Community pharmacist workflow: **S**pace for **P**harmacy-Based **I**nterventions and **C**onsultation Tim**E** (SPICE) study protocol

ABSTRACT

Background: Pharmacists' roles are expanding to delivering a wider set of professional services including medication management optimisation, vaccinations and screening services. Robust research determining whether pharmacists have the capacity to offer such services in the Australian community pharmacy setting is lacking. This protocol details a mixed methods study that investigates the variation in pharmacists' daily tasks and the workspace they work in as a measure of their workload capacity for expanding pharmacy services.

Methods: An observational time and motion study will be conducted in up to twenty community pharmacies in metropolitan and rural regions of Australia. A trained observer will follow a pharmacist and record the type, location and duration of tasks undertaken over the course of their working day. Data will be collected and analysed using the electronic Work Observation Method By Activity Timing (WOMBAT) tool. Pharmacists' work patterns will be described as time for each task, and by proportionating multitasking and interruptions. This information will be combined with workspace data collected using floor plans, photographs and a qualitative assessment of the working environment completed by the observer. Analysis will include heat-mapped floor plans visually highlighting pharmacist movements.

Discussion: Pharmacists may provide solutions to the strained health workforce and system. There is limited quantitative evidence on whether pharmacists have the time or work setting to support such needs. The use of time and motion methodology is novel to Australian community pharmacy research and the findings will provide a better understanding of pharmacists' capacity and work environment.

Keywords:

Community Pharmacy; Professional Practice; Primary Care; Observation Study

BACKGROUND

Community pharmacy is an integral part of the Australian healthcare system through its role in facilitating access to Pharmaceutical Benefits Scheme (PBS) medicines, ensuring the quality use of medicines and providing effective healthcare services [1]. Through the Sixth Community Pharmacy Agreement (6CPA) the Australian Federal government is funding several programs aimed at improving patient outcomes and expanding the role of community pharmacy in delivering a wider range of professional primary healthcare services [1]. Existing programs offered include screening, medication reviews, and the administration of vaccinations [2, 3].

The adoption of community pharmacy-based professional services can result in a number of potential benefits for service users and health systems. Examples include optimised management of medications [4], reduced adverse drug events [5], achievement of patient therapeutic goals, improved clinical outcomes [6, 7], and better management of minor ailments [8]. Given the increasing time pressures on general practitioners (GP) due to population growth, an ageing population and rise in chronic diseases, community pharmacists could potentially provide solutions by taking some functions currently managed by the GP [9, 10]. However, Australia is relatively more cautious about utilising pharmacists to provide clinical services than other countries [11-13]. For example, non-medical prescribing rights exclude pharmacists and the co-location of pharmacists into GP practices is still relatively new within Australia [14, 15]. While there have been projects recommending an increase in public awareness of pharmacy services, little progress has occurred in the last decade [16]. Differing economic, policy and workforce issues could be reasons for disparities between Australia and for example, the UK, US and New Zealand [17, 18]. From a pharmacy perspective, challenges include lack of remuneration, insufficient staffing levels, absence of appropriate training, limited private consultation areas, increasing workloads and challenging

work environments [19-22]. Furthermore, interprofessional collaboration has been hindered by perceived distrust by some GPs of the commercial interest of pharmacists, potentially inciting competition and boundary encroachment [23, 24]. However, continual communication mechanisms, clear defined roles, long-term rapport and external funding have been seen as major facilitators and more studies are required in this space [23, 24]. Regardless, research into the capacity of community pharmacists to deliver such services may need to take precedence.

Gradual reductions in prescription item profits due to Australian community pharmacy remuneration agreements have facilitated a change in practice with the profession seeking alternative income sources and to providing more consumer focused services [22]. However, the delivery of such services can be affected by, but not limited to, workflow, pharmacy location, and public and professional relationships [25-27]. Additionally, the pharmacy layout can enable or impede the activities of staff and consumers [28]. For example, pharmacies in Australia are required to have an area for consumer consultations that ensures privacy and confidentiality, although many still take place in the public eye [29]. More recently, pharmacies that wish to provide certain services such as the administration of flu vaccinations may only do so in an area screened from the general public space; yet little is known if these areas are being used as intended [29]. These necessities are to be balanced with consumer expectations of a retail space that allow ease of movement, finding sought items, and paying for goods and services [28]. Ultimately, community pharmacies are both a professional healthcare practice and a retailing business, and architectural challenges are therefore a balance between comfort, safety, and aesthetics [28, 30]. Further research is required and a better understanding of pharmacists' tasks, time spent, their workspace and of the social interactions that take place within it, may support the advancement of professional pharmacy services [1, 22, 27].

Identifying workflows of healthcare workers can be a challenge, and qualitative approaches such as interviews and focus groups may rely on the participant's ability to clearly articulate needs and tasks [31]. In contrast, reviews by Bratt et al. [32], Lopetegui et al. [33], and Zheng et al. [34] suggest continuous observation time and motion (TMS) design involving an external observer following the participant in real-time and continuously recording activity at

1-second intervals, as being the method of choice for collecting time/duration data in healthcare. Alternatives such as time efficiency questionnaires (participant's self-reporting of own activity) and work-sampling (observations recorded at predetermined intervals) techniques can potentially lose granularity in data and are generally considered less reliable, especially when observers need to follow participants travelling across a number of areas, like in a pharmacy [31, 34, 35].

Time and motion methodology has demonstrated its utility in understanding pharmacists' workloads in previous studies [19, 31, 36], in Australian hospital pharmacies [37], and in non-Australian community pharmacies [19]. However, little is still known about workflows within Australian community pharmacies and of the impact of the community pharmacy workspace on various parameters such as professional practice [38].

Comparatively, Australian community pharmacists differ from their hospital colleagues in terms of their function, remuneration structure, policies, teams they work within, and resources [18]. Hospital pharmacists are paid more, work in multidisciplinary teams and can choose to practice providing clinical services, drug information services, and drug policy administration [18]. Australia shares some commonality with countries such as Canada, England, and the US in terms of the leading cause of health burden being chronic conditions such as cardiovascular disease, diabetes mellitus and cancer; and of gradually equipping community pharmacists with additional patient-centred roles [18, 39]. However, they do have contrasting geographical challenges, number of practicing pharmacists, health workforce, multicultural population and the burden of chronic diseases, together with funding, legislative and policy differences [18, 39-41]. For example, there are notable shortages in access to GP services in rural, remote and regional Australia [11]. Additionally, the Australian health system operates on a fee-for-service basis for GPs and many allied health professionals; however, there is no system level funding structure for community pharmacists [11, 42, 43].

The diverse nature of Australia's population, differences in health needs and systems present unique challenges to the Australian community pharmacy sector. This research will better inform policymakers and stakeholders as to what community pharmacy services to prioritise. More importantly, it will add depth to current literature by exploring the use of time and motion

methodology that is novel to community pharmacy research, and by combining workflow data with analysis of spatial metrics.

Lack of well designed, dedicated consultation areas and workspace in pharmacies is often discussed in relation to the uptake of consultation services, professional identity, error and workplace satisfaction [27]. Furthermore, employee satisfaction and perceived productivity/effectiveness, has been shown to be affected by the Indoor Environment Quality (IEQ) and physical layout (spatial arrangement) of office environments [27, 44, 45]. To better understand the influence of such workspace parameters on work patterns we wish to administer a spatial questionnaire that has been developed using industry standard IEQ dimensions of light, acoustics and design from the Centre for the Built Environment post-occupancy evaluation occupant satisfaction survey [44, 45].

Such qualitative research has often been combined with behavioural mapping, the systematic visual documentation of location based human activity [46], to provide information of the effect of building design [47] on efficiency and wellbeing of pharmacy staff [45, 48], and in improving the flow of healthcare clinics [49]. In this study, mapping will be informed by data gathered from pharmacy-user observational research. This will be paired with area metrics (m^2) measured from pharmacy floor plans to inform spatial efficiency scores [50].

Study aims and objectives

The primary aim of this study is to measure and map community pharmacists' time and workspace as a means of informing the feasibility of implementing extended pharmacy services.

Our objectives are to quantify the proportion of time spent on different work tasks (such as dispensing, counselling, sales and waiting), the frequency of each task and of consumer contact. We will also calculate time spent on multi-tasking and the rate of interruptions and relate these observations to metrics analysis of existing spatial capacity and pharmacy layouts.

METHODS

Study design

This study has been approved by the University of New South Wales and Curtin University Human Research Ethics Committees (HREC number HRE2018-0635).

This research follows a feasibility study that reported pharmacists' workflow observations over a period of 35 hours within three Australian community pharmacies [38]. We are now seeking to extend this to improve the robustness and generalisability of results, investigate whether or not pharmacy location or type of pharmacy impacts on workflow and also extend the data collection to include spatial mapping of the pharmacy tenancy area (floor space within the pharmacy).

A direct observational time and motion study will be conducted across twenty pharmacies (or until data saturation occurs) in metropolitan and rural regions of Australia. Initial recruitment will be sought in Western Australia (WA) and New South Wales (NSW), and thereafter extended to other states if necessary. The initial restriction to these states is logistical, and we believe there is enough uniformity of practice between states that results will generalise across Australia.

Workspace data will be collected using floor plans, photographs and an environment questionnaire completed by the observer. This information will be combined with the observational results to visually highlight areas and patterns of pharmacist movements across the pharmacy through heat mapping.

Collected data will be stored primarily in digital format. All data on paper (such as consent forms) will be stored in locked filing cabinets and all digital data will be stored on password-

protected computers. Data will be retained for at least seven years following results publication and destroyed in line with current local guidelines.

Study participants

Potential participants will be identified using a snowball strategy where pharmacists known to the investigator team will be contacted in the first instance, and they then will be asked to recommend others, who then recommends another. A convenience sample of twenty pharmacies representative of high and low script volumes (i.e. above and below the average number across pharmacies in Australia of 140 prescriptions per day per pharmacy) [51] and metropolitan and rural regions of NSW and WA will be selected (Table 1).

Table 1: Matrix of initial pharmacy numbers and characteristics.

Informed written consent will be sought from both the pharmacist to be observed and the owner(s) allowing us to undertake observational data collection in their pharmacy. Independent to this, the owners will also be asked to give a separate consent to collect spatial data including floor plans and location of shop fixtures and lighting. Information will be provided through verbal and written communication and questions will be welcomed.

Participation will be voluntary and participants will be able to withdraw from the study at any time, without explanation or penalty. Should they decide to withdraw, they may give or refuse permission to use any information collected thus far.

Data collection

During recruitment, no restrictions will be placed on the size of the pharmacy or the number of pharmacists working at the pharmacy. However, at least one active, practicing pharmacist (i.e. not just undertaking managerial duties) must agree to be observed per pharmacy for a total of eighteen hours over a period of three days of the working week, excluding weekends.

225

226 Pharmacist workflow

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228 Workflow analysis will be conducted using the Work Observation Method by Activity Timing
229 (WOMBAT) electronic software installed onto tablet computers [52, 53]. Data will be collected
230 across four dimensions: (1) What (the task being observed); (2) Where (the location where
231 the observed task is being undertaken); (3) With (the person/people with the pharmacist at
232 the time the observed task is being undertaken); and (4) How (how the task is being
233 completed, for example, using a phone) [38, 54]. A time log of the data will be automatically
234 recorded by the software. Interruptions, defined as stopping the current task to respond to an
235 external stimulus and multitasking, defined as performing two tasks simultaneously, will also
236 be recorded. The same task list and definitions schedule developed and utilised in the pilot
237 study [38] will be used in this research. It may be amended for clarification during observer
238 training.

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240 During observations, posters displayed in highly visible locations around the pharmacy will
241 notify that pharmacist work patterns are being observed and no data on consumers is being
242 collected. Consumers will be invited to discuss the study directly with the pharmacist involved.
243 The observer will not interact with consumers or pharmacists and will cease observing if
244 requested by the consumer or pharmacist. The observer will not record any conversations or
245 any information inadvertently witnessed or not related to the study. Confidentiality of the data
246 will be strictly adhered to and only non-identified information will be used.

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248 The observer will position in close proximity to the pharmacist without interrupting their flow of
249 work during observations. Observations will be of two-hour intervals, for six hours per day. A
250 total of nine sessions will take place over three working weekdays convenient to the
251 participants. A short break will be scheduled between sessions to help minimise observer
252 fatigue. Pharmacist-consumer interactions will be noted under general headings such as
253 ‘dispensing of medication’, ‘education’, and ‘sales’. The collecting and reporting checklist
254 suggested by Zheng et al. [34] for continuous observational time and motion studies will be
255 used as a guide to ensure data consistency and quality. The observer will not have any
256 interactions with consumers and no patient and public information will be recorded.

Demographic data on pharmacy location, number of employed staff, type of pharmacy (privately owned versus large chain), and prescription volumes per day (as a measure of workload) will also be collected. Additionally, the number of pharmacists, pharmacy staff, non-pharmacy staff, prescriptions and sales will be noted for each two-hour session.

Two observers (one in WA and one in NSW) will familiarise themselves with task definitions (appendix 1), data collection techniques and the WOMBAT tool. These observers will then train other employed research assistants if required. Inter-rater reliability testing will be conducted to assess consistency between observers [55]. During the training, observers will jointly practice observing and categorising tasks undertaken by a pharmacist participant. Discrepancies between observers will be discussed and corrected. Consistency will then be tested with both the trainer and the trainee research assistant independently recording observations of the same pharmacist, at the same time until there is reasonable uniformity and good inter-rater reliability scores between all observers. Repeated training sessions and assessments will be scheduled to clarify observations, rectify discrepancies and achieve consistency before any further data collection occurs. Task list and definitions will also be amended during observer trainings if clarification is required. Two research assistant observers in NSW and two in WA will be employed to collect data. One observer will collect data at one participating pharmacy at any given time.

It is acknowledged that the direct, open observational method adopted here may influence pharmacists' work patterns where the participant (and other staff or consumers) may feel anxious, and possibly present an enhancement in performance in the presence of an external observer [33, 38, 56, 57]. However, these may be reduced with the pharmacist being observed for extended periods, on multiple occasions and for up to two hours per session, and by the observer being positioned out of the way of usual practices but close enough to observe the participant [34, 35].

Pharmacy workspace

Pharmacy spaces can be thought of as a complex landscape of holistic health-care provision and retail where emotion [58] plays a vital role in customer experience [29]. We are seeking to understand the affects of the work environment and space on pharmacist work patterns. Data gathered from the WOMBAT software will be combined with area metrics (m^2) measured from the pharmacy floor plans to inform spatial efficiency scores – floor areas of each defined spatial category (i.e. dispensary, office, consultation and retails areas) expressed as a percentage of the overall pharmacy area. The observer will request floor plans from owners that consent to this part of the research. If these are unavailable, the observer will take area measurements, photographs and sketch floor plans using a commercially available computer-aided design (CAD) and drafting software application (AutoCAD®). The observer will also complete a qualitative questionnaire (appendix 2) assessing the pharmacy atmosphere [28], and environment, which includes user responses to environmental stimuli including light, visual and audible noise, visibility (i.e. height and depth of space) and wayfinding. The questionnaire will also prompt when supplementary photographs are required to help give visual context to the entered data. No persons will be included in the photographs.

Floor plans will be combined with the results from the workflow WOMBAT task dimension (the amount of time spent in a location) to generate heat maps reflecting patterns of pharmacist's movements throughout the day. Collectively, the quantitative and qualitative research will be used to identify evidence-based design opportunities for effective consultation space and spatial improvement of pharmacy workspaces.

Outcome measures

The primary outcome will be the frequency of each of particular task and the proportion of total observation time spent on different tasks. Secondary outcomes will include documentation of spatial capacity and shop layouts within community pharmacies, mapping of pharmacist's movements within the pharmacy area, time spent with consumers and time spent on professional services.

Analysis

A total of 360 hours (2 hours x 9 session per pharmacy x 20 pharmacies) of pharmacist observations are planned: 180 hours in metropolitan areas and 180 hours in rural pharmacies.

Pharmacists' work patterns will be described by calculating task time for each task; proportion of total observation time on different tasks; proportion of multitasking time; rate of multitasking; and rate of interruptions. 95% confidence intervals (CIs) for the proportion of total time and the proportion of time on multitasking will be obtained using the large sample normal approximations. The interruption rates, including their 95% CIs, will be calculated using Poisson regression. Other descriptive statistics including number of tasks, average length of tasks, and frequency of tasks over observation time will also be presented.

The workspace data, floor plans and photographs will be used to document and categorise pharmacy space, and generate heat maps. Thematic analysis will be used to identify emergent spaces, spatial qualities and issues from the questionnaire results using a general inductive approach [59]. Themes will be grouped and mapped back to each spatial category (as defined in the WOMBAT tool and floor plan analysis) and then analysed against the supporting observational data (photographs) to identify causal design parameters that are impacting (positively or negatively) the overall pharmacy experience for staff and customers; also suggesting outcomes for further study.

DISCUSSION

There is limited quantitative evidence of pharmacists' work patterns, especially in Australian community pharmacists. The use of time and motion methodology is novel to community pharmacy research. This observational workplace study will add depth and breadth to the understanding of pharmacist's capacity and the availability of time and workspace to provide pharmaceutical services. Although the approach may influence the behaviours of

pharmacist's being observed appropriate steps will be taken to minimise its effect on the overall findings. The convenience sampling procedure and the amount of hours of observation (360 hours over twenty pharmacies) may limit the generalisability of the results. However, the inclusions of metropolitan and non-metropolitan pharmacies, across two states, each varying in size, range of resources, type of pharmacy, and workloads will negate such concerns.

Healthcare and the health workforce are facing a number of stressors due to population growth, rise in chronic diseases, and geographical challenges. Better utilisation of pharmacist's skills have shown to improve patient outcomes, access to services, and reduced disease burden, yet their duties are seldom extended to providing clinical services and in assisting GPs. Even if a number of barriers of Australian health system are negotiated will pharmacists have the time, workspace, infrastructure or work environment to support such needs? This study will aid a review of the position of pharmacists amongst other primary care providers, and direct better ways to broaden capacity to deliver services, meet consumer demands and possibly improve the application of pharmacists' skills. The results will add to future studies looking at barriers and facilitators and to those investigating stakeholder perceptions.

LIST OF ABBREVIATIONS

PBS: Pharmaceutical Benefits Scheme;
6CPA: Sixth Community Pharmacy Agreement;
GP: General practitioners;
TMS: Time and motion studies;
IEQ: Indoor Environment Quality
NSW: New South Wales;
WA: Western Australia;
WOMBAT: Work Observation Method by Activity Timing;
CAD: Computer-aided design;
CI: Confidence intervals;

HREC: Human Research Ethics Committees.

DECLARATIONS

Ethics approval and consent to participate

This study has been approved by the University of New South Wales and Curtin University Human Research Ethics Committees (HREC number HRE2018-0635). All study participants are required to provide written informed consent.

Consent for publication

Not applicable

Availability of data and materials

Not applicable

Competing interests

The authors declare that they have no competing interests.

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