Clinical Pharmacy Activity Collection Tool for Ambulatory Care Practice

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Abstract

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Background

A clinical pharmacy activity collection tool is important for improving service quality. In a London-based hospital, such a tool that was developed for use in ward-based practice has been used in all settings, including ambulatory care services. However, clinical pharmacists practicing in ambulatory care services have reported that this tool does not adequately represent their practice.

Aim

This study aimed to determine whether the existing inpatient-based tool accurately captured all clinical pharmacy activities undertaken in ambulatory care services.

Method

Non-participant direct observation was used to record the frequency of activities observed in ambulatory clinics and multidisciplinary meetings. These activities were compared with the existing tool to identify any discrepancies in activities. Semi-structured interviews were used to explore the views of 8 ambulatory pharmacists on the representativeness of the tool for their routine clinical activities.

Results

Twenty-nine clinical pharmacy activities were observed in the ambulatory services. Fifteen of these activities were captured by the existing tool, with monitoring of therapy and recommending therapeutic changes not accurately captured, while multidisciplinary meeting activities not comprehensively captured. Pharmacists' responses were inclined toward the view that the tool was not completely representative with some irrelevance. The 4 common uncaptured activities were multidisciplinary meeting specific activities, arranging laboratory tests, monitoring patient outcomes during follow-up, and liaising with community healthcare professionals to coordinate care.

Conclusion

The existing inpatient-based clinical pharmacy activity collection tool is not completely representative of the clinical pharmacy activities undertaken in ambulatory care practice.

Word count: 250

Keywords: Clinical pharmacy activities, Ambulatory care, Activity tool, Quality improvement

Impact statements

The findings of this study contribute to quality improvement initiatives of clinical pharmacy practice in ambulatory care settings by:

- Assembling candidate clinical pharmacy activities for multi-specialty ambulatory care services in a London-based hospital
- Highlighting features of ambulatory care practice that were not captured by an inpatient-based tool; therefore, the need to consider these features in measuring process of ambulatory care services
- Illustrating characteristics of an ideal activity collection tool based on pharmacists' responses on the strength of an existing tool and the challenges they faced
- Demonstrating how interviews and observation could be used to improvise an existing tool

Introduction

Ambulatory care pharmacy practice is defined as the provision of integrated and accessible healthcare services by pharmacists who are accountable for addressing the medication needs of ambulatory patients through direct patient care [1]. Pharmacy professionals working as part of the multidisciplinary team (MDT) in the acute sector provide pharmaceutical care to patients in outpatient and ambulatory settings as well as traditional inpatient settings. In these settings, pharmacists (pharmacy technicians) are recognised to impact. Research has largely been focussed on individual clinics and disciplines. A preliminary investigation in an Australian hospital pharmacy used retrospective audit of notes to describe activities across a range of pharmacists providing hospital outpatient clinic services, authors recommended standardisation of documentation to improve evaluation of roles and benefits to patients and the hospital. There remains a paucity of evidence broadly evaluating the roles, activities, quality and effectiveness of pharmacy teams providing these services.

The American College of Clinical Pharmacy (ACCP) introduced 5 core tenets for ambulatory quality metrics in 2011 [2]. The tenets stated that quality metrics should be comprehensive, accountable, feasible, scientifically sound, and usable. To be comprehensive, metrics should include measures of structure, process, and outcomes, based on the Donabedian model. Process refers to the set of activities undertaken to deliver a patient service. Process measures are important to produce the desired health outcomes for patients [3]. An example of a process measure in clinical pharmacy practice is the clinical pharmacy key performance indicator (cpKPI) developed for hospital pharmacies in Canada [4]. The cpKPI covers eight clinical pharmacy activities that are linked to improvements in patient outcomes. Re-allocating resources towards the processes that have the greatest impact on outcomes could help to efficiently improve quality of care [5].

At our study site, a large tertiary and quaternary-referral acute teaching hospital, pharmacists and pharmacy technicians contribute to over 100 MDT meetings and provide 80-100 outpatient clinic sessions monthly across a broad range of subspecialities. A clinical pharmacy activity data collection tool developed and validated for use in ward-based settings is used to monitor activities of clinical pharmacy teams in all settings, including outpatient and ambulatory care services [6]. However, clinical pharmacists informally reported the tool insufficiently captures activities provided in ambulatory settings. The inability to accurately capture activities unique to these settings may lead to difficulty in appropriately measuring the performance of clinical pharmacy teams. There is perceived need for a clinical pharmacy activity collection tool suitable for ambulatory settings to facilitate accurate and comprehensive recording of representative activities. This could aid in visualising the workload distribution of

clinical pharmacy teams, thus allowing more efficient workforce deployment [7, 8]. This tool could serve as a foundation for a benchmarking tool to promote the profession's accountability in patient care and to highlight the value of clinical pharmacists' contributions to stakeholders [9]. A validated benchmarking tool could then allow for standardised comparative performance measurement of activities between units and provide a base for continuous quality improvement towards a higher standard of service by identifying gaps in practice [10, 11].

When developing process measures, it is crucial to consider work-as-done, as it reflects what practitioners found to work best in practice [12]. Studies of clinical pharmacy activities in ward settings have been conducted in Australia [13, 14], the United Kingdom (UK) [6], and Malaysia [15]. A study of activities in Canada involved hospital and clinic-based pharmacists [16], while in the United States (US), it specifically involved ambulatory care pharmacists [17]. To date, however, there is no national consensus on standard clinical pharmacy activities for ambulatory care practice in the UK. Since clinical pharmacy practice in ambulatory care is relatively new in comparison to its ward-based counterpart, an exploratory study is needed to establish baseline data of the extent of clinical pharmacy activities performed in this setting. This would be a first step to inform any necessary amendment of the current tool to comprehensively represent clinical pharmacy activities undertaken in ambulatory settings.

Aim

To determine the range of clinical pharmacy activities undertaken in ambulatory care services and the suitability of the existing inpatient-based clinical pharmacy activity collection tool for capturing the activities undertaken across ambulatory services. .

Ethics approval

This study was approved by the UCL School of Pharmacy and the hospital's Pharmacy Research and Audit Group in June 2023 and deemed service evaluation without need for ethics approval.

Method

Design

This service evaluation was a qualitative, cross-sectional study that employed direct observation to identify the range of clinical pharmacy activities performed and semi-structured interviews to explore the views of pharmacists on the existing tool.

Settings

The study site is one of London's largest and busiest teaching hospitals. It provides ambulatory care clinical pharmacy services that consist of 17 subspecialties of pharmacist-led clinics and 24 subspecialties of multidisciplinary meetings (MDM).

Sample

Sampling strategy:

Purposive sampling was used to target clinical pharmacists working across the range of different ambulatory care specialties, including HIV (human immunodeficiency virus) and sexual health, haemato-oncology, specialist medicine, respiratory medicine, anticoagulation, paediatrics, liver, renal, neurosciences and outpatient parenteral antimicrobial therapy (OPAT). Day surgery and emergency units were excluded. This study aimed to observe between 6 and 10 ambulatory units.

Sampling procedures:

The lead investigator invited all principal pharmacists in the eligible units to participate by email. All respondents were supplied with a participant information leaflet for informed consent and consented to participate. Appointments were scheduled based on the date that their clinics or multidisciplinary meetings (MDM) were available for observation during the stipulated data collection period from 22 June to 14 July 2023.

Data collection process

Non-participant direct observation

Non-participant direct observation was chosen to identify activities performed to ensure high ecological validity [18]. The observation focused on clinical activities defined by the Royal

Pharmaceutical Society (RPS) Benchmarking Metrics for Acute Hospitals [10]. The observor attended one full session of clinic or MDM in each unit.

An activity datasheet (Electronic Supplementary Material 1) was developed by the lead investigator to record observed activities. This datasheet consisted of a preset list of activities that were compiled based on three components: internal scoping performed by the Deputy Chief Pharmacist, Clinical Services with principal pharmacists from respective eligible units in March 2023, the existing activity collection tool, and literature reviews of studies that looked at the range of clinical pharmacy activities in ward and ambulatory settings [13,17,16]. These activities were arranged based on the Pharmacists' Patient Care Process [19] to aid systematic detection and recording of activities. The list was revised by the Deputy Chief Pharmacist, Clinical Services to remove synonyms and non-clinical activities such as dispensing.

The lead investigator, an internationally registered pharmacist with hospital pharmacy experience, observed the clinics and MDMs unobtrusively. The observer had shadowed clinical pharmacists at the site for over a month and was familiar with the clinical activities undertaken at the study site.

Each activity was recorded as one frequency every time it was observed. Any activities observed but not listed on the activity datasheet were written in an empty template of the datasheet and frequency counted. At the end of each session, the observer clarified any ambiguous or unlisted activities with the respective pharmacist to confirm whether they corresponded to any of the preset activities or needed addition as new activities. The time taken for each activity was not measured, as the study focused on identifying the range of activities. To minimise the Hawthorne effect, participants were briefed on the study's purpose and the anonymity of findings.

Semi-structured interview

An interview schedule was developed comprising 15 questions (Electronic Supplementary Material 2). These questions revolved around pharmacists' opinions on the existing tool's strengths, challenges utilising the tool, its representativeness of their routine clinical activities, need for modification, and suggestions for improvement. Pharmacists were also asked to share the activities that they spent the most time on, viewed as the most important and believed to improve patients' health outcomes.

The pharmacist who delivered the service in each observed unit was interviewed by the lead investigator, At the start of each interview, participants were assured of the interviewer's independence from the site's administrative team. Responses were audio recorded with prior consent granted. During the interviews, participants had access to the reference list of activities from the existing tool .

Data Analysis Plan

Observation Analysis: The total frequency of each observed clinical pharmacy activity and its relative frequency across the ambulatory units were summarised using simple descriptive statistics. These observed activities were then compared with those in the existing inpatient-based tool to identify any discrepancy in activity collection.

Interview Analysis: Recorded responses were transcribed verbatim using Otter.ai, an artificial intelligence (AI)-based transcription application, and verified by the interviewer. The transcribed responses were anonymised and thematically analysed using NVivo 12. The initial codes generated, emerging themes and final defined themes were cross-checked on three iterative occasions by the Principal Pharmacist, Clinical Services, who was independent from the interviews.

Results

Characteristics of the ambulatory units and the respective pharmacists

Six clinics and two MDMs were included and eight pharmacists interviewed within the 3-week data collection period; clinics and MDMs were a mix of physical and virtual (Table 1). All pharmacists who participated in this study had postgraduate qualifications and independent prescriber status. The observation duration for each unit ranged from 1 to 3 hours. The booked patient(s) for clinic 6 did not attend, so only an interview was conducted. Saturation sampling was achieved through the 6th participant's interview; nevertheless, the interviews were completed for all eight participants to ensure that views from all participating specialties were included.

Table 1 Ambulatory units' and the respective pharmacists' characteristics

Unit	Clinic type	Pharmacists' Role	Highest qualification	Prescriber status	Onsite experience (years)	Study participation
Clinic 1	Phone clinic	Specialist	Pg Diploma	IP	3.5	Observed and interviewed
Clinic 2	Physical clinic	Consultant	Pg MSc	IP	7	Interviewed
		Specialist	Pg Diploma	IP	1	Observed
Clinic 3	Physical collaborative clinic	Specialist	Pg MSc	IP	0.5	Observed and interviewed
Clinic 4	Phone clinic	Specialist	Pg MSc	IP	15	Observed and interviewed
Clinic 5	Physical clinic	Specialist	Pg Diploma	IP	3.5	Observed and interviewed
MDM 1	Online MDM	Principal	Pg MSc	IP	6	Observed and interviewed
MDM 2	Physical MDM	Principal	Pg Certificate	IP	25	Observed and interviewed
Clinic 6	Physical clinic	Principal	Pg MSc	IP	8	Interviewed

MDM= Multidisciplinary meeting; NHS= National Health Service; Pg= Postgraduate; MSc= Master of Science; IP= Independent prescriber

Objective 1: The range of clinical pharmacy activities observed

Across the 7 clinics and MDMs observed, 29 clinical pharmacy activities were observed i, amounting to 217 frequencies. The most frequent activity, was assessing medical notes with a recorded frequency of 40 (18.4%). Drug history taking was the most distributed activity, observed in all 7 units. The relative frequency of each activity varied across the units. (Fig 1)

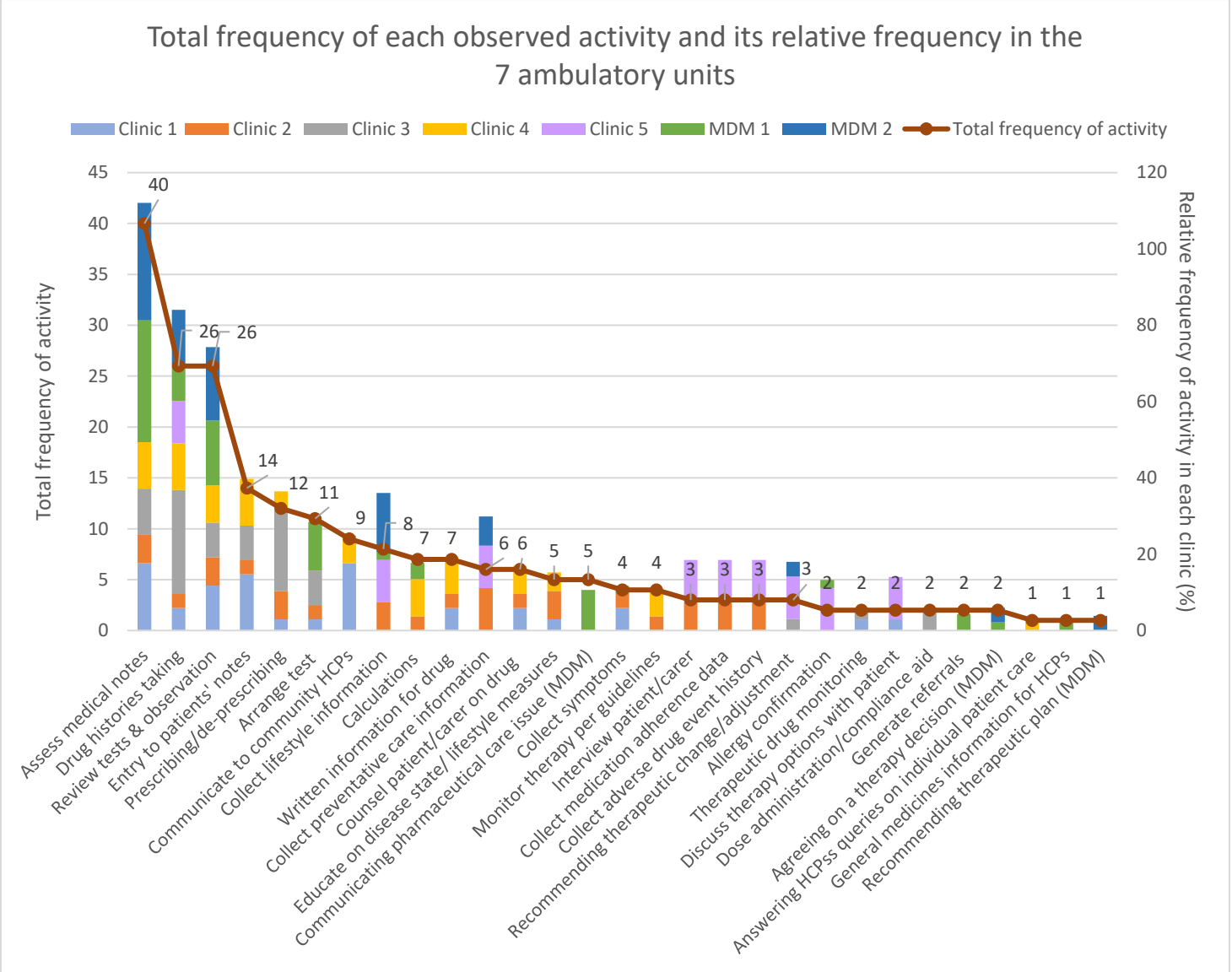


Fig. 1 Total frequency of each observed activity (line chart) and its relative frequency in the 7 ambulatory units (column chart)

The stacked portion in each activity column represents its relative frequency across the 7 ambulatory units. MDM= Multidisciplinary meeting; HCPs= Healthcare professionals

Objective 2: Discrepancy between the observed activities and activities in the existing tool

Only half of the activities observed were captured by the existing ward-based tool (15/29, 51.7%) (Fig. 2). Recommending therapeutic changes and monitoring of therapy were considered captured but inaccurately: the tool required recommendations resulted in a change to a prescription, but observations revealed that recommendations were proactive and occurred before a prescription was written. Furthermore, the tool measured the number of monitoring recommendations that pharmacists made to other HCPs, while in reality, pharmacists were observed monitoring patients directly by themselves. MDMs were considered captured, but not comprehensively, because the tool only measured the time spent in the meeting, but not the activities contributed . These specific activities were: recommending therapeutic plans; agreeing on therapy decisions and raising pharmaceutical care issues. All formed part of the activities that were observed but not captured. Pharmacists were not observed to complete or correct allergy status despite routinely checking allergy status as no error or incomplete information was found in the observed sessions.

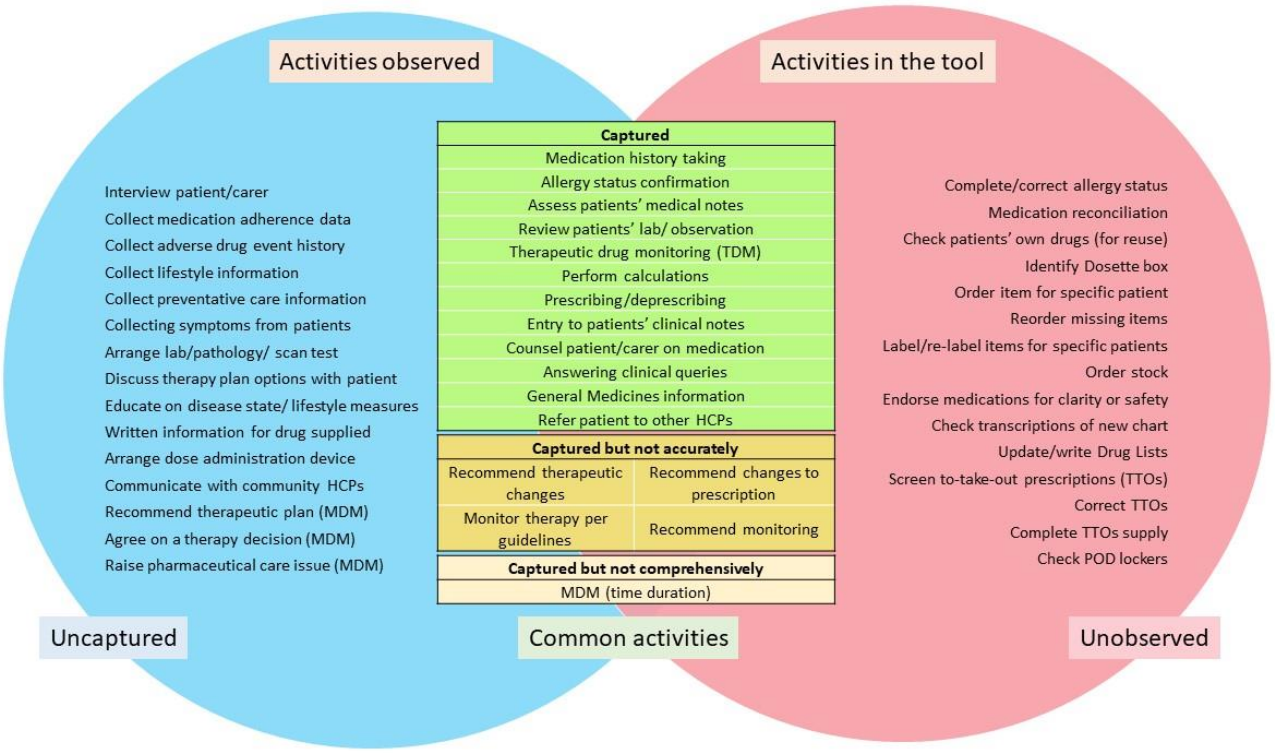


Fig. 2 Comparison of observed activities with activities in the inpatient-based tool

HCPs= Healthcare professionals; MDM= Multidisciplinary meeting; TTOs= To take out prescriptions; POD= Patients' own drugs

Objective 3: Views on the representativeness of the tool

Three views emerged from interview responses. (Fig 3)

First, the tool was viewed as not completely representative with some irrelevances. It was deemed unfit for ambulatory use due to differences in the nature of interventions, whereby interventions in ambulatory settings were described as prospective rather than reactive, in comparison to ward-based interventions. This was consistent with the observation of therapeutic recommendations being made before prescriptions were written. MDM activity, such as providing clinical advice, was mentioned as not captured by the tool, consistent with the observation findings. Pharmacists explained that it was important to capture this activity to showcase pharmacists' value and expand the service. In the education and training section of the tool, only patient counselling on medication and medicine information (MI) provision to HCPs were accounted for. Pharmacists explained that this did not account for queries from patients or external HCPs that were received via e-mails or phone calls. Although not an activity by itself, the quality of contribution was raised as an important element that was uncaptured, especially for recommending therapeutic interventions and answering MI queries. They explained that these two activities varied in their complexities; therefore, providing details about the type of interventions or the time taken to find answers to queries would be reasonable to show the amount of work that went into completing these. Additionally, some activities were viewed as irrelevant.

The second view perceived the tool as generally relevant for the majority of activities. Generating referrals to other HCPs was not mentioned, although it was observed.

The third view stated that the tool was not representative. This was expressed by the pharmacist from clinic 2. However, when asked to specify the activities that were performed but not captured by the tool, the participant reflected that some activities were actually captured, thus supporting the first view.

