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Describing interruptions, multi-tasking and task-switching in the community pharmacy: A qualitative study in England

ABSTRACT

Background: There is growing evidence base around interruptions and distractions in the community pharmacy setting. There is also evidence to suggest these practices may be associated with dispensing errors. Up to date, qualitative research on this subject is limited.

Objective: To explore interruptions and distractions in the community setting; utilising an ethnographic approach to be able to provide a detailed description of the circumstances surrounding such practices.

Setting: Community pharmacies in England, July to October 2011.

Method: An ethnographic approach was taken. Non participant, unstructured observations were utilised to make records of pharmacists' every activities. Case studies were formed by combining field notes with detailed information on pharmacists and their respective pharmacy businesses. Content analysis was undertaken both manually and electronically, utilising NVivo 10.

Results: Response rate was 12% (n=11). Over fifteen days, a total of 123 hours and 58 minutes of observations were recorded in 11 separate pharmacies of 11 individual pharmacists. The sample was evenly split by gender (female n=6; male n=5) and pharmacy ownership (independent n=5; multiple n=6). Employment statuses included employee pharmacists (n=6), owners (n=4) and a locum (n=1). Average period of registration as a pharmacist was 19 years (range 5-39 years). Average prescriptions busyness of pharmacies ranged from 2,600 – 24,000 items dispensed per month. Two key themes were: "Interruptions and task-switching" and "distractions and multi-tasking." All observed pharmacists' work was dominated by interruptions, task-switches, distractions and multi-tasking, often to manage a barrage of conflicting demands. These practices were observed to be part of a deep-rooted culture in the community setting. Directional work maps illustrated the extent and direction of task switching employed by pharmacists.

Conclusions: In this study pharmacists' working practices were permeated by interruptions and multi-tasking. These practices are inefficient and potentially reduce patient safety in terms of dispensing accuracy.

IMPACTS ON PRACTICE

- "Interruptions and task switching" and "distractions and multi-tasking" were observed to be part of a deep rooted culture in community pharmacies. Novel directional work maps helped to chart pharmacists' task-switching practices.
- These practices may impact on both patient safety and pharmacists' perceptions of workload.
- Training for both pharmacists and support staff is required to facilitate practice change; directional work maps may be used as a tool to facilitate this.

INTRODUCTION

Community pharmacists (CPs) have previously stated that interruptions and distractions at work are commonplace.[24, 25] These practices potentially linked to patient safety though their influence on accuracy checking of dispensed medicines. It is estimated that 22 near misses [where an error is identified prior to reaching a patient] and four dispensing errors [errors which reach patients] occur per 10,000 items dispensed in community pharmacies. Interruptions and distractions have been associated with circumstances surrounding dispensing errors.[26] Experiments utilising simulated dispensing tasks incorporating interruptions and distractions indicate these negatively affect pharmacists' ability to detect dispensing errors; recommendations resulting from this research suggests pharmacists should try to reduce interruptions and distractions whilst dispensing or accuracy checking.[27]

Interruptions have been categorised and quantified in both the community and hospital pharmacy settings.[refs] Studies specifically relating to community pharmacy indicate that a range of issues are associated with interruptions and distractions. Ashcroft et al showed that pharmacists cited telephone interruptions, staff and patient queries as well as distractions linked to busy over the counter trade as contributory factors towards dispensing errors and near misses.[ref] People talking in the background and general background noise have been shown to upset concentration.[ref] These may also reduce the likelihood of individuals' abilities to perform cognitive functions.[refs, incl szeinbach] Another paper stated that community pharmacies have a "culture of interruption" suggesting the practices are deeply embedded in day-to-day operating of the pharmacy. Indeed, a review of literature on incidence and causes of dispensing errors highlighted six studies which attributed interruptions and/or distractions to either errors or near misses.

It is important that interruptions and distractions are not considered in isolation from changes to the structure of the National Health Service (NHS) and the community pharmacy contractual framework in England (CPCF, table 1) in recent years. These changes have ultimately resulted in role expansion and increased workloads for CPs.[6,7] Dispensing workload alone has increased by 53% in the past decade with over 1 billion prescriptions dispensed in England alone. Both anecdotal [20, 21] and peer reviewed evidence have indicated that CPs perceive their workload as increasing.[6, 7, 12, 22-25] It may be postulated that increased workload and a larger range of tasks to undertake might generate more interruptions and distractions. Furthermore, this is likely to be compounded by staff having to take on new roles associated with changes to the CPCF. Recent research on this subject revealed staff have concerns around taking on new tasks, especially around accountability. It could be argued that this might result in lack of staff confidence around undertaking new tasks leading to more interruptions or distractions for pharmacists.

Table 1 Structure of the NHS CPFC in England [28-30]

Service Tier		
Essential	**Advanced**	**Locally commissioned services**
These are nationally commissioned by the government and include: Dispensing Medicines, Dispensing Appliances, Repeat Dispensing, Disposal of Unwanted Medicines, Public Health, Signposting, Support for Self Care, Clinical Governance	There are nationally commissioned by the government and include: Medicines Use Reviews (MUR), Prescription Intervention Service, Appliance Use Reviews New Medicines Service and Stoma Appliance Customisation Service	Services are specific to local areas and include (but are not limited to) smoking cessation, supervised administration, needle exchange, influenza vaccination, chlamydia screening and treatment and emergency hormonal contraception.

AIM

Whilst the research presented in the paper is part of a larger study on CPs' working practices, the specific aim of this paper was to explore interruptions and distractions in the community setting. An essential component of this was to understand how community pharmacists work within teams of support staff; investigating interactions between staff, pharmacists and ongoing events. Many previous studies have focused on categorising and quantifying interruptions and distractions. This study was different in that an ethnographic approach employing unstructured, non-participant observations was chosen to provide a different insight into these practices, to allow a more detailed description of the circumstances surrounding them.

ETHICAL APPROVAL

Ethical approval was granted by a NHS Research Ethics Committee. Research governance approval was granted by a local Primary Care Trust.

METHOD

Study setting

Observations of CPs were conducted in community pharmacies located in England between July and October 2011. Pharmacists working in pharmacies located in a single Primary Care Trust were recruited via postal invitation (n=90), with telephone follow-ups two weeks later for non-responders. Pharmacies open longer than 60 hours per week were excluded due to the possibility of observer fatigue.

The researcher (VL) established a rapport with participants prior to observations through regular telephone contact with the aim of putting them at ease and ensuring they fully understood what was being recorded, and why. It was hoped this step would reduce changes in behaviour as a result

of any lack of understanding of study motives, particularly as concerns around whistleblowing over dispensing errors had been highlighted by several participants prior to consent. Written and verbal consent was gained prior to participation along with assurance of confidentiality and anonymity. Pharmacists were provided with information sheets to help them brief staff about the study and the reasons for the presence of a researcher within the pharmacy.

Pilot observations

Three pilot observations of 120 minutes each were undertaken in a convenience sample of local community pharmacies to ensure that unstructured observations were suitable for this purpose; review and analysis of field notes demonstrated this was the case.

Data collection

An ethnographic approach was considered the most appropriate given the exploratory nature of the study. Continuous, unstructured notes covering all activities the observed pharmacist undertook during the working day were made by the researcher. Impressions of pharmacists' demeanour and ongoing events were also recorded and clearly labelled as "impressions" so they could be differentiated from the rest of the observational notes. Observations were recorded continuously with one hour timelines noted to help tracking of events and to allow creation of directional work maps, presented later. At the end of each observation, the pharmacist was asked to provide a verbal reflection on the day; a written record of this was made by the researcher. Observational notes were combined with detailed information on each pharmacy and pharmacist (scaled pharmacy plans, workflow, staffing, business and pharmacist information) to form a case study pack. Case studies totalled over 146,000 words. One pharmacist (pharmacist 1) agreed to be observed for five consecutive days. All other pharmacists agreed to a single day observation. The five days of observations allowed the research team to check if the pharmacist's behaviour remained the same or changed over time, as part of a validation process for single day observations.

Data Analysis

Analysis of field notes and interview transcripts was undertaken using the content analysis method, both manually and electronically, utilising NVivo (version 10). Content analysis was deemed the most appropriate method as the study was exploratory and it was imperative for the codes to originate from the data. All case studies were analysed on a line-by-line basis by VL. A 50% sample of cases were coded independently by RR and SC. Emergent codes and themes were discussed amongst the research group in detail and at regular intervals during the analysis phase to ensure accuracy of interpretation and application. Data saturation was reached at the tenth observation. An additional observation was undertaken to ensure this was the case.

Directional work maps were also created by charting pharmacists' task switches. Whilst this study is largely qualitative in nature, vast quantities of field notes detailing a pharmacist's every activity can make it difficult to provide an overall impression of how they work. These maps allowed an easy-view of how many times a pharmacist change tasks, and which tasks they move from and to. Examples are provided in the findings section.

RESULTS

Over fifteen days, a total of 123 hours and 58 minutes of observations were recorded. The number of pharmacists who agreed to participate after telephone follow up was 11 (response rate 12%; n=11). The sample was evenly split by gender (female n=6; male n=5) and pharmacy ownership (independent n=5; multiple n=6). Employment statuses included employee pharmacists (n=6), owners (n=4) and a locum (n=1). Average period of registration as a pharmacist was 19 years (range 5-39 years). Average prescription activity of pharmacies ranged from 2,600 – 24,000 items dispensed per month.

Results from the pilot observations were excluded from the study. The five consecutive days of observations showed that the pharmacist's behaviour did not change over this course of time so data from all single day observations were considered appropriate to include in the results. Findings are presented as extracts from field notes.

Analysis generated multiple key themes. Those reported in this paper include: "interruptions and task switching", "distractions and multi-tasking." These permeated all observations and were seen to be prominent characteristics of pharmacists' working practices.

Interruptions and task switching

Interruptions and task switching were frequently observed pharmacists' and workload was fragmented because of this. Reasons for this were either due to an external factor, or self-directed interruptions. Self-directed task switching occurred when pharmacists made a conscious decision to switch from one task to another. Examples included switching from a dispensing based activity to an administrative task such as stock management or paperwork. Conversely, externally directed task switches were directly driven by interruptions.

Interruptions and subsequent task switches were driven by activities which pharmacists perceived as needing immediate attention. For example, pharmacists' work on accuracy checking of dispensed medicines was frequently interrupted for tasks linked to providing prompt service, such as queries from waiting customers concerning over-the counter (OTC) and prescription medication or phone calls:

> The phone rings and the pharmacist answers it. It is a nursing home asking a question about one of their customer's medication. Pharmacist stops what he is doing and writes some notes about the call on a piece of paper. (P10)

> Whilst checking dispensed medicines, the dispenser asks the pharmacist how to label a prescription item. He stops what he's doing and turns to the dispenser who is at the computer, looks at the screen and prescription and tells her how to label it. At that moment, a customer shouts over to him asking how to take the item that the dispenser is working on. He stops what he's doing and goes to the customer and advises them. (P7)

However, pharmacists' work was also interrupted for other issues which did not need an immediate answer, such as non-urgent stock or paperwork enquiries. In all pharmacies staff had a tendency to go directly to the pharmacist when they required advice or information, as opposed to gaining advice from other, more experienced staff first. There was a range of awareness amongst support

staff as to what the pharmacist was doing when they were interrupting. In some instances, staff were considerate before interrupting the pharmacist, waiting until they had finished the task they were undertaking. On other occasions less consideration was employed; a commonly observed example involved staff holding prescription forms or boxes of medicine in front of the pharmacist to prevent them from continuing the task they were working on:

> The pharmacist has resumed accuracy checking medication in dosette boxes as previously. The shop employed delivery driver walks into the dispensary and up to the pharmacist. Without notice, he holds a dosette tray in the pharmacist's line of sight (so he cannot see what he is working on) and tells him that the patient is in hospital [*Observer's impression: Pharmacist looks exasperated at this interruption].* (P1)

In some of the busier pharmacies, interruptions were observed to occur in quick succession, often before the pharmacist had a chance to resume their original task:

> Whilst checking dosette trays, a dispenser comes to him [pharmacist] and asks about the differences between two dressings. She holds two boxes in front of him and he stops what he's doing and advises her. He then turns back to the dosette trays in front of him. Before he gets a chance to start checking again a work placement girl comes to him with a query about a delivery. (P1)

The notion that interruptions might give pharmacists' perceptions of increased busyness was reinforced in several of the pharmacists' end of day reflections:

> "He [pharmacist] thought that was down to the fact that because the afternoon was quiet and he did quite a bit of checking uninterrupted he felt less busy than usual." (Reflections on observed work day, P7)

Interruptions appeared to be much more irksome to pharmacists than distractions, possibly because it meant having to stop work altogether. Even when pharmacists appeared annoyed at having been interrupted, they rarely diverted the interruption elsewhere. Some pharmacists indicated that interruptions were a feature of their working day. One pharmacist stated that it was a "hazard of the job" (P3). The idea that interruptions hamper productivity was also voiced by several pharmacists:

> "She [pharmacist] said that she felt she was interrupted a lot which meant that things took longer than they probably should have." (Reflections on observed work day, P4)

Distractions and multi-tasking

"Distractions and multi-tasking" was a theme which featured heavily in observed pharmacists' working days. Distractions occurred when pharmacists' attention was diverted away from their original task to another demand. The key difference between this and an interruption was that during distractions they did not stop working on their original task altogether, resulting in multi-tasking. Pharmacists were commonly observed to multi-task as a way of trying to manage conflicting workload demands. This was most frequently observed to happen whilst they were involved with some part of the dispensing process and also trying to deal with queries from staff or customers:

> Whilst on the phone [to the nursing home], pharmacist is checking dispensed medicines that the pre-reg [trainee pharmacist] has given him. She then takes the items away to give to a customer. (P5)

However, distractions were also observed that allowed pharmacists to engage in social exchanges or informal staff training:

> ...the dispenser asks him [pharmacist] to check a few dosette boxes. He does this. Whilst doing this he tells the dispenser about best practice on dispensing into dosette boxes. (P7)

As with interruptions, staff showed different levels of awareness of how busy the pharmacist was when distracting them:

> Pharmacist is checking some medicines information for a customer. He is looking in a book called "Stockley's drug interactions. [*Observer's impression: Pharmacist now looks deep in thought.*] Whilst he is doing this, another counter assistant comes to him and says "I need your advice, I know you're busy." [*Observer's impression: Pharmacist looks slightly stressed.*] Pharmacist answers the counter assistant's query whilst looking in the book… (P1)

Pharmacists also utilised multi-tasking to supervise ongoing events in the pharmacy, particularly conversations among staff, or staff and customer conversations:

> Pharmacist goes back to the computer and types. Whilst doing this she is listening to a conversation between a counter assistant and customer at the counter. Pharmacist looks concerned. She intervenes to check customer has the correct medicine [counter assistant was advising customer incorrectly on an OTC medicine]. (P3)

As with interruptions, pharmacists rarely delegated distractions elsewhere, resulting in them continuing to have to multi-task. Interestingly, observations appeared to show that pharmacists reach a point where they know they cannot continue multi-tasking (as if "overloaded") and they have to interrupt their work instead, to be able to focus on a single task:

> ...dispenser comes to the pharmacist and starts speaking about staffing arrangements for the next day. He listens whilst writing in the controlled drugs register. [*Observer's impression: Pharmacist looks like he is trying to concentrate on his work*.] Pharmacist flicks through the book and starts writing on another page whilst still talking to the dispenser about staffing. An ACT comes over and asks him a question about endorsing. He answers. Dispenser then restarts conversation about staffing. Pharmacist stops what he's doing and finishes conversation. [*Observer's impression: Appears pharmacist has given up the possibility of talking to the dispenser and working at the same time.]* (P1)

Directional work maps

Directional work maps were created to help visualise and compare the extent of different pharmacists' task switching and multi-tasking. The first three maps in figure 1 were used to compare pharmacists working in pharmacies ranging from high to low busyness. Maps in figure 2 depict the second and penultimate hour of work one for pharmacist to compare task-switching and multi-tasking at different points in the day.

The first three maps in figure 1 (below) show that despite differences in pharmacy busyness, pharmacists' workflow is dis-jointed by frequent multi-directional tasks switches, compounded by additional multi-tasking. Interestingly, multi-tasking commonly occurs when pharmacists are

involved in some stage of the dispensing process, despite the fact good practice indicates divided attention whilst dispensing is an unsafe activity. Communication with staff in also heavily implicated in both multi-tasking and task switching.

The fourth and fifth maps in figure 2 (below) show a contrast in working pattern when a pharmacist is providing a specific service (MUR) to a patient. In map 4 where the pharmacist is undertaking an MUR, task switching and multi-tasking is less than in map 5 or the other maps in figure 1. It would appear that interruption of, or multi-tasking whilst undertaking a service is perceived as being much less acceptable than when undertaking dispensing activities. This may because pharmacists are isolated in a consultation room with a patient whilst providing an MUR and are therefore much less susceptible to distractions or interruptions.

DISCUSSION

The aim of this study was to explore interruptions and distractions in the community setting. Observations revealed pharmacists' work was permeated by interruptions and distractions which drove task-switching and multi-tasking. Pharmacists did not appear to have insight in to the extent or possible ramifications of this which is corroborated by the fact that they did not frequently re-delegate interruptions and distractions. Continual permission of these practices reinforces to staff that this is an acceptable practice. The results presented in this paper support those from a recent study that highlighted unsafe acts pharmacists partake in whilst dispensing. This included distractions and how these cause divided attention throughout the dispensing process.[32]

Extracts from observational field notes illustrated how integral interactions between pharmacists, staff and sometimes patients were in driving task-switching and multi-tasking. Staff displaying different levels of awareness of pharmacists' busyness suggests a training need, particularly in terms of empowerment and utilising other, more experienced members of staff for advice first-line. However, training needs also extend further than just support staff; pharmacists should also be included being that these working practices appeared to be part of a deep rooted culture.

The directional work maps indicated the extent of task switching and multi-tasking: It is clear pharmacists' regularly manage a barrage of conflicting demands. If perceptions of workload are high, it can be argued that working in this manner only propagates it. Furthermore, perceptions of being very busy are likely to hamper a desire to take on additional services within primary care. The maps paint a more detailed picture of the extent of task-switching than basic tallies of these events. They may prove useful in terms of pharmacists and staff being able to reflect on their working practices.

The potential consequences of interruptions, task switching and distractions relate to both workload management and patient safety. Interruptions and multi-tasking are increasingly well documented in the medical and nursing profession; not only are these common occurrences due to the nature of healthcare, but these working practices have ramifications for quality of care.[34-39] Coeira *et al* observed communication between members of staff working in hospital emergency departments and concluded the high level of multitasking was concerning, especially as several on-going tasks might overload memory and the combination of interruptions and multi-tasking may be a potential source of error.[40] This is especially pertinent in terms of this study since the work maps showed pharmacists often combine communicating with staff with tasks such as dispensing.

Other literature describes multi-tasking in particular as being inefficient and a cause of cognitive overload.[41, 42]This is congruent with what was observed. Studies on task switching report that in experiments where subjects were are asked to switch tasks rather than repeat them they were slower and error rates on subsequent tasks were higher after a task switch[43]– important considerations not just for safety, but also for workload management.

Although interruptions and multi-tasking are not well reported in pharmacy, particularly in the community setting, there is evidence to suggest that distractions and interruptions are associated with the circumstances surrounding dispensing errors.[26] Other studies cite interruptions and distractions as contributory factors to dispensing errors.[44, 45] Family et al demonstrated interruptions and distractions can hamper pharmacists' ability to detect dispensing errors.[27] These are important considerations the high volume of prescriptions dispensed in community pharmacies.

The community pharmacy environment will always be busy with conflicting and often unpredictable workload demands. Working practices described in this paper are potentially inefficient in terms of workload management and negative in terms of safety. Working towards safer practice leans to focusing on one task at a time and minimising interruptions to those which are only truly necessary. Considering staff involvement in these practices, training of whole pharmacy teams is crucial to work toward a safer and more efficient culture.

Strengths and limitations

This study has produced detailed findings on distractions, interruptions and task switching observed amongst a small number of pharmacists within a single Primary Care Trust. The strength of employing observations as a data collection method lies in the ability to identify and focus on issues that pharmacists don't themselves fully recognise; this might not necessarily be achieved via other methods. Although a convenience sample, the final observed population was diverse. However, the results are not generalisable. Observational data can be subject to the Hawthorne effect. However, the effect of this is difficult to quantify.[46] Pharmacists' motives for participating are likely to have affected the sample composition. Observations may have deterred participation from pharmacists who were not coping with their workload. Video recording was considered for validating observations but rejected; it would have been intrusive and impractical in many pharmacies visited due to their layout. Its use would also have raised concerns about consent and confidentiality, particularly from a patient perspective.

CONCLUSION

The findings from this study demonstrate that CPs' work is dominated by interruptions, task-switches and multi-tasking. Research suggests these practices are inefficient, can cause cognitive overload and potentially increase the risk of task error.[40-43] This makes these types of working practices important considerations for dispensing errors and patient safety. With continually increasing workloads these issues need to be addressed to ensure pharmacists work efficiently and utilise support staff to their maximum potential to be able to take on extended roles. However, this would involve practice change by pharmacy teams as a whole and buy in from employers. Practice change has shown to be a complex process underpinned by numerous interacting barriers and facilitators.[47] More high quality research is needed to understand why pharmacists and their teams work the way they do and what methods could be employed to help them progress towards safer and more efficient working methods.

REFERENCES

1. Evaluating the impact of the 2003 OFT study on the Control of Entry regulations in the retail pharmacies market. *Office of Fair Trading*. 2010: 1-124.

2. Elliot R et al. Understanding and Appraising the New Medicines Service in the NHS in England. *Department of Health*, 2014: 1-120.

3. Watson M, Blenkinsopp A. The Minor Ailment Study (MINA). *Pharmacy Research UK* 2014:1-38.

4. Securing the Future GP Workforce. Delivering the Mandate on GP Expansion. *Health Education England* 2013:1-63.

5. Focus on Accident and Emergency. *Health and Social Care Information Centre* 2013:1-57.

6. Gidman W. Increasing community pharmacy workloads in England: causes and consequences. *Int J Clin Pharm* 2011;33:512-20. doi:10.1007/s11096-011-9498-x

7. Gidman W, Hassell K, Day J et al. The impact of increasing workloads and role expansion on female community pharmacists in the United Kingdom. *Res Social Adm Pharm* 2006;3:285-302. doi:10.1016/j.sapharm.2006.10.003

8. General Pharmaceutical Services in England: 2003-04 to 2012-13. *Health and Social Care Information Centre,* 2013:1-56.

9. A strategic review of the future pharmacist workforce. Informing pharmacist student numbers. *Centre for Workforce Intelligence*.2013:1-57.

10. Hassell K. Centre for Pharmacy Workforce Studies Briefing Paper. GPhC Register Analysis 2011. 2011:1-24.

11. Bell HM, McElnay JC, Hughes CM. A self-reported work sampling study in community pharmacy practice. *Pharm World Sci* 1999;21:210-6.

12. Bond C, Blenkinsopp A, Inch J, Bond C et al. The effect of the new community pharmacy contract on the community pharmacy workforce. *The Pharmacy Practice Research Trust,* 2008: 1-34.

13. McCann L, Hughes C, Adair C. A self-reported work-sampling study in community pharmacy practice: a 2009 update. *Pharm World Sci* 2010;32:536-43. doi:10.1007/s11096-010-9405-x

14. Davies J, Barber N, Taylor D. What do community pharmacists do? Results from a work sampling study in London. *Int J Pharm Pract* 2014;22:309-318. doi:10.1111/ijpp.12083

15. Savage I. Time for prescription and OTC advice in independent community practice. *PharmJ* 1997;258:873-7.

16. Savage I. Time for customer contact in pharmacies with and without a dispensing technician. *Int J Pharm Pract* 1995;3:193-9. doi:10.1111/j.2042-7174.1995.tb00818.x

17. Rutter P. Pharmacist work patterns: are they affected by staffing levels and prescription numbers?[abstract] *Int J Pharm Pract* 2002;10(suppl):R49. doi:10.1111/j.2042-7174.2002.tb00652.x

18. Rutter P, Hunt A, Darracott R, et al. Validation of a Subjective Evaluation Study Using Work Sampling*. J Social Adm Pharm* 1999;16:174-85.

19. Rutter P, Hunt A, Darracott R, et al. A Subjective Study of How Community Pharmacists in Great Britain Spend Their Time*. J Social Adm Pharm* 1998;4:252-61.

20. Gidley S. Don't get left behind. Pharm J [eLetter]. 1 April 2012. http://www.pharmaceutical-journal.com/opinion/correspondence/dont-get-left-behind/11100081.article?adfesuccess=1.

21. Churton S. Workplace Pressure: Open letter from the President to all Members. *PharmJ* 2009;282:103.

22. Eden M, Schafheutle E, Hassell K. Workload pressure among recently qualified pharmacists: an exploratory study of intentions to leave the profession*. Int J Pharm Pract* 2009;17:181-7. doi:10.1211/ijpp.17.03.0009

23. Shann P, Hassell K. Flexible working: Understanding the locum pharmacist in Great Britain*. Res Social Adm Pharm* 2006;2:388-407. doi:10.1016/j.sapharm.2006.03.002

24. McCann L, Adair CG, Hughes CM. An exploration of work-related stress in Northern Ireland community pharmacy: a qualitative study*. Int J Pharm Pract* 2009;17:261-7. doi:10.1211/ijpp.17.05.0002

25. McCann L, Hughes CM, Adair CG, Cardwell C. Assessing job satisfaction and stress among pharmacists in Northern Ireland*. Pharm World Sci* 2009;31:188-94. doi:10.1007/s11096-008-9277-5

26. Ashcroft D, Quinlan P, Blenkinsopp A. Prospective study of the incidence, nature and causes of dispensing errors in community pharmacies. *Pharmacoepidemiol Drug Saf 2005*;14:327-32. doi:10.1002/pds.1012

27. Family H, Weiss M, Sutton J. The effects of mental workload on commmunithy pharmacists' ability to detect dispensing errors. *Pharmacy Research UK* 2013:1-121.

28. Essential Services. Pharmaceutical Services Negotiating Committee. http://psnc.org.uk/services-commissioning/essential-services/ (accessed 20 October 2014).

29. Advanced Services. Pharmaceutical Services Negotiating Committee. http://psnc.org.uk/services-commissioning/advanced-services/ (accessed 20 October 2014).

30. Locally commissioned services. Pharmaceutical Services Negotiating Committee. http://psnc.org.uk/services-commissioning/locally-commissioned-services/ (accessed 20 October 2014).

31. Clark P, Bowling A. Quality of everyday life in long stay institutions for the elderly. An observational study of long stay hospital and nursing home care*. Soc Sci Med* 1990;30:1201-10. doi:10.1016/0277-9536(90)90260-y

32. Harvey J, Avery A, Ashcroft D et al. Exploring safety systems for dispensing in community pharmacies: focusing on how staff relate to organizational components. *Res Social Adm Pharm* Published online first: 29 July 2014. doi:10.1016/j.sapharm.2014.06.005

33. Grasha A, Reilly S, Schell K et al. Process and delayed verification errors in community pharmacy: implications for improving accuracy and patient safety. Technical Report Number 112101. *Cognitive Systems Performance Lab* 2001: 1-27.

34. Westbrook J, Coeira E, Dunsmuir W. The impact of interruptions on clinical task completion. *Qual Saf Health Care* 2010;19:284-9. doi:10.1136/qshc.2009.039255

35. Westbrook J, Woods A, Rob M. Association of interruptions with increased risk and severity of medication administration errors. *Arch Intern Med* 2010;170:683-90. doi:10.1001/archinternmed.2010.65

36. Westbrook J, Ampt A, Kearney L. All in a day's work: an observational study to quantify how and with whom doctors on hospital wards spend their time. *Med J Aust* 2008;188:506-9.

37. Ulanimo V, O'Leary-Kelley C, Connolly, P. Nurses' perceptions of causes of medication errors and barriers to reporting. *J Nurs Care Qual* 2007;22:28-33. doi:10.1097/00001786-200701000-00007

38. Ly T, Korb-Wells C, Sumpton D et al. Nature and impact of interruptions on clinical workflow of medical residents in the inpatient setting. *J Graduate Med Educ* 2013;5:232-237. doi:10.4300/jgme-d-12-00040.1

39. Chisholm C, Collison K, Nelson D et al. Emergency department workplace interruptions: are emergency physicians "Interrupt-driven" and "Multi-tasking"? Acad Emerg Med 2000;7:1239-43. doi:10.1111/j.1553-2712.2000.tb00469.x

40. Coiera E, Jayasuriya R, Hardy J, et al. Communication loads on clinical staff in the emergency department. *Med J Aust* 2002;176:415-418.

41. Rubinstein J, Meyer D, Evans J. Executive control of cognitive processes in task switching. *J Exp Psychol Hum Percept Perform* 2001;27:763-97. doi:10.1037/0096-1523.27.4.763

42. Kirsch D. A few thoughts on cognitive overload . *Intellica* 2000;30:19-51.

43. Monsell S. Task Switching. *Trends Cogn Sci* 2003;7:134-40. doi:10.1016/S1364-6613(03)00028-7

44. Flynn E, Barker K, Gibson J, et al. Impact of interruptions and distractions on dispensing errors in an ambulatory care pharmacy. *Am J Health Syst Pharm* 1999;56:1319-25.

45. Flynn E. Relationships between ambient sounds and the accuracy of pharmacists' prescription-filling performance. *Hum Fact* 1996;38:614-22. doi:10.1518/001872096778827314

46. Mays N, Pope C. Qualitative Research: Observational methods in health care settings. *BMJ* 1995; 311:182-4. doi:10.1136/bmj.311.6998.182

47. Roberts AS, Benrimoj S, Chen TF, et al. Understanding practice change in community pharmacy: A qualitative study in Australia. *Res Social Adm Pharm* 2005;12:546-64. doi:10.1016/j.sapharm.2005.09.003

Legend for figures 1 and 2
The solid arrows on the maps detail the pharmacist switching from one task to another, the direction of the switch, and in the small box next to the arrow, the number of times it occurred during the hour. The dotted lines on the maps indicate pharmacists' multi-tasking. The lines join the activities pharmacists multi-task on and the number in the grey box denotes the number of times it occurred during the hour.