers and necessary changes are also mentioned in previous literature

[20,24]. Overall, pharmacists consider they should be able to have more information about the patients and their conditions, as it is their role not only to provide medication but also to check for medication interactions and support medication adherence.

Since pharmacists have a close relationship with patients, they could play an important role in communicating symptoms' evolution and adherence data to clinicians. As identified in prior work [19], clinicians often lack information that could allow them to better monitor patients, even without direct contact. Pharmacists dedicate their efforts to ensure that chronic patients have the opportunity to monitor their medication and other health parameters not only onsite at the pharmacy but also when helping patients that have difficulties performing their measurements at home an issue previously identified in prior work [28].

It became clear during this study that, as observed before [19], one of the most prominent challenges currently faced by pharmacists is the lack of direct communication with clinicians. Pharmacists envision a closer collaboration with clinicians, to support a better understanding and common agreement of the roles each will play in patient care, with doctors being in charge of the diagnosis, with pharmacists being involved in prescription and treatment adjustments.

It should be noted that our work is limited due to the localised nature of the fieldwork. We involved pharmacies from one city, and it is possible that other pharmacies in different locations (e.g. rural settings) report different practices. We compared our findings with the literature to overcome the localisation issue, but fieldwork in other locations would be required to further validate our findings.

5.1 Implications for Design

According to our fieldwork, technology can support collaboration between pharmacists, patients and clinicians to improve chronic care. As such, we derived a set of implications for the design of such technologies to ensure that they answer to the current challenges faced by pharmacists.

Enable pharmacies to keep a personalized profile of their patients. Pharmacies play a very important role in the measurement and monitoring of patients' measurements. By providing expert feedback on patients' values, pharmacists not only advise patients but also support screening of aggravations or further health issues. Having the possibility to keep track of measurements should enable pharmacists to more efficiently know the baseline of values for a specific patient, enabling them to detect minor issues before they aggravate. During the fieldwork, we also understood that pharmacists have access to the record of client purchases and use this list to screen for medication interactions. However, the list of purchases for each client may include products bought for others, which can complicate this process. With this in mind, pharmacists suggested having an individual profile for each patient, especially chronic patients taking more medication simultaneously. The data management of patient profiles will need to be carefully designed, but pharmacists already have an ethical duty to

their patients and manage medication data confidentially, so having a profile for patients would be a logical next step.

Provide a direct communication channel between pharmacists and clinicians. The fieldwork showed issues in communication between pharmacists and clinicians. Without a direct communication channel, patients had to wait or come back another time to the pharmacy, each time there seemed to be a medication interaction or an error in prescription. Collaboration between pharmacist and clinician was also hindered, and there was no way for clinicians to rely on the pharmacist besides what they could intuit from a prescription. With a direct software communication channel, pharmacists would be able to: (i) support patient education and training, (ii) share observations with clinicians about patient adherence or (side)effects, (iii) recommend adjustments in medication taking into consideration health issues or the daily habits of the patient, and (iv) ask for alternative medications, e.g., when a medication is out of stock. While clearly important for patient care, having this effective communication can also be valuable in defining the role of the pharmacist as a support for doctors, helping them support patient self-care and triage of acute illness episodes.

Enable measurements made at the pharmacy to be shared with clinicians. It was clear from the fieldwork that pharmacists take a number of precautions to reach measurements with clinical quality. Currently, values measured at the pharmacy are shared with clinicians using paper slips (Fig. 1), which can be easily lost and even require additional note-taking at the clinician's office. In case the measurement process is digitised, the measurements could be uploaded directly to the patient profile or an alternative option that can be easily shared with the clinician. Having these measurements made at the pharmacy and with the support of the pharmacist ensures measurement quality, avoiding false concerns and doctor visits, or delay in care.

6 Conclusion

This study was conducted to understand current practices and challenges faced by pharmacists to inform the design of solutions that could play an important role in supporting their chronic patients. Our findings indicate that while pharmacists are a key actor in helping chronic patients manage their diseases, they lack the information and communication with clinicians to better support their decisions and provide more services and better care to their patients. Technology can be seen as a potential solution, but it needs to address these professionals' real needs, and some key features must not be left out. The derived implications for design intend to summarise these action points, which should be implemented with Participatory Design projects that involve all relevant stakeholders.

Moreover, there is a need for a change of pharmacists role in healthcare and their relationship with clinicians, patients and in particular chronic patients. While this change seems to be clear for our participants, other policy, legal and organisational aspects should be approached and discussed in future studies.

Acknowledgements. This study was funded by the project ConnectedHealth (n.º 46858), supported by the Competitiveness and Internationalisation Operational Programme (POCI) and Lisbon Regional Operational Programme (LISBOA 2020), under the PORTUGAL 2020 Partnership Agreement, through the European Regional Development Fund (ERDF).

References

1. Anderson, S.: The state of the world's pharmacy: a portrait of the pharmacy profession. J. Interprof. Care **16**(4), 391–404 (2002). https://doi.org/10.1080/1356182021000008337
2. Aungst, T.D., Miranda, A.C., Serag-Bolos, E.S.: How mobile devices are changing pharmacy practice. Am. J. Health-Syst. Pharm. **72**(6), 494–500 (2015). https://doi.org/10.2146/ajhp140139
3. Baldo, D., Benelli, G., Pozzebon, A., Sesto, R.: The fides project: a pharmacy toolbox to allow healthcare decentralization. In: 2011 E-Health and Bioengineering Conference (EHB), pp. 1–5 (2011)
4. Barlow, J., Wright, C., Sheasby, J., Turner, A., Hainsworth, J.: Self-management approaches for people with chronic conditions: a review. Patient Educ. Couns. **48**(2), 177–187 (2002). https://doi.org/10.1016/S0738-3991(02)00032-0
5. Burgess, H., et al.: The sticky notes method: adapting interpretive description methodology for team-based qualitative analysis in community-based participatory research. Qual. Health Res. **31**(7), 1335–1344 (2021)
6. Craddock, D.S., Hall, R.G.: Pharmacists without access to the EHR: practicing with one hand tied behind our backs. Innovations pharm. **12**(3), 16 (2021). https://doi.org/10.24926/iip.v12i3.4141
7. Crilly, P., Kayyali, R.: A systematic review of randomized controlled trials of telehealth and digital technology use by community pharmacists to improve public health. Pharmacy **8**(3), 137 (2020). https://doi.org/10.3390/pharmacy8030137
8. Fitzpatrick, G., Ellingsen, G.: A review of 25 years of CSCW research in healthcare: contributions, challenges and future agendas. Comput. Support. Coop. Work (CSCW) **22**(4), 609–665 (2012). https://doi.org/10.1007/s10606-012-9168-0
9. van der Gaag, M., Heijmans, M., Spoiala, C., Rademakers, J.: The importance of health literacy for self-management: a scoping review of reviews. Chronic Illn. **18**(2), 234–254 (2022). https://doi.org/10.1177/17423953211035472
10. Gheorghiu, B., Hagens, S.: Measuring interoperable EHR adoption and maturity: a canadian example. BMC Med. Inf. Decis. Making **16**(1), 1–7 (2016). https://doi.org/10.1186/s12911-016-0247-x
11. Gregório, J., Lapão, L.V.: Uso de cenários estratégicos para planeamento de recursos humanos em saúde: o caso dos farmacêuticos comunitários em portugal 2010–2020. Revista Portuguesa de Saúde Pública **30**(2), 125–142 (2012). https://doi.org/10.1016/j.rpsp.2012.12.003
12. Howard, J., et al.: Exploring the barriers to using assistive technology for individuals with chronic conditions: a meta-synthesis review. Disabil. Rehabil. Assist. Technol. **17**(4), 390–408 (2022). https://doi.org/10.1080/17483107.2020.1788181
13. Hughes, C.A., Guirguis, L.M., Wong, T., Ng, K., Ing, L., Fisher, K.: Influence of pharmacy practice on community pharmacists integration of medication and lab value information from electronic health records. J. Am. Pharm. Assoc. **51**(5), 591–598 (2011). https://doi.org/10.1331/JAPhA.2011.10085

14. Lapão, L.V., et al.: EHealth services for enhanced pharmaceutical care provision: from counseling to patient education. In: 2013 IEEE 2nd International Conference on Serious Games and Applications for Health (SeGAH), pp. 1–7 (2013). https://doi.org/10.1109/SeGAH.2013.6665308
15. Lee, K.P., Hartridge, C., Corbett, K., Vittinghoff, E., Auerbach, A.D.: Whose job is it, really? physicians, nurses and pharmacists perspectives on completing inpatient medication reconciliation. J. Hosp. Med. **10**(3), 184–6 (2015). https://doi.org/10.1002/jhm.2289
16. Lofland, J., Snow, D.A., Anderson, L., Lofland, L.H.: Analyzing Social Settings: A Guide To Qualitative Observation And Analysis, 4th edn. Wadsworth Publishing, Belmont, CA, USA (2005)
17. Martin, A., et al.: The evolving frontier of digital health: opportunities for pharmacists on the horizon. Hosp. Pharm. **53**(1), 7–11 (2018). https://doi.org/10.1177/0018578717738221
18. Martins, S., Costa, F.A.D., Caramona, M.: ImplementaÇÃo de cuidados farmacÊuticos em portugal, seis anos depois. Rev. Port. de Farmacoterapia **5**(4), 4–12 (2015). https://doi.org/10.25756/rpf.v5i4.38
19. Mercer, K., et al.: Physician and pharmacist medication decision-making in the time of electronic health records: mixed-methods study. JMIR Hum. Factors **5**(3), e24 (2018). https://doi.org/10.2196/humanfactors.9891
20. Mossialos, E., et al.: From retailers to health care providers: transforming the role of community pharmacists in chronic disease management. Health Policy **119**(5), 628–639 (2015). https://doi.org/10.1016/j.healthpol.2015.02.007
21. Mullins, A.K., et al.: Physicians and pharmacists use of my health record in the emergency department: results from a mixed-methods study. Health Inf. Sci. Syst. **9**(1), 1–10 (2021). https://doi.org/10.1007/s13755-021-00148-6
22. MURAL: Mural (2022). https://www.mural.co/
23. Murero, M.: E-prescribing: the rise of socio-tech-med micronetworks of care during the COVID-19 pandemic. Salute E SocietÀ **XX**(suppl. 2), 104–118 (2021). https://doi.org/10.3280/SES2021-002-S1007
24. Puspitasari, H.P., Aslani, P., Krass, I.: Challenges in the management of chronic noncommunicable diseases by indonesian community pharmacists. Pharm. pract. **13**(3), 578 (2015). https://doi.org/10.18549/PharmPract.2015.03.578
25. Rosenthal, M.M., Breault, R.R., Austin, Z., Tsuyuki, R.T.: Pharmacists self-perception of their professional role: insights into community pharmacy culture. J. Am. Pharm. Assoc. **51**(3), 363–368a (2011). https://doi.org/10.1331/JAPhA.2011.10034
26. Shane-McWhorter, L., et al.: Pharmacist-provided diabetes management and education via a telemonitoring program. J. Am. Pharm. Assoc. **55**(5), 516–526 (2015). https://doi.org/10.1331/JAPhA.2015.14285
27. Spradley, J.P.: Participant Observation. Holt, Rinehart and Winston (1980)
28. Storni, C.: Multiple forms of appropriation in self-monitoring technology: reflections on the role of evaluation in future self-care. Int. J. Hum. Comput. Interact. **26**(5), 537–561 (2010). https://doi.org/10.1080/10447311003720001
29. van de Pol, J.M., Geljon, J.G., Belitser, S.V., Frederix, G.W., Hövels, A.M., Bouvy, M.L.: Pharmacy in transition: a work sampling study of community pharmacists using smartphone technology. Res. Social Adm. Pharm. **15**(1), 70–76 (2019). https://doi.org/10.1016/j.sapharm.2018.03.004
30. Waszyk-Nowaczyk, M., et al.: Cooperation between pharmacists and physicians - whether it was before and is it still ongoing during the pandemic? J. Multidiscip. Healthc. **14**, 2101–2110 (2021). https://doi.org/10.2147/jmdh.s318480

31. Webster, L., Spiro, R.F.: Health information technology: a new world for pharmacy. J. Am. Pharm. Assoc. **50**(2), e20–e34 (2010). https://doi.org/10.1331/JAPhA.2010.09170
32. WHO, W.H.O.: Non communicable diseases (2021). https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases Accessed 14 Feb 2022
33. Zhang, H., et al.: A mobile health solution for chronic disease management at retail pharmacy. In: 2016 IEEE 18th International Conference on E-Health Networking, Applications and Services (Healthcom), pp. 1–5 (2016). https://doi.org/10.1109/HealthCom.2016.7749455