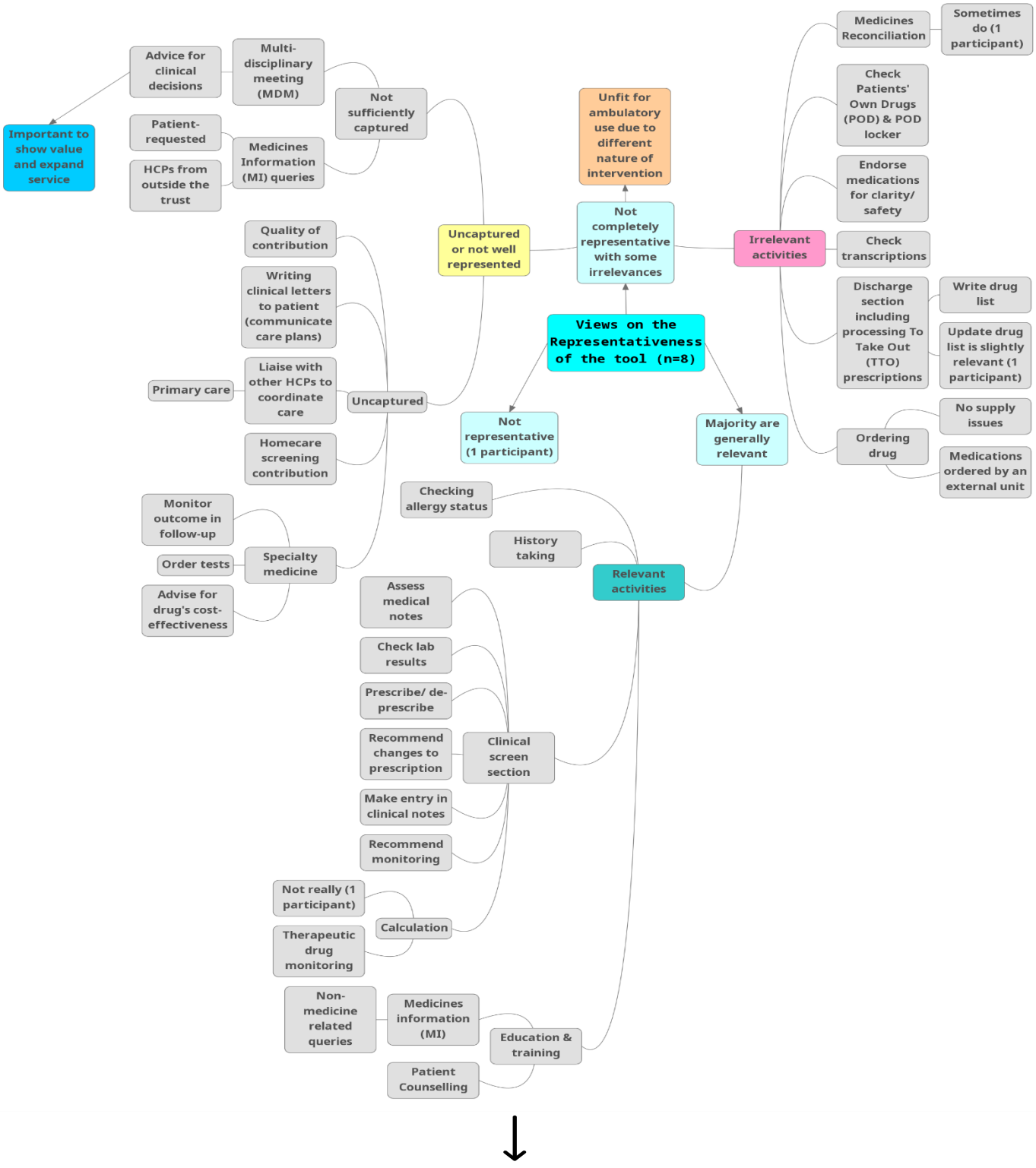


Fig. 3 Views on the representativeness of the tool

MDM= Multidisciplinary meeting; HCPs= Healthcare professionals; POD= Patients' own drugs; (1 participant) = Only 1 participant had that view

The tool captured five activities viewed as important: medication history taking, assessing clinical notes, prescribing, recommending monitoring, and counselling patients. Monitoring outcomes during follow-up was viewed as important and contributing to health outcomes but were not accurately captured, as mentioned previously. Four activities viewed as important, contributing to patients' health outcomes and where the most time was spent, were MDM activities, answering queries from patients or external HCPs, liaising with other HCPs to coordinate care and prescription screening. The former two were deemed not captured comprehensively, while the latter two were deemed uncaptured. Pharmacists perceived these activities were important to ensure continued access to medicines and to ensure medicine use was safe, efficacious and cost effective.

All participants said the tool required modification for ambulatory use. Three ideas emerged: creating categories for activities actually performed in ambulatory settings, removing irrelevant activities, and adding sections for qualitative details for certain activities. The interviews revealed the challenges pharmacists faced with the tool, such as time constraints and the length of the list. One pharmacist explained that the tool's 1-day snapshot of clinical contributions might not reflect temporal workload variations in ambulatory services, which could be affected by other HCPs' availability. Two pharmacists suggested digitalising the tool for convenience and ensuring technological accessibility for all ambulatory pharmacists. The tool was praised for being easy to use, providing prescriptive tallies, covering most pharmacists' general activities, capturing inpatient activities well, and being a quick measure of clinical contributions.

Discussion

Statement of key findings

Hospital pharmacists providing patient care in outpatient and ambulatory settings undertake a range of activities that differ from traditional ward-based clinical pharmacy activities. The activities of clinical ambulatory and outpatient pharmacists are not sufficiently captured by an existing activity data collection tool.

Four common uncaptured activities were identified from both the observation and the interviews; these were MDM activities, arranging laboratory tests, monitoring patients' outcomes during follow-up, and liaising with community HCPs to coordinate care. Apart from arranging laboratory tests, these activities were viewed as important and contributing to patients' health outcomes, emphasising their important contributions in ambulatory practice. In addition, among the activities deemed uncaptured, answering patients' queries and prescription screening were also considered as important by the pharmacists. (Fig. 4)

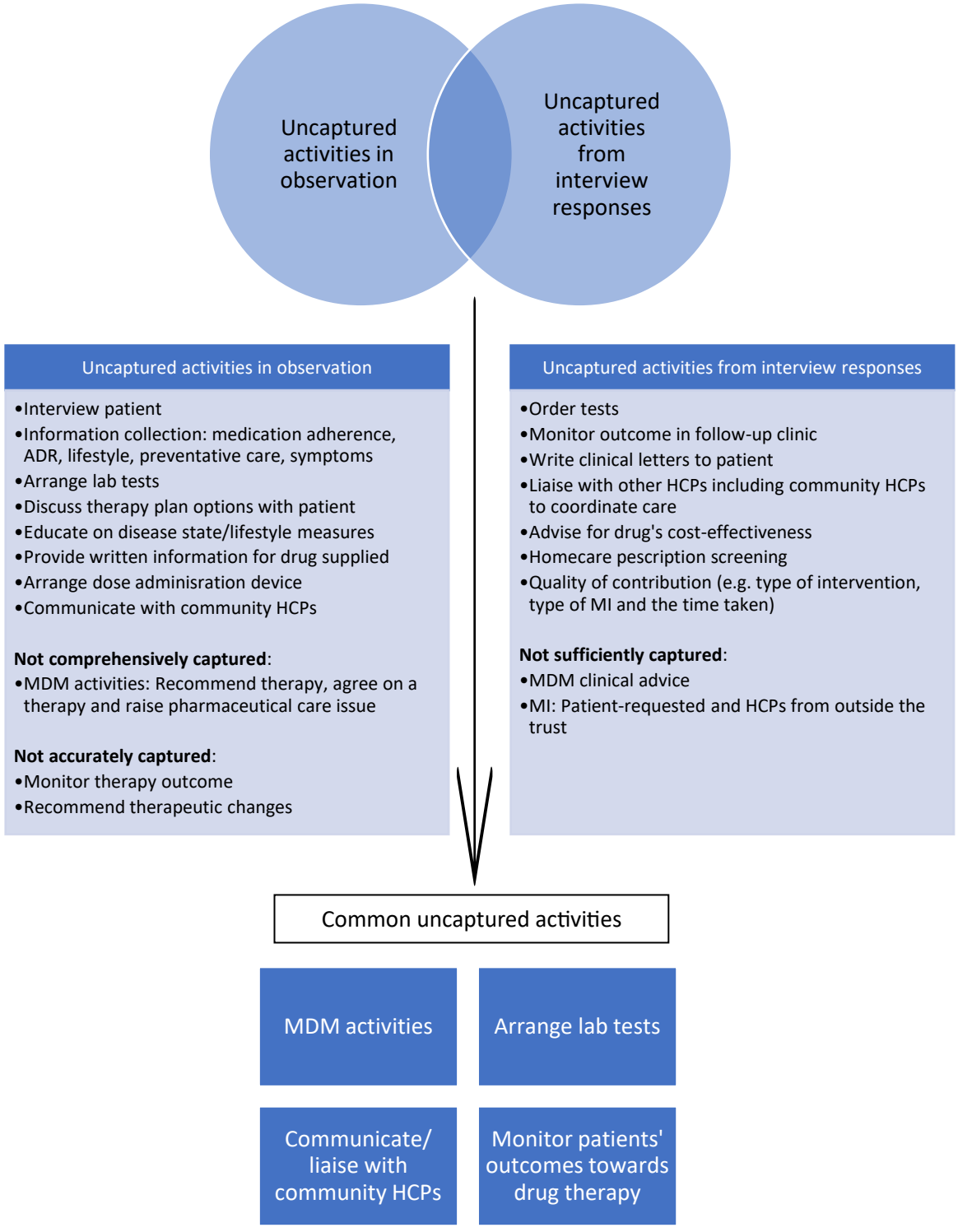


Fig. 4 Comparison of uncaptured activities from the observation and the interview

In this figure, observed activities that were 'captured but not accurately,' and 'captured but not comprehensively,' were reclassified as 'not accurately captured' and 'not comprehensively captured,' respectively, for the purpose of clarity, in the overriding intention to improve the representativeness of the tool; ADR= Adverse drug reactions; HCPs= Healthcare professionals; MDM= Multidisciplinary meeting; MI= Medicine information

Strengths and weaknesses

The primary strength of this study stems from utilisation of two qualitative methods, direct observation and interviews, which allowed integration of the findings to comprehensively evaluate the representativeness of the tool. Both methods were consistent in showing that the tool represented many activities but did not capture some important activities and measured some irrelevant activities. This approach was advantageous over a previous study that used pharmacists' self-reported activities as the primary source of data, which might predispose the results to unknown bias [6]. The inclusion of activities that were not in the preset datasheet has led to the addition of the three specific MDM activities. This was advantageous over a previous study that did not account for unlisted activities, which might limit the range of activities identified [17]. Furthermore, asking the pharmacists to share the activities that mattered to them encouraged a more contextualised response on the representativeness of the tool.

This study has some limitations. Owing to irregular monthly clinic schedules, advance appointments had to be made, and only one slot of observation per unit could be conducted within the study period. This could increase the chance of participants amending their behaviour in the knowledge it was going to be studied. This was an accepted limitation because the study intended to identify the range of clinical activities performed rather than quantify the work output of activities.

Only activities performed within the windows of observation were recorded. All clinics were observed for at least 1 hour and an assumption made that the usual range of activities had occurred during this duration, based on the same process of care observed for each patient. Clinic 5 had only one patient attending, clinical activities by pharmacy technicians were not studied. Activities that took place outside of the clinic or MDM session such as preparation work were not observed. All these factors could limit the range of activities identified.

Activities observed were generally comparable to the US-based study [17]. Performing medicines reconciliation and creating new medication lists were observed in the US-based study but were not observed and were deemed irrelevant in our study. These differences might be attributed to the relatively more clinically stable patients attending the observed clinics.. One of the cpKPIs in Canada is interprofessional patient care rounds, which is related to the specific MDM activities identified in our study [4]. The cpKPIs also encompasses disease education, which was observed but uncaptured in our study. Cillis et al. created a

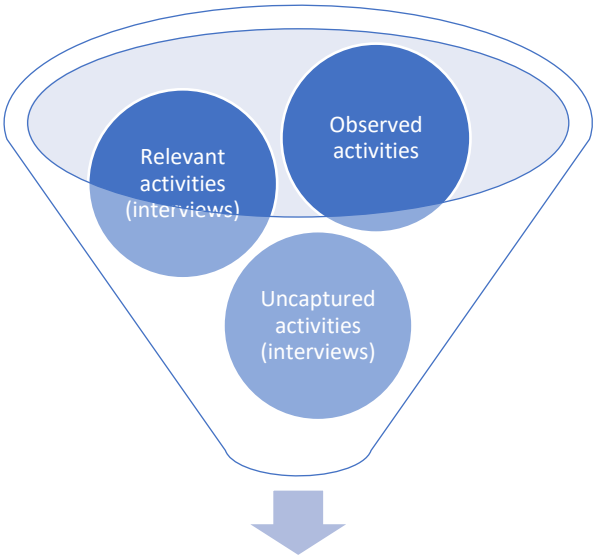
benchmarking tool for clinical pharmacy activities in Belgian hospitals and listed monitoring as one of the activities to measure [11]. This was comparable to the direct clinical outcome monitoring performed by our pharmacists. Patient engagement after hospitalisation was proposed by ACCP as one of the process quality metrics of ambulatory care [20]. This was comparable to the patients' queries that our pharmacists received outside of patients' scheduled clinic times. A cpKPI should fulfil the criteria of being pharmacist-sensitive; this supports the inclusion of the activities that mattered to the pharmacists into the tool.

The four common uncaptured activities indicate two important features of ambulatory clinical pharmacy practice. First, arranging laboratory tests and monitoring outcomes highlight the proactive nature of pharmacists in evaluating patients' therapy progress and safety, which is in line with the definition of ambulatory care that describes pharmacists as accountable for addressing medication needs through direct patient care [1]. Second, MDM activities and liaising with community HCPs to coordinate care highlight the collaborative nature of the practice, which is in line with the role of care coordinators advocated by this definition. Despite not being raised in the interviews, discussing therapy plan options was an interesting uncaptured observed activity because it correlated well with the means proposed to accomplish ambulatory care service: by developing sustained partnerships and patient advocacy, which are both important elements in facilitating the shared decision-making process with patients [21]. The common irrelevant activities suggest that medication supply preparation and discharge activities were not a focus in ambulatory practice due to its specialised direct patient-care focused service and outpatient nature, respectively.

Implications for practice and recommendations for further research

Based on findings of this study, we propose 33 candidate ambulatory clinical pharmacy activities. (Table 2/consider simplifying fig 5 as table)) This is the first study to our knowledge to propose candidate clinical pharmacy activities suitable for UK practice.

These candidate activities built upon in further evaluation studies such as Delphi rounds, to achieve consensus among ambulatory pharmacists on the activities to measure, and subsequently, the development of quality indicators for each. Future studies can investigate the time spent on each activity to better characterise ambulatory clinical pharmacy services.



33 Candidate activities

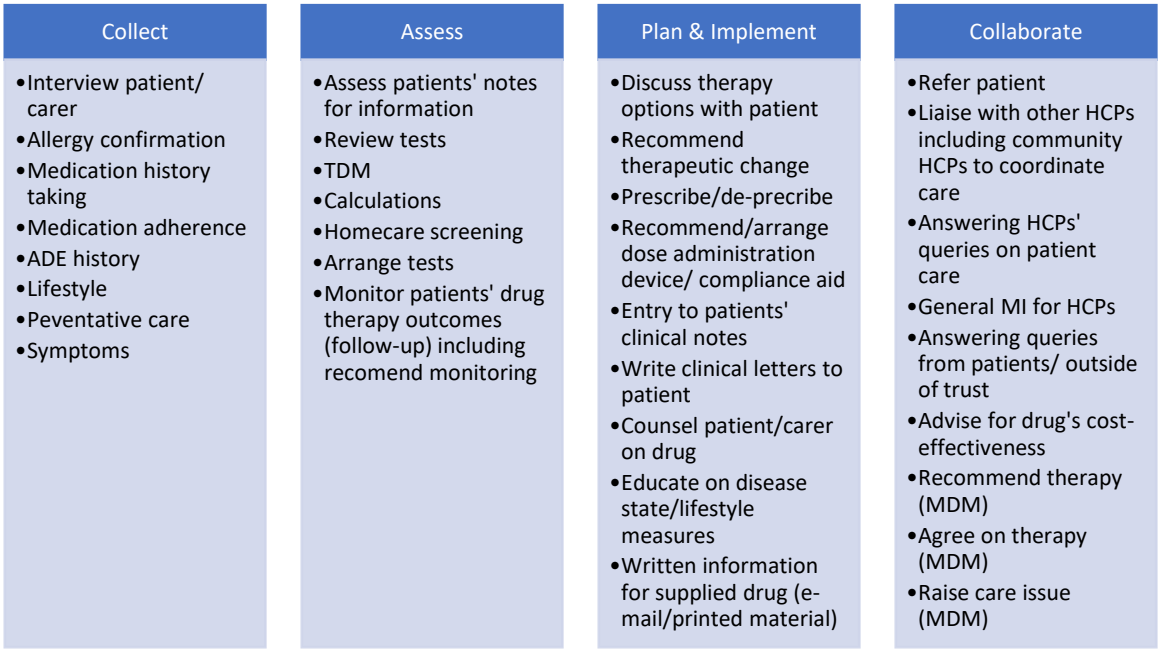


Fig. 5 Candidate clinical pharmacy activities for ambulatory care practice

ADE= Adverse drug event; TDM= Therapeutic drug monitoring; HCPs= Healthcare professionals; MI= Medicine information; MDM= Multidisciplinary meeting

Conclusion

There is a sparsity of studies broadly describing clinical pharmacy activities in ambulatory services in the UK, despite this being a growing area of practice. This study adds to existing research, providing evidence of the range of activities undertaken by hospital pharmacists caring for ambulatory patients. There is a need to update existing hospital clinical pharmacy activity data collection tools to capture the clinical pharmacy activities undertaken by hospital pharmacists across the full range of services provided in order to better understand and optimise the work of pharmacy teams and describe the clinical benefit provided to ambulatory patients and the hospital. We suggest candidate activities, further work is required to refine and validate the tool for wider use.

Word count: 3922

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Statements & Declarations

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Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

Authors' Contributions

Conceptualisation and methodology: Izwan Ishak, Caroline Cheng, Ian Bates; Data collection: Izwan Ishak; Data analysis: Izwan Ishak, Lindsay Greenland; Supervision: Ian Bates, Caroline Cheng; Writing - original draft preparation: Izwan Ishak; all authors commented on previous versions of the manuscript. All the authors have read and approved the final manuscript.

Data Availability

The datasets generated and analysed during the current study are available from the corresponding author upon reasonable request.

Ethics approval

This is a service evaluation study. The UCL School of Pharmacy has confirmed that no ethical approval was required. The questionnaire and methodology of this study were approved locally by the UCL School of Pharmacy and King's College Hospital Pharmacy Research and Audit Group (RAG).

Consent to participate

Verbal informed consent was obtained from all individual participants included in the study. Each participant received a Participant Information Leaflet through e-mail to support this.

Consent to publish

All data from participants were anonymised and non-identifiable. As part of informed consent, all participants gave permission for the publication of anonymised data from this study.

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Figures and Tables

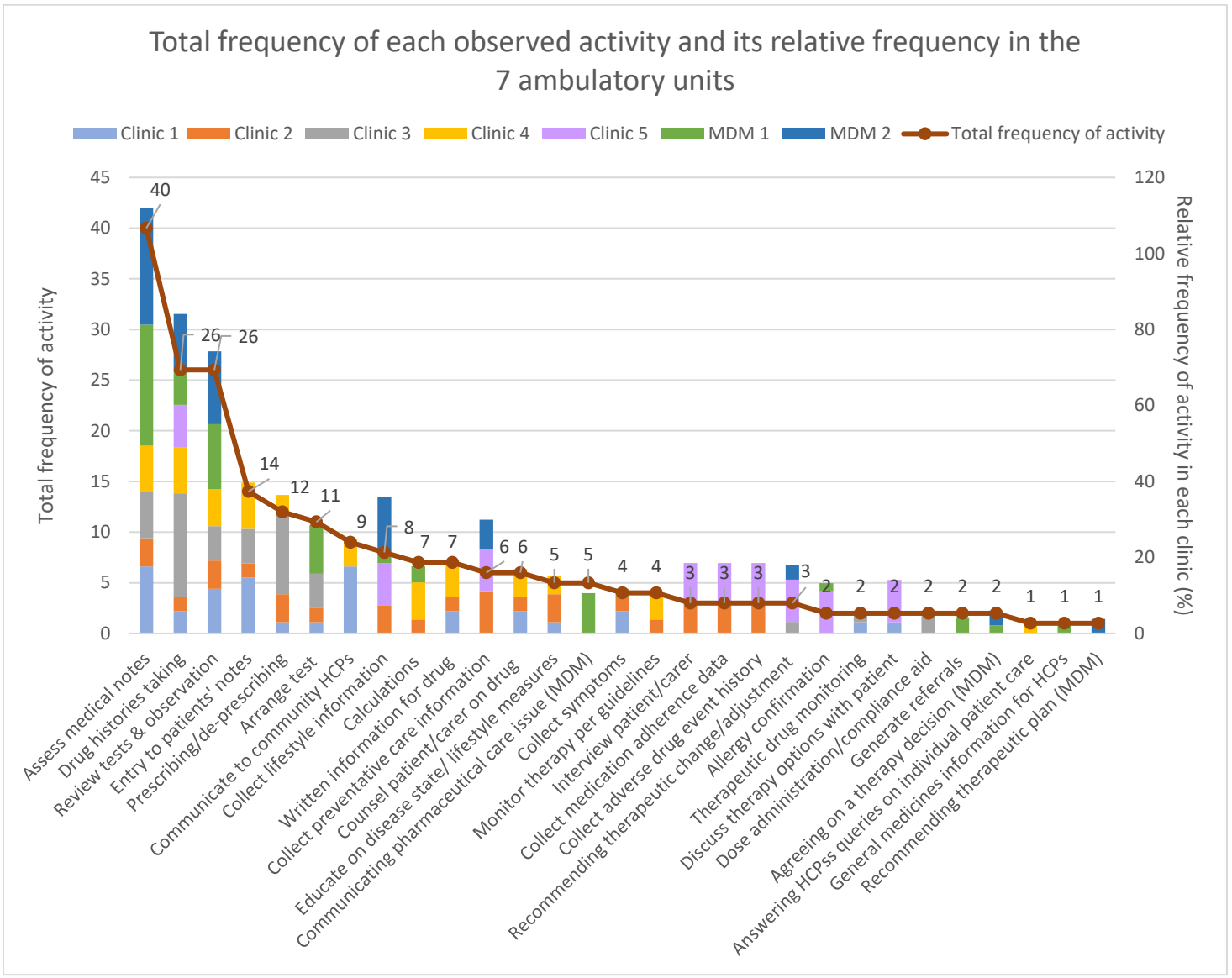


Fig. 1 Total frequency of each observed activity (line chart) and its relative frequency in the 7 ambulatory units (column chart)

The stacked portion in each activity column represents its relative frequency across the 7 ambulatory units. MDM= Multidisciplinary meeting; HCPs= Healthcare professionals

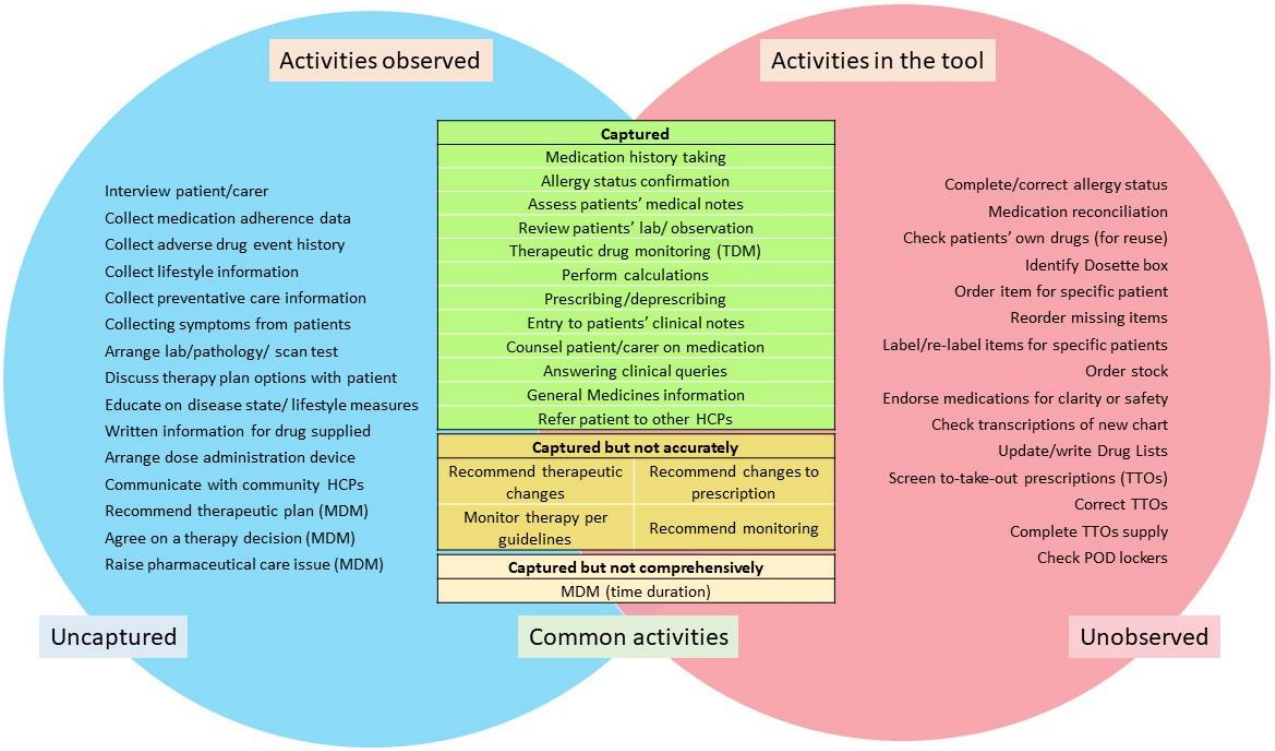


Fig. 2 Comparison of observed activities with activities in the inpatient-based tool

HCPs= Healthcare professionals; MDM= Multidisciplinary meeting; TTOs= To take out prescriptions; POD= Patients' own drugs

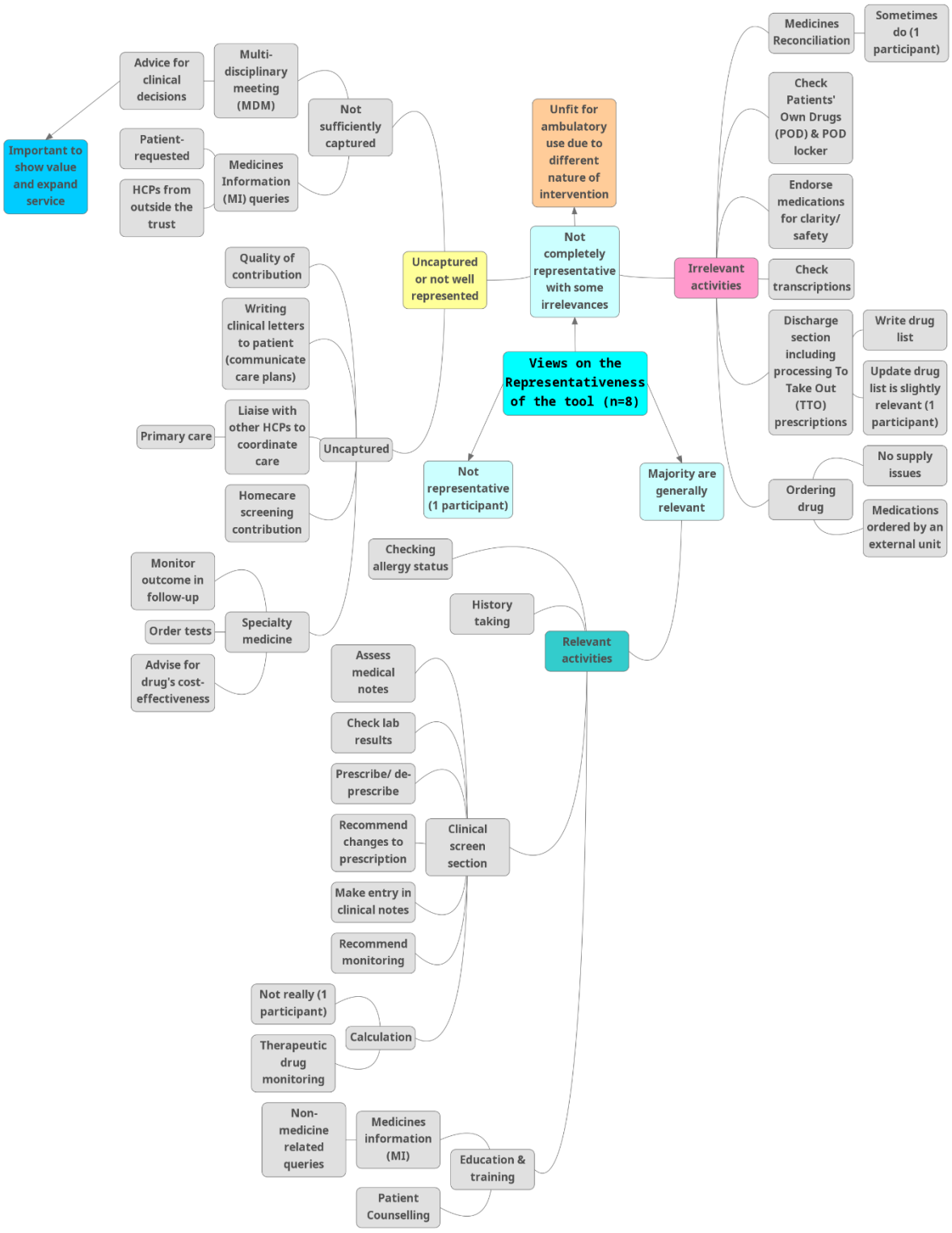


Fig. 3 Views on the representativeness of the tool

MDM= Multidisciplinary meeting; HCPs= Healthcare professionals; POD= Patients' own drugs; (1 participant) = Only 1 participant had that view

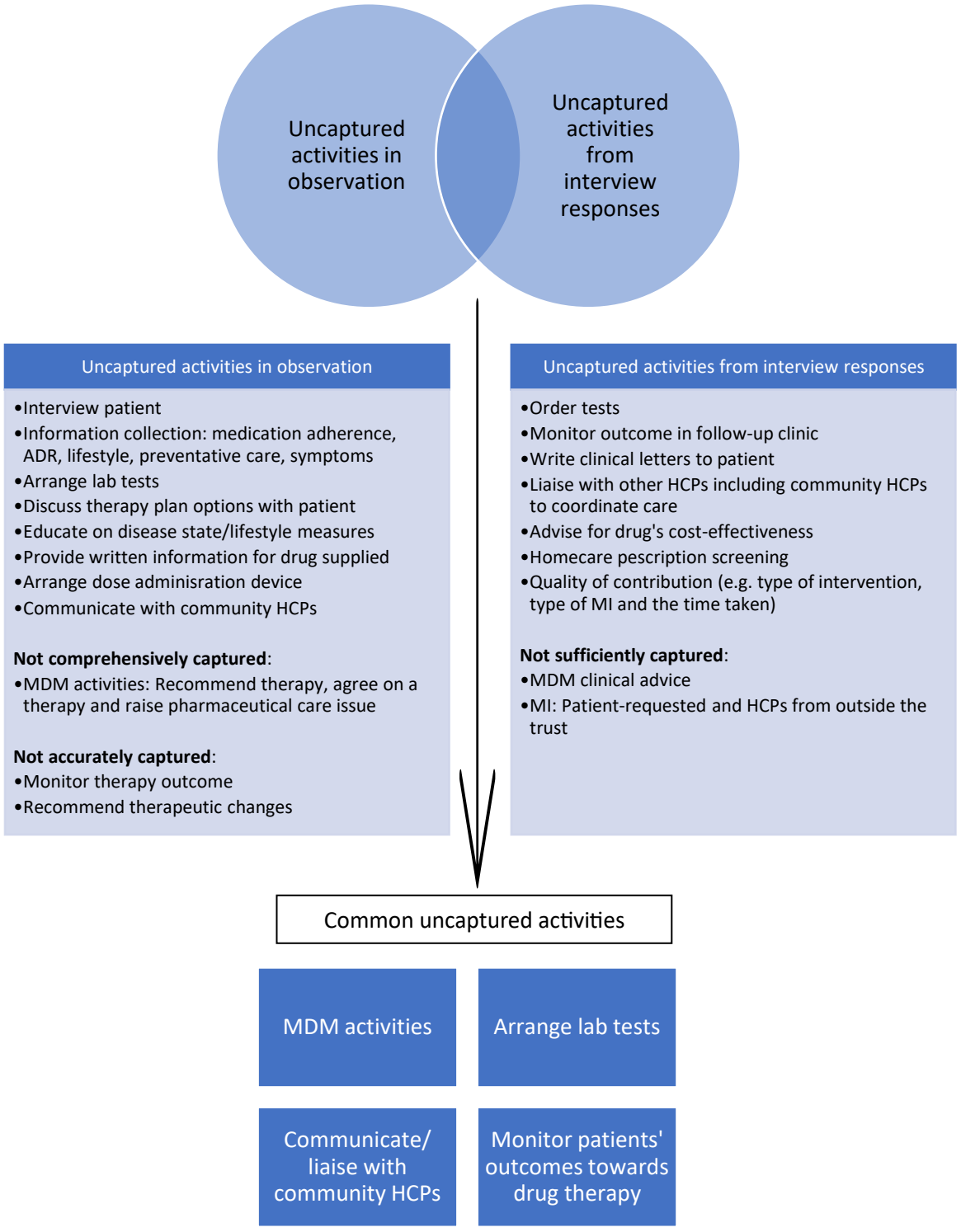
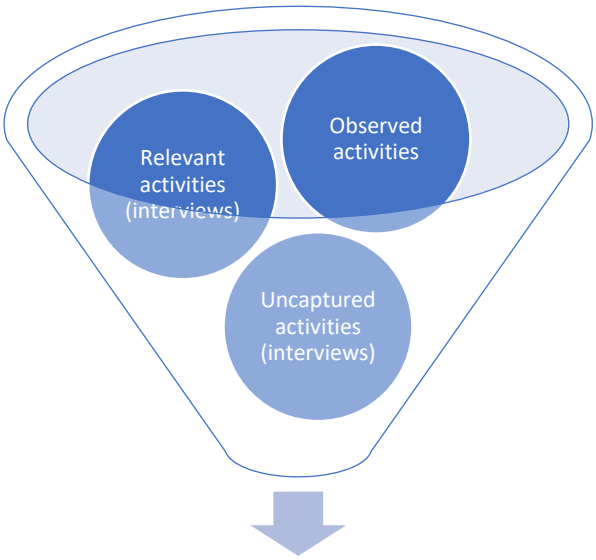


Fig. 4 Comparison of uncaptured activities from the observation and the interview

In this figure, observed activities that were 'captured but not accurately' and 'captured but not comprehensively' were reclassified as 'not accurately captured' and 'not comprehensively captured', respectively, for the purpose of clarity, in the overriding intention to improve the representativeness of the tool; ADR= Adverse drug reactions; HCPs= Healthcare professionals; MDM= Multidisciplinary meeting; MI= Medicine information



33 Candidate activities

Collect	Assess	Plan & Implement	Collaborate
•Interview patient/ carer •Allergy confirmation •Medication history taking •Medication adherence •ADE history •Lifestyle •Peventative care •Symptoms	•Assess patients' notes for information •Review tests •TDM •Calculations •Homecare screening •Arrange tests •Monitor patients' drug therapy outcomes (follow-up) including recomend monitoring	•Discuss therapy options with patient •Recommend therapeutic change •Prescribe/de-precribe •Recommend/arrange dose administration device/ compliance aid •Entry to patients' clinical notes •Write clinical letters to patient •Counsel patient/carer on drug •Educate on disease state/lifestyle measures •Written information for supplied drug (e-mail/printed material)	•Refer patient •Liaise with other HCPs including community HCPs to coordinate care •Answering HCPs' queries on patient care •General MI for HCPs •Answering queries from patients/ outside of trust •Advise for drug's cost-effectiveness •Recommend therapy (MDM) •Agree on therapy (MDM) •Raise care issue (MDM)

Fig. 5 Candidate clinical pharmacy activities for ambulatory care practice

ADE= Adverse drug event; TDM= Therapeutic drug monitoring; HCPs= Healthcare professionals; MI= Medicine information; MDM= Multidisciplinary meeting

Table 1 Ambulatory units and the respective pharmacist characteristics

Unit	Clinic type	Pharmacists' Role (NHS Band)	Highest qualification	Prescriber status	Onsite experience (years)	Study participation
Clinic 1	Phone clinic	Specialist	Pg Diploma	IP	3.5	Observed and interviewed
Clinic 2	Physical clinic	Consultant	Pg MSc	IP	7	Interviewed
		Specialist	Pg Diploma	IP	1	Observed
Clinic 3	Physical collaborative clinic	Specialist	Pg MSc	IP	0.5	Observed and interviewed
Clinic 4	Phone clinic	Specialist	Pg MSc	IP	15	Observed and interviewed
Clinic 5	Physical clinic	Specialist	Pg Diploma	IP	3.5	Observed and interviewed
MDM 1	Online MDM	Principal	Pg MSc	IP	6	Observed and interviewed
MDM 2	Physical MDM	Principal	Pg Certificate	IP	25	Observed and interviewed
Clinic 6	Physical clinic	Principal	Pg MSc	IP	8	Interviewed

MDM= Multidisciplinary meeting; NHS= National Health Service; Pg= Postgraduate; MSc= Master of Science; IP= Independent prescriber