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Pharmacy in transition: A work sampling study of community pharmacists using smartphone technology

Jeroen M. van de Pol[a,b,*], Jurjen G. Geljon[a], Svetlana V. Belitser[a], Geert W.J. Frederix[a], Anke M. Hövels[a], Marcel L. Bouvy[a,c]

[a] Utrecht Institute for Pharmaceutical Sciences (UIPS), Department of Pharmacoepidemiology & Clinical Pharmacology, Utrecht University, Utrecht, The Netherlands
[b] BENU Apotheken BV, Maarssen, The Netherlands
[c] SIR Institute for Pharmacy Practice and Policy, Leiden, The Netherlands

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ABSTRACT

Introduction: The nature of community pharmacy is changing, shifting from the preparation and distribution of medicines to the provision of cognitive pharmaceutical services (CPS); however, often the provision of traditional services leaves little time for innovative services. This study investigated the time community pharmacists spend on the tasks and activities of daily practice and to what extent they are able to implement CPS-related services in daily practice.

Methods: Self-reporting work sampling was used to register the activities of community pharmacists. A smartphone application, designed specifically for this purpose, alerted participants to register their current activity five times per working day for 6 weeks. Participants also completed an online survey about baseline characteristics.

Results: Ninety-one Dutch community pharmacists provided work-sampling data (7848 registered activities). Overall, 51.5% of their time was spent on professional activities, 35.4% on semi-professional activities, and 13.1% on non-professional activities. The proportion of time devoted to CPS decreased during the workweek, whereas the time spent on traditional task increased.

Discussion and conclusion: This study shows it is feasible to collect work-sampling data using smartphone technology. Community pharmacists spent almost half of their time on semi-professional and non-professional activities, activities that could be delegated to other staff members. In practice, the transition to CPS is hampered by competing traditional tasks, which prevents community pharmacists from profiling themselves as pharmaceutical experts in daily practice.

1. Introduction

Worldwide, the role of community pharmacists is changing, shifting from the traditional preparation and distribution of medicines to the provision of cognitive pharmaceutical services (CPS). Both policy makers and professional pharmacy organizations emphasize the necessity of this transition for the future of the profession and for the benefit of the ageing population.[1–6] Population ageing will increase the need for healthcare provision, with increasing demands being made of doctors and nurses, who in turn need support, especially when managing patients with multimorbidity and polypharmacy.

Community pharmacists can have an important role as drug experts in the increasingly demanding healthcare setting.[7] In current daily practice, however, community pharmacists are underutilized as healthcare provider, even though their relevance to healthcare is widely recognized. This is probably because new services are slowly being incorporated into community pharmacy practice.[8] Next to reimbursement issues, many community pharmacists encounter a lack of time in daily practice.[9–11] It is therefore important to gain insight into how much time community pharmacists devote to different activities and tasks.

Earlier time utilization studies have shown that community pharmacists devote considerable time and effort to logistic processes, such as labelling and dispensing.[6,12–21] Work sampling is a generally accepted technique to obtain insight into time utilization and can be applied to assess the time community pharmacists invest in labelling and dispensing and direct patient care.[22] It is based on the assumption that a sufficient number of random observations enable a reliable

* Corresponding author. Utrecht Institute for Pharmaceutical Sciences (UIPS), Department of Pharmacoepidemiology & Clinical Pharmacology, Universiteitsweg 99, 3584 CG, Utrecht, The Netherlands.
E-mail address: j.m.vandepol@uu.nl (J.M. van de Pol).

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estimate to be made of the time spent on different activities. However, these studies are time consuming for both participants and researchers and have therefore generally involved relatively small sample sizes. The advent of smartphones provides new possibilities for efficient data collection, by reducing the workload of work sampling by eliminating the need for trained external observers, which is labour intensive and can cause a “Hawthorne” effect (participants changing their behaviour as a consequence of the presence of an observer).[12] Another possibility is to let participants estimate their time commitment to specific activities, but this method is considered unreliable due to recall bias.[12]

The aim of this study is to assess the amount of time community pharmacists spend on different activities (taking into account whether these activities are professional, semi-professional or non-professional) and how these activities are divided over the workweek.

2. Methods

2.1. Study design

Cross-sectional study using a work-sampling technique based on self-reporting at random intervals. A smartphone application was developed to register the activities of participating pharmacists. The application randomly alerted pharmacists to record their activities five times between 9.00 and 19.00 h each working day (within ± 60 min of 10.00, 12.00, 14.00, 16.00, and 18.00 h). This timing was purposely chosen to register activities during the entire workday, while reducing the risk of registering activities with a daily cyclical nature. The activities were registered in an online database. Participants could register activities directly after the initial alert or at the end of the workday. After that, an alert was coded as missing. The time that elapsed between the alert and the actual registration of the activity was recorded. Participants were also asked to complete an online survey on baseline characteristics. The duration of this study lasted 6 weeks for each participant to ensure that activities with a monthly cyclical nature (e.g. the monthly billing cycle) would be recorded at least once during the observation period. Participants participated between January and July 2016.

2.2. Participants

Community pharmacists were recruited through the Utrecht Pharmacy Practice network for Education and Research (UPPER), which includes approximately 1200 of the in total 1900 Dutch community pharmacies.[23] All registered community pharmacists were informed about the study by means of a short announcement in the UPPER newsletter and a random selection of 400 community pharmacists was invited by e-mail.

2.3. Mobile application development

Categories and subcategories of activities were based on previous community pharmacy work-sampling studies performed in Northern Ireland[13,17] and were slightly modified to fit current Dutch pharmacy practice. Subsequently, five Dutch practicing community pharmacists tested a beta version of the application. Their feedback was used to define the final categories and subcategories (see Table 1 and appendix A). They also deemed five alerts per workday acceptable. To prevent misclassification, a short description of the type of activities in each subcategory was provided (see appendix A). If pharmacists were unable to categorize their activities, they could enter free text, which was recoded by the authors (JvdP, MB) after data collection was finished.

The risk of misclassification was assessed in a pilot study by asking eight practising community pharmacists to classify 50 activities into one of the main categories listed in Table 1. The agreement between the eight pharmacists, and between the pharmacists and the categorization made by the researchers, was assessed. Kappa was calculated for both situations to adjust for chance agreement. The agreement between the eight pharmacists had a Fleiss' kappa of 0.799. On the basis of this result, the researchers made the final categorization. There was substantial agreement between the eight pharmacists and the final categorization (Cohen's kappa 0.71–0.93).[24]

2.4. Ethics and confidentiality

The research proposal was approved by the Institutional Review Board of Utrecht University. The smartphone application provided each participant with a unique *user code*. These codes could not be linked to identifiers of individual participants. Acquired data were anonymous and treated as confidential.

2.5. Data analysis

The data were collected on an online server using Microsoft Excel and analysed using Microsoft Excel, Microsoft Access, and SPSS 23.0. The number of registered activities is expressed as the mean and median percentage of the total number of registered activities and interquartile range. Activities were classified in three levels based on the necessity of the professional skills of a pharmacist to perform the activity: professional, semi-professional, and non-professional. A professional activity needs the specific expertise of a pharmacist; semi-professional activities can be delegated to pharmacy technicians under the supervision of a pharmacist; and non-professional activities do not require the expertise of either a pharmacist or pharmacy technician. Consensus on the classification of activities was reached by a panel of six practising community pharmacists (see appendix A).

3. Results

A total of 156 community pharmacists agreed to participate and registered 11,918 activities using the smartphone application between 11 January and 27 July 2016; 65 participants who did not complete the online survey were excluded. Results from the excluded versus included participants are presented in appendix B. Participants were also excluded if they responded to fewer than 30% of the alerts. This mainly excluded pharmacists who tried the smartphone application a few times without the intention of actually participating. In total, 734 alerts occurred when participants were not at work (because of holidays or part-time employment); these responses were excluded (not formal activities). All analyses were performed on the remaining dataset consisting of 7848 registered activities provided by 91 participating pharmacists (see Fig. 1). Demographic data of the participants are shown in Table 1.

Data analysis using non-parametric Mann-Whitney U test showed no statistical differences between the activities registered by participants who did or did not complete the online survey. However, there were statistical differences between participants who responded within an hour on average compared to participants who did not (see appendix B).

Most participants were women and were on average 40 years old (Table 2), consistent with Dutch employment statistics for pharmacists.[25] The participants had an average of about 15 years of working experience. Throughout the workweek, community pharmacists spent most time (51.7%) on professional activities, with CPS, the dispensing process, and checking prescriptions being the most frequently recorded activities (Table 3, Figs. 2 and 3).

4. Discussion

This study shows that community pharmacists have a diverse and demanding set of activities in daily practice. While pharmacists spent approximately half (51.5%) of their time on activities that require their specific professional expertise, they spent a substantial proportion of their time on semi-professional activities (35.4%) and to a lesser extent

Table 1
Classification of pharmacists' activities (a more detailed description is given in appendix A).

Main activity	Definition
Cognitive pharmaceutical services	Direct contact with patients or healthcare providers (e.g. counselling). Performing medication reviews. Updating patient status.
Logistics	Stock maintenance. Ordering products from suppliers. Contact with patients regarding the supply of products.
Organizational activities	Internal staff meetings. External meetings on communal healthcare projects.
Quality assurance	Updating the quality manual. Attending audits. Performing customer satisfaction research.
Human resource management	Staff appraisal. Making work schedules. Supervising interns.
Household chores	Cleaning the pharmacy. Repairing broken or malfunctioning equipment.
Finances	Bookkeeping. Health insurance negotiations.
Dispensing process	Validating, labelling, preparing, and checking medicines.
Final check of prescription	Checking the appropriateness of the prescription. Checking drug indication, dose and suitability for the patient.
Clinical risk management	Checking all medication alerts (e.g. interactions, drug dose, intolerability).
Education	Attending post-graduate education
Non-professional encounters and other	General chat with patients, colleagues or other healthcare professionals.
Rest	Lunch, coffee breaks, toilet breaks.

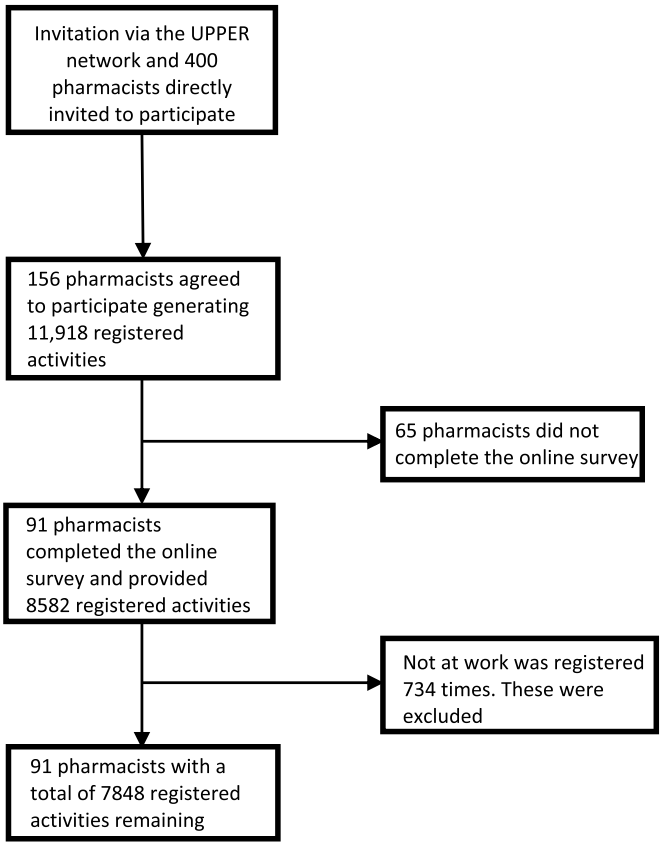

Fig. 1. Data flowchart.

Table 2
Demographic data.

Characteristic	N = 91
Age in years (mean ± SD)	39.4 ± 10.7
Male gender	30 (33.0%)
Working experience in years (mean ± SD)	14.4 ± 10.1
Graduation year (mean ± SD)	2002 ± 10
Type of pharmacist	
Pharmacist owner	27 (29.7%)
Pharmacist in employment	33 (36.3%)
Locum pharmacist	31 (34.1%)
Working hours per week (mean ± SD)	36.7 ± 7.32

on non-professional activities (13.1%). Although all professionals want to focus on their professional tasks as much as possible, it is impossible to avoid semi- and non-professional tasks, e.g. administrative work.[23] The current study population is representative of Dutch community pharmacists, and therefore this study provides a fair representation of time utilization by community pharmacists in the Netherlands.[25]

Findings suggest that there is ample room to increase the time spent on CPS (currently 14.2%), although this will be at the expense of other activities. Dispensing activities (15.7%) and the final prescription check (15.9%) seem to compete with CPS, as suggested by the observation that less time was spent on CPS and more time was spent on dispensing and checking prescriptions as the week progressed. Both professional organizations and policymakers emphasize the importance of an increased focus on CPS. The results of this study show that community pharmacists are still mainly occupied with traditional tasks. It will be necessary to discontinue or delegate some of these traditional tasks in order to be able to redirect attention to CPS.

The dispensing process seems to be the primary candidate. Dispensing consists mainly of semi-professional activities that can be automated and delegated to other pharmacy staff. Although the final prescription check is considered a professional task and in many countries is mandatory for pharmacists, recent technological developments, such as barcode scanning and automated dispensing, could render a final check by a pharmacist superfluous. These regulatory changes will be necessary in order to help pharmacists perform this task more efficiently (e.g. delegating the final check of low-risk prescriptions to pharmacy staff or support from intelligent software), and it will be necessary to demonstrate that changing these processes does not affect drug safety. However, some pharmacists may feel uncomfortable about delegating certain tasks.[26]

That community pharmacists spent relatively a lot of time (15.7%) on the dispensing process may be because of understaffing as a result of reduced remuneration in community pharmacy. In the Dutch community pharmacy setting, dispensing has always been viewed as a typical task of the pharmacy technician, not the pharmacist. Thus, understaffing may mean that the pharmacist has to help technicians. The same may be true for finance (6.1%) and logistics (5.0%), activities which do not require the expertise of the pharmacist and which can be delegated to supporting staff (e.g. book-keepers). Here again, the lack of remuneration may indirectly prevent pharmacists from devoting more time to CPS.[22] The administrative red tape required for reimbursement of the costs for an increasing number of (expensive) drugs and medical devices is time consuming and of very limited added value to society. Not only pharmacists[27] but also other healthcare professionals report a high administrative workload that limits their ability to provide care-related services and directly impedes job satisfaction.[28–30]

Though rest is a non-professional activity, its importance should not be underestimated. Too little rest carries the risk that the pharmacist makes medication errors.[14] In this study, community pharmacists had 45 min of rest during an 8-h working day. This may explain the high burnout rate among Dutch community pharmacists, which is currently 1 in 3.[31] Dutch and UK community pharmacy collective working

Table 3
Average and median percentage of time (with interquartile range) community pharmacists spend on various activity groups.

Main activity	Average ± SD (%) N = 91	Median (%) N = 91	Interquartile range (IQR) (%)
Cognitive pharmaceutical services	14.2 ± 8.2	14.3	7.8–19.4
Logistics	5.0 ± 4.2	3.8	1.7–6.8
Organizational activities	8.7 ± 7.5	6.3	2.8–12.5
Quality assurance	2.9 ± 3.0	1.9	0.0–4.5
Human resource management	7.0 ± 6.2	5.4	3.0–8.9
Household chores	1.7 ± 2.1	1.0	0.0–3.0
Finances	6.1 ± 7.4	3.6	1.4–8.1
Dispensing process	15.7 ± 10.6	14.7	8.1–22.2
Final check of prescription	15.9 ± 7.3	14.9	11.1–20.5
Clinical risk management	5.7 ± 5.1	4.5	1.7–8.6
Education	5.4 ± 5.0	4.5	1.6–8.7
Rest	5.5 ± 3.9	5.2	2.3–8.1
Non-professional encounters and other	6.3 ± 3.8	6.1	3.2–8.3
Professional	51.5 ± 12.2	53.2	42.9–60.4
Semi-professional	35.4 ± 10.7	35.7	28.0–41.3
Non-professional	13.1 ± 6.8	12.2	8.0–16.5

agreements state that community pharmacists should have a 20- and 30-min rest break every 6 h (5.6–8.3%).

Work-sampling studies in community pharmacy are sparse, which makes it difficult to compare results, especially because pharmacists' tasks and responsibilities may differ nationally.[12] A review from 1996 reported that pharmacists spend between 17.6% and 46.9% of their time on professional activities.[12] Two more recent work-sampling studies from Northern Ireland performed in 1999 and 2009 also showed that pharmacists spend roughly half of their time on professional activities.[13,17] Little seems to have changed between 1999 and 2009. These studies also showed that pharmacists spend most of their time on dispensing.

These results suggest that the barriers that community pharmacists face in their transition to CPS are universal. More needs to be learned about these barriers – are they financial (lack of remuneration)[22] or professional (perceived importance of both traditional activities and CPS).[26] More insight is needed into how to reform community pharmacy practice to make it ready for future demands and how to overcome obstacles in the process. Community pharmacists need to profile themselves as pharmaceutical experts.

This study shows that work sampling can be done in an efficient and user-friendly way by using smartphone technology. This technology makes it possible to include large groups of participants so as to generate more data and to repeat studies. Moreover, using self-reporting limits the "Hawthorne" effect compared to direct observation.[32] Another advantage is that pharmacists have a better insight into their activities than trained observers.[33] However, there are drawbacks to self-reported data. Participants may provide socially desirable answers and they may classify activities differently. The participants were provided with feedback on their time registration and included a benchmark, so as to discourage socially desirable responses. In the pilot stage of this study, it was found that the impact of misclassification was limited, perhaps because the smartphone application provided a brief explanation of what each activity entailed. This helped participants to choose the category that fitted best to their activity.

The use of a smartphone application meant that participants had to keep their smartphone with them at all times, which might not always be possible or desirable in daily clinical practice. Therefore, some activities were registered with a delay after the original alert, which could introduce recall bias and more socially desirable answers. Sensitivity analysis, however, showed no major differences between responses given within an hour after the alert versus responses given more than an

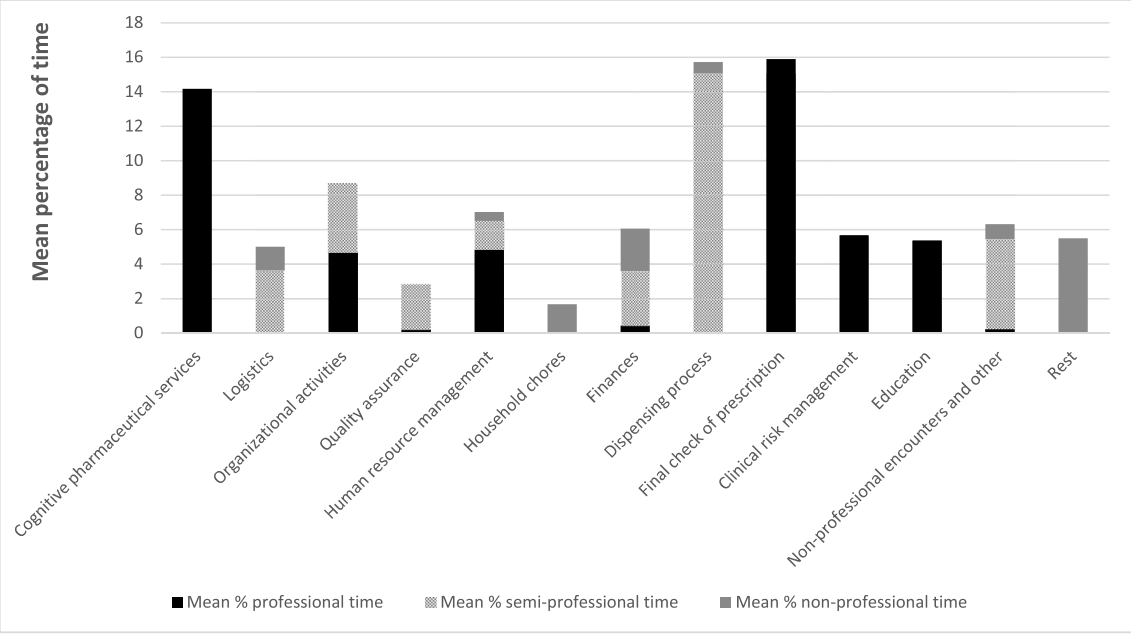

Fig. 2. Mean percentage of time spent on each main activity, classified by whether the pharmacist's professional skills were needed to perform the activity.

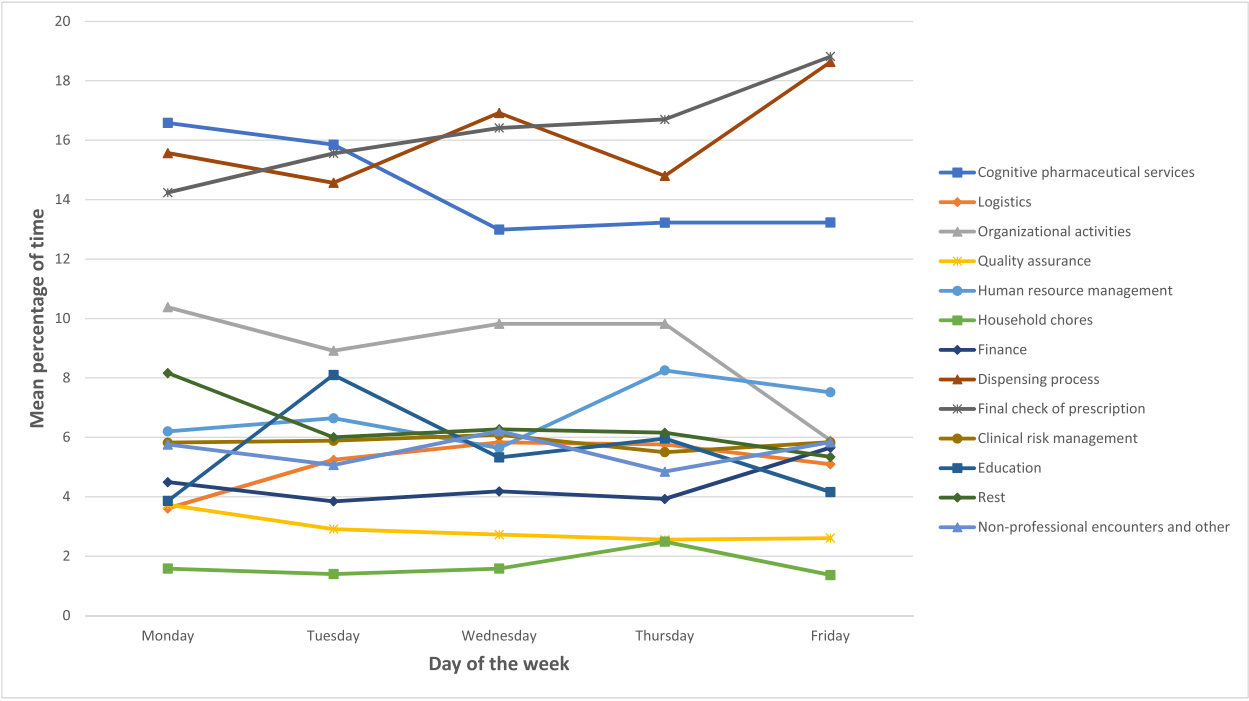

Fig. 3. Variation in main activities during the working week.

hour after the alert. However, there was a significant difference between participants responding on average within an hour to alerts and those who responded later. This is probably because some activities (e.g. counselling patients) are not easily interrupted and so they are registered later.

A potential study limitation is recruitment bias. Community pharmacists with efficient and good coordinated work streams might have been over-represented, because they had more time to participate in research. However, the invitation letter encouraged pharmacists to participate in the study as it would give insight into own activities and would provide a benchmark. This might have stimulated pharmacists who are struggling with inefficient work streams to participate. Some participants actually reported that the study helped them gain insight into their own time utilization.

Data were collected between 9.00 and 19.00 on workdays from 11 January to 27 July 2016. This is a 6-month period, which makes it unlikely that results in other periods would be different. Activities that mainly took place outside this timeframe would be structurally missed; however, Dutch pharmacies are generally open between 8.00 and 18.00. Although this study reveals how community pharmacists spend their time in daily practice, it does not provide insight into the quality of the activities done.[14]

5. Conclusion

Community pharmacists spend half of their time on professional activities, mainly CPS, dispensing tasks, and the final prescription check. This study suggests that various aspects of the current situation are barriers to the optimal utilization of the community pharmacy workforce.

Conflicts of interest

None.

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Appendices

Appendix A
Main activities and subcategories used in the smartphone application

Main activity	Subcategory	Professionality
Cognitive pharmaceutical services	Medication use review	Professional
	Care-related contact with a patient (not a medication review)	
	Contact with another healthcare professional(s) about a patient (not a medication review)	
	Periodic meeting with GPs and pharmacists on prescribing policy	
	Updating clinical information from patients	
	Clinical rules	

Logistics	Contact with a patient about logistics	Semi-professional
	Stock management	
	Processing a recall	
	Stock-taking	Non-professional
	Processing orders from the wholesaler	
Organizational activities	Contact with other healthcare professionals for organizational reasons	Professional
	Preparing or attending work meetings	
	General organization management	Semi-professional
Quality assurance	Supervising an audit	Professional
	Working on the quality manual	Semi-professional
	General quality assurance management	
	Investigating customer satisfaction	
	Investigating satisfaction with other healthcare professionals	
Human resource management	General employee management	Professional
	One-on-one conversation with an employee, e.g. job performance evaluation	
	Supervising an intern	
	Hiring new employees	Semi-professional
	Making and updating work schedules	
	Employee administration, e.g. salary, worked hours etc.	Non-professional
Household chores	General housekeeping tasks	Non-professional
Finances	Assessing contracts with health insurance companies	Professional
	Checking declarations and authorizations	Semi-professional
	Administrative tasks for patients	
	Registering cash money in cash register and/or safe	Non-professional
	General financial administration	
Dispensing process	Processing prescriptions	Semi-professional
	Filling prescriptions	
	Checking filled prescriptions	
	Hand out filled prescriptions to patients	
	Preparing or checking a prepared drug	
	Copying prescriptions for the digital archive	Non-professional
Final check of prescription	Checking for inappropriate prescribing and possible distribution errors	Professional
Clinical risk management	Checking for inappropriate prescribing and faulty drug combinations	Professional
Education	Following a refresher course	Professional
	Teaching a refresher course to others	
	Studying work-related literature	
Rest	Taking a break at work	Non-professional
Non-professional encounters and other	Conducting research for other institutions	Professional
	Processing mail and e-mail	Semi-professional
	General chat with other healthcare professional(s)	Non-professional
	General chat with a patient	

Appendix B
Sensitivity analysis survey responders vs. non-responders and response time

Main activity	Survey vs. Non-survey					Registered within 60 min after initial alert or longer				
	Survey		Non-survey		p-value	Within 60 min		Longer than 60 min		
	Mean (%)	Median (%)	Mean (%)	Median (%)		Mean (%)	Median (%)	Mean (%)	Median (%)	p-value
Cognitive pharmaceutical services	12.1	11.0	9.8	7.5	0.098	13.3	13.0	9.0	9.0	0.016
Logistics	4.3	3.0	3.8	3.0	0.336	4.2	3.0	4.4	3.0	0.466
Organizational activities	7.4	5.0	7.8	6.0	0.974	8.1	6.0	5.6	3.0	0.023
Quality assurance	2.4	1.5	2.3	1.0	0.501	2.5	2.0	2.2	1.0	0.737
Human resource management	5.9	5.0	4.9	4.0	0.262	6.4	5.0	4.5	3.0	0.026
Household chores	1.4	1.0	0.8	1.0	0.199	1.4	1.0	1.5	1.0	0.771

Finances	5.5	3.0	3.7	2.0	0.339	6.0	3.0	4.4	3.0	0.411
Dispensing proces	13.6	11.5	11.9	8.0	0.081	14.3	11.0	11.8	12.0	0.286
Final check of prescription	13.7	13.0	11.5	9.0	0.100	14.4	14.0	11.8	10.0	0.044
Clinical risk management	5.0	3.0	3.6	2.5	0.161	5.6	4.0	3.4	2.0	0.093
Education	4.6	3.5	5.0	4.0	0.836	5.2	4.0	3.3	2.0	0.045
Non-professional encounters and other	5.4	5.0	4.7	4.0	0.194	5.4	5.0	5.2	5.0	0.923
Rest	4.7	4.0	5.0	4.5	0.717	4.9	5.0	4.1	4.0	0.516

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