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## **Interdisciplinary Medication Decision Making by Pharmacists in Pediatric Hospital**

### **Settings: An Ethnographic Study**

#### **Abstract**

*Objective:* Children are particularly vulnerable to experiencing medication incidents in hospitals. Making sound medication decisions is therefore of paramount importance. Prior research has principally described pharmacists' role in reducing medication errors. There is a dearth of information about pharmacists' interactions with pediatric hospital staff across disciplines in resolving medication issues. The aim of this study was to examine interdisciplinary medication decision making by pharmacists in pediatric hospital settings.

*Design:* An ethnographic design was undertaken comprising observations, semi-structured interviews and focus groups. Audio-recorded data were analyzed thematically.

*Setting:* The study was conducted in three wards of an Australian pediatric tertiary teaching hospital, comprising general surgical, gastroenterology, endocrinology, neurology, adolescent and rehabilitation settings.

*Participants:* Pharmacists, registered nurses and doctors were recruited from diverse clinical wards following information sessions.

*Results:* Pharmacists were central to complex pediatric medication decision making, intervening about dosage, administration, drug interactions and authorities. Pharmacists proactively

contacted doctors and nurses about prescribing issues; conversely, staff routinely approached pharmacists for medication advice. Pharmacists were perceived as medication experts, their extensive knowledge valued in resolving complex issues: when off-label medications were prescribed, when protocols were absent or ambiguous, where tension existed between protocol adherence and patient safety, and where patients on multiple medications were at risk of medication error. Pharmacists had strong relationships with doctors and nurses, which had a bearing on pharmacists' input in interventions. Furthermore, pharmacists identified prescribing errors through strategies, such as case note review and medication reconciliation, although the lack of emergency department pharmacists and limited after-hours staffing posed challenges to both strategies.

*Conclusions:* Pharmacists made a substantial and highly valued contribution to pediatric inter-professional medication decision making. These results provide new knowledge that informs theoretical developments of pharmacists' role in decision making.

*Keywords:* Pharmacist; Medication; Interdisciplinary; Decision-making; Pediatrics; Ethnography

## **Introduction**

Children are more vulnerable than adults to experiencing medication errors for a range of reasons: Their body organs are not as mature as those of adults, and therefore pharmacodynamics and pharmacokinetics of medications are different. Problems can occur with having to prescribe on a kilogram weight basis. Off-label use can cause concerns as many medications are not tested in pediatric populations.<sup>1</sup> Children are not as verbally confident as adults, and are therefore less able to describe symptoms that may be medication-related. However, this verbal confidence depends on the children's age, as well as their past experiences with medications and illness, self-esteem, and resilience.<sup>2</sup>

Medication safety is predicated on clear and precise communication between health professionals. Communication problems between clinicians about children's medications are very concerning.<sup>3</sup> An audit comprising 2,753 medication incidents in an Australian pediatric hospital, for example, found inadequate verbal communication between staff occurred in 34% of cases. In incidents that occurred when children were transferred between clinical areas, a further 29% of incidents were documentation errors through misreading or not reading medication orders, and 22% involved not following policies and procedures.<sup>4</sup>

Previous research has shown the important role played by pharmacists in managing children's medications. Studies of pharmacists working in pediatric intensive care units (PICUs) demonstrate substantial reductions in prescribing errors.<sup>5</sup> In a retrospective review of pharmacy interventions resulting in medication changes in a PICU over an 11-year period, 27,773 interventions were initiated by pharmacists for 10,963 admissions, most frequently dosing changes (52.3%) and appropriate choice of medication (21.4%).<sup>5</sup> In a prospective study

contrasting medication error (ME) rates before and after appointing a clinical pharmacist in a PICU, serious medication errors decreased from 29 per 1000 patient days before the intervention to 6 per 1000 patient days after the intervention ( $p < 0.01$ ).<sup>6</sup>

Importantly, the pharmacists' role has developed over time from a focus on correcting medication orders to increased participation in medication decision making,<sup>7</sup> including complex decision making in treating hospitalized children.<sup>5</sup> Prior research has also identified pharmacists' expanding role in medication information provision and education.<sup>8,9</sup> Pharmacists have been described as "hubs of advice" (p. 1) and their contribution to complex medication decision making noted.<sup>10</sup>

Interdisciplinary collaboration in medication decisions has been advocated as fundamental to pediatric patient-centered care. Research has focused on communication between hospital doctors and pharmacists rather than pharmacists' interactions with health professionals of different disciplines.<sup>10</sup> In an Australian prospective study of an evidence-based model to reduce medication errors in hospitalized children, multidisciplinary communication was considered an intrinsic component of a safe prescribing guideline.<sup>11,12</sup> There is a lack of information however about *how* pharmacists participate in inter-professional medication decisions, in particular, their input into complex and unusual medication issues.<sup>8</sup> Such complex decisions include: off-label prescribing, which involves medications prescribed outside the scope of usual therapeutic practice, in the absence of protocols or when guidelines are ambiguous, when strict adherence to administrative protocols may compromise patient safety, or when patients on a plethora of medications require review. These scenarios may involve protracted deliberation for the interdisciplinary team before gaining collaborative consensus.

In this study, interdisciplinary medication decision making was defined as interactions of pharmacists with clinicians of other disciplines with the outcome of changes in medication treatment. The aim of this paper is to describe the role of pediatric clinical pharmacists in interdisciplinary medication decisions.

## **Methods**

### *Overview*

The study used an ethnographic design<sup>13</sup> to explore communication between pharmacists, nurses and doctors about medication decisions in a major Australian pediatric teaching hospital. There are a number of defining characteristics relating to ethnography. Research involving an ethnographic approach is undertaken in a natural setting, and it requires close, face-to-face interactions with participants.<sup>14</sup> This approach provides an accurate understanding of participant perspectives, behaviors and activities. Data collection is of an inductive, interactive, and recursive manner, using diverse methods. Data are framed within a socio-political and cultural milieu using the local, specific context through which to interpret findings. In this study, we sought to understand the complexities of how interdisciplinary medication decision making occurred. Since a central tenet of ethnography is mapping out how individuals interact with each other, this approach is appropriate for this study.

### *Sample*

Inclusion criteria for the sample involved pharmacists, nurses and doctors who were recruited from diverse wards including: general surgical, orthopedic, maxillofacial, and urology;

neurology, metabolic, endocrinology and complex gastroenterology; cardiac and renal; and adolescent and rehabilitation settings. Children cared for by these health professionals therefore had a diverse range of conditions in relation to these various ward settings. In addition, the sample included specialist nurses in pain management, burns and diabetes education in how they interacted with other health professionals.

Exclusion criteria included nurses who had only completed a one-year course and therefore had no medication responsibilities, and health professionals who were not employees of the hospital.

#### *Context of pharmacy care in clinical ward settings*

Selection of clinical settings as study sites occurred following consultations with research team members who worked in the organization. Wards selected for observation enabled researchers to observe pharmacists working with staff, children and families across a continuum of acute to chronic health care needs. Medication decision making undertaken in these settings was representative of the diverse roles undertaken by pharmacists. In these settings, pharmacists worked from 8.30 a.m. to 5.00 p.m., and this model of having pharmacists working on the wards was usual for the hospital. The main settings where pharmacists were not directly present at the hospital were the emergency department and outpatient environments. Hence, this study epitomized how pharmacists were actually involved rather than how they could be involved in interdisciplinary medication decision making. The research team chose these settings because they comprised medical, surgical and specialist environments, and they were therefore typical of the care delivered to hospitalized children.

In the wards where pharmacists were present, they listened in on ward rounds or connected with ward round doctors in passing. Their major priorities involved medication reconciliation, discharge interviews, and dispensing of medications. All patients to be discharged received medication counselling from a pharmacist. The chief pharmacist of the hospital chaired the hospital medication safety committee, and many pharmacists also had important roles in terms of membership on quality improvement committees and medication safety working groups. Dedicated medication rooms were present in all inpatient wards. In these rooms, nurses prepared medications for administration. Doctors and nurses also often congregated around these rooms and in the central office areas to seek out advice from ward pharmacists about managing medications. Pharmacist presence on the wards directly helped to create a culture of interprofessional respect and involvement. Formalised structures through pharmacists' active engagement in team meetings, hospital committees, ward rounds, discharge planning and education also facilitated pharmacist respect and involvement.

### *Data collection*

The study was conducted from March 2014 to February 2016. Participants were recruited following the conduct of information sessions with the pharmacy department and ward managers. The health professionals recruited for the study worked together with other health professionals situated in the same ward. However, health professionals were recruited as individuals.

### Observations

Observational data were collected at different times of day ranging from 7 am to 6 pm, at times when medication activities were frequent: predominantly 8.30 am-12.30 pm with pharmacists, and 7.00 am-11.30 am with nurses to capture handover and morning medication administration. Researchers accompanied pharmacists and nurses to all areas of their daily tasks: to satellite pharmacies, medication rooms, patients' rooms and emergency or ultrasound departments. The decision was made to accompany pharmacists and nurses and observe their interactions with doctors, and with other pharmacists and nurses rather than to accompany doctors and observe their interactions. The research team found that following doctors often led to disjointed interactions with patients and health professionals situated across wide expanses of the hospital. It was felt that more productive interactions were apparent in pharmacists' and nurses' interactions with doctors and with each other.

Observations were audiotaped and field notes were written as an adjunct to audio-taping. When researchers observed patients being administered medications, they retrospectively checked medication charts for dose, route, and frequency of administration. Information about patients' reason for admission, their medical condition, and age was also recorded. In accordance with the marginal participant method,<sup>13</sup> researchers rarely interacted with participants, asking questions only at appropriate intervals occurring every ½-an-hour or so, depending on the busyness of the environment. Pharmacists and nurses expanded on reasons for admissions, chronicity or otherwise of illness, rationale for prescribing, the need to check doses with families to reconcile medications, and strategies to ensure effective medication regimens during ward transfer and to community agencies at discharge.



## Semi-structured interviews

Semi-structured interviews with pharmacists, doctors and nurses explored their perceptions of making decisions for medication management within the hospital, the barriers and facilitators to optimal management of children's medications, and their views on strategies for improving it. These three aspects of decision making acted as initial prompts for participants, and they were encouraged to illustrate their perceptions with examples from their own practice. Interviews were conducted in a quiet room in the clinical setting, at a time that was convenient for the participant. Using prompts to explain their stance and probing to expand on their views, comprehensive data were obtained. Interviews were approximately one hour in duration. Demographic data were collected from participants of observations and interviews.

## Focus groups

Focus groups explored the barriers and enablers experienced by participants in how decision making occurred with managing children's medications in hospital. In some cases, the people who participated in focus groups were the same people who were interviewed, and in some cases, they were different. Participation at a semi-structured interview was not a requirement. The researchers performed data analysis on interviews and observations and during focus groups, participants were provided with summary excerpts of some themes emanating from data. Focus groups were conducted to enable member checking of themes, and to obtain additional, in-depth insights about key aspects of importance for participants. Participants were asked about all key themes generated through data analysis, with amplification of the context in which decision making occurred. Focus groups also facilitated clarification about health professionals' roles and

activities during observations. As such, focus groups did not involve changing themes that were developed by the research team but rather an elaboration of these themes.

The initial intent was to conduct focus groups with all health professional groups, comprising doctors, nurses and pharmacists. However, focus groups could only be conducted with the nursing and pharmacy disciplines as the work schedules of doctors posed enormous difficulties in organizing medical focus groups, despite extensive efforts of the research team. Thus, doctors were interviewed individually and were observed for this study. Separate discipline-specific focus groups were undertaken with nurses and pharmacists involving the presence of two research team members, a researcher who posed questions, and a facilitator who took notes and prompted participation from all focus group members.

### *Analysis*

Audiotaped data were transcribed and interactions thematically analyzed according to the 'framework' approach.<sup>15</sup> The framework approach is firmly grounded in the theory of social action. Through social action, the experiences of individuals are examined and interpreted in terms of the demands, constraints and enablers affecting health care practice. Utilizing social action involves understanding the complex needs, behaviors, system and culture under examination. For this study, the needs relate to the process of interdisciplinary decision making about medications, the behaviors are how various individuals interrelate with each other, the system is the micro-context of the inpatient setting, and the culture relates to the specific characteristics and roles of pharmacists and the health professionals with whom they interact.<sup>15</sup>

The thematic framework process involved a five-step process.<sup>15</sup> The first step, familiarization involved reading the transcripts carefully and making notes of ideas emanating from the data. The second step comprised identifying the thematic framework which required referring to the research aims, and creating categories that are structured into refined themes and subthemes. The third step, indexing, involved annotating data text with codes relating to the themes and subthemes. The fourth step, charting, required the development of tables where the data were extracted and grouped into themes and subthemes. The final step, mapping and interpretation involved comparing and contrasting the various data elements in the charts, and developing meanings of the data as a whole.

Transcription was undertaken by the researchers who conducted observations. Field notes were consulted for context. Data were mapped using Excel spreadsheets and repeatedly scrutinized in an iterative process to identify major themes. Emergent themes were grouped and coded, and subthemes further articulated. Results were reviewed by three researchers for concordance. Differences of interpretation and analysis were debated with all researchers, many of whom have clinical medical, nursing and pharmaceutical experience. Focus groups of nurses and pharmacists were then conducted to gain feedback on the themes obtained, to enable further refinement of themes, and to verify that no important information had been omitted.

### *Ethics approval*

Ethics approval was granted by university and hospital Human Research Ethics Committees (HRECs). Staff gave written consent for observations and interviews, and written consent was obtained from pharmacists and nurses for focus groups. Verbal consent was obtained from staff

interacting with the study participants, when the researchers were observing the health professionals who had given written consent. Verbal consent was sought from parents when researchers accompanied observed nurses or pharmacists into patient rooms. Children over 14 years were considered capable of autonomous consent. If parents or patients declined consent, researchers did not enter rooms.

## **Results**

In all, 200 hours of audio-taped observations were undertaken. Semi-structured interviews were conducted with three pharmacists, seven doctors, and 11 nurses. In addition, 59 nurses and 15 pharmacists participated in focus groups. Seven focus groups were conducted altogether. Pharmacists ranged in age from 24 to 37 years of age. Three had Bachelor of Pharmacy degrees, and three pharmacists held Masters in Clinical Pharmacy degrees, with clinical experience ranging from three months to 14.25 years. Nurses were aged 22 to 65 years, with nine months to 49 years of post-registration experience. All nurses held a Bachelor of Nursing qualification. Doctors were from 26 to 52 years of age, comprising two residents, three registrars (fellows), and two consultants (medical specialists). While all doctors held a university medical degree, the two consultants had also completed a postgraduate medical fellowship qualification. There were 141 hospitalized children who were involved in observations relating to interdisciplinary decision making. Their ages ranged from 12 days to 18 years.

Three interdisciplinary medication decision themes were identified (Table 1). These themes were: pharmacists' role in interdisciplinary complex medication decisions; factors facilitating

pharmacists' involvement with other health professionals in medication decisions; and challenges impeding pharmacists' ability to make medication decisions.

### *Pharmacists' role in interdisciplinary complex medication decisions*

The first theme was pharmacists' role in interdisciplinary complex medication decisions. Pharmacists played a substantial role in medication decisions with doctors and nurses in a range of circumstances: when off-label medications were prescribed, heightened vigilance was required, in the absence of defined protocols, when protocols were ambiguous, and when patients received a large number of medications.<sup>16</sup> These medication decisions were extremely complex, requiring consideration be given to several competing factors in making judgments, and addressing tensions between adherence to protocols and patient safety. In these situations, pharmacists vigorously debated risks and benefits with nurses and doctors to achieve treatment plan consensus.

#### Use of off-label medications

The first subtheme for this theme about pharmacists' role in interdisciplinary complex medication decisions was the use of off-label medications. Discussion of the clinical safety and efficacy of prescribing and administering off-label medications occurred frequently. In off-label discussions, pharmacists and nurses spent considerable time conferring with each other about the appropriateness of using a particular medication in an off-label way, before raising the issue with a doctor. In the example below, for a child anxious about post-surgical removal of tubes, a nurse

approached a pharmacist to discuss dosing and administration of the benzodiazepine, midazolam, prescribed as a muscle relaxant:

Nurse: “Can we borrow you for a second? We want to give some midaz (midazolam) because we’re taking out some tubes and he is very, very anxious, stresses himself out to the max.

Pharmacist: (checking) is this for the oral dosing?

Nurse: Yeah. 0.4 (mls) is 13 (mgs), cause he’s 32 kilos.

Pharmacist: What you could do is just split the dose, and give him half, and then if half is not enough...

Nurse: So, 6 (mgs) would be ok?

Pharmacist: Give him 6 (mgs), and then have another 6 (mgs) charted, so that way, you can always give that dose.” [Obs-Pharm-Surg-JL-19-1-1-1]

The pharmacist had carefully checked the administration route and weight of the child with the nurse. She then advised splitting the dose, so that if the initial 6mg dose of midazolam was insufficient to alleviate the patient’s anxiety, nurses could give an additional 6 mgs.

In another example, a nurse queried a dose of clonidine, an alpha-agonist hypotensive agent used for post-surgical analgesia for an adolescent:

Nurse: “Some changes with clonidine from one mcg to 10 mcg(s). I was a bit concerned?

Pharmacist: (reading notes) it’s two mcg per kilo, so every two hours.

Nurse: It's a lot, isn't it?

Pharmacist: We usually do tds (three times a day), but why was it written up every two hours?

Nurse: I don't really know why." [Obs-Pharm-Surg-ES-2-2-2]

The pharmacist confirmed the patient's identity and rationale for clonidine use, encouraging the nurse to query the dose with the senior prescribing physician:

Pharmacist: "This is X (patient's name), so we're using it for analgesia?

Nurse: Analgesia.

Pharmacist: This is pre-operative but the Pharmacopoeia has a dose for post-op. Post-op analgesia, 0.5-0.215? (mcg) per kilo, dose every eight hours? So I'm not sure what this two hourly (dose) is about.

Nurse: Is it still a huge dose?

Pharmacist: The dose itself is fine but it's a little bit **too** frequent; we usually do tds (three times a day) eight hourly, so I can annotate that if you like. We can ask him (doctor - nervous laughter). He won't mind." [Obs-Pharm-Surg-ES-2-2-1]

#### Unusual or infrequently used medications

The second subtheme for this theme about pharmacists' role in interdisciplinary complex medication decisions was unusual or infrequently used medications. Pharmacists frequently conversed with doctors to clarify their intent for prescribing uncommonly-used medications, and

nurses often sought out pharmacists to gauge further information about these medications.

Nurses developed a thorough knowledge of medications used in treating chronic conditions, for example, for endocrine disorders or chronic lung or heart disease. When unfamiliar medications were charted or administered in unfamiliar ways, pharmacists provided vital advice and support.

In one situation, a decision was made to use acetic acid or pharmacy-grade vinegar for a toddler with burns on her legs and perineum. The patient had a *Pseudomonas aeruginosa* infection, which was unresponsive to oral antibiotics. The pharmacist paged the doctor to verify that acetic acid was incorporated into the treatment plan, advised nurses on the appropriate dilution for burns baths, calculated supplies and resolved to review treatment in a week's time. In another example, a pharmacist provided nurses with detailed information about the application of witch hazel to reduce swelling in the face of a child after head and neck surgery, explicitly instructing them to be careful to avoid the eyes.

#### Lack of protocols and ambiguity of protocols

The third subtheme for this theme about pharmacists' role in interdisciplinary complex medication decisions was the lack of protocols and ambiguity of protocols. When protocols were unavailable or ambiguous, pharmacists were routinely consulted by doctors and nurses. A baby with significant gastrointestinal dysfunction, a PEG (percutaneous endoscopic gastrostomy) tube, stoma and bile bag, had a central line block and infection. The treating team decided to try an ethanol lock to clear the line and infection. The pharmacist was one of several clinicians in addition to a TPN (total parenteral nutrition) nurse, gastroenterological registrar, CNE (clinical nurse educator), and AUM (assistant unit manager) deciding how to administer an ethanol lock



before and after the baby's benzyl penicillin dose. The registrar was confused about the ethanol concentration. The pharmacist explained that when applied under the SAS (Special Access Scheme for obtaining infrequently used medications in Australia) ethanol was manufactured at a higher concentration than therapeutically delivered, therefore requiring dilution before dispensing:

Registrar: "So is it 98% ethanol we're using?"

Pharmacy: 70%. You order the 98% and we make it into a 70%. The SAS product is the 98%.

Registrar: That's what confused me. 'Cause I'm pretty sure I wrote (98%), yeah. (charting ethanol)" [Obs-Nur-Neuro-EM-37-1-1-4]

When intravenous administration differed from the Pediatric Injectable Guideline (PIG), or when online protocols were unclear, pharmacists helped synthesize information. A nurse approached a pharmacist about a four-year-old patient admitted with ketoacidosis, newly diagnosed Type 1 diabetes, nephropathy, and hypothyroidism, who was charted for insulin administered intravenously rather than subcutaneously. The pharmacist discussed NovoRapid insulin as an infusion with nurses in the medication room:

Nurse: "Same time; separate drips! I said (to the doctor) Oh but you give NovoRapid (insulin) as an infusion?"

Pharmacist: Actrapid (insulin) I've seen more. I haven't seen NovoRapid....yeh, so NovoRapid is ultra short-action compared to Actrapid but this is an ambiguous (protocol)...

Nurse: So then we just draw them up separately and make the NovoRapid two units in what.....? Shall we bring the dextrose? (dextrose is administered prior to insulin, as insulin can decrease the blood sugar levels).

Pharmacist: (consulting protocol) NovoRapid can be given IV, compatible fluids are.....15% of saline. It doesn't say how fast, so I think we'll make it up in a comfortable volume and just push it....Since the guide doesn't say 'don't push', I would just push it, dilute it like 5%, 10% of saline....I would say have the glucose running first.

Nurse: OK, how long?

Pharmacist: Cause it's gonna drop, the glucose...I dunno, like a couple of minutes? Just so he's got some glucose in the system cause as soon as the NovoRapid hits, booom boom, so try that one first..." [Obs-Pharm-Card-MC-2-3-3]

### Weighing the benefits of protocols and patient safety

The fourth subtheme for this theme about pharmacists' role in interdisciplinary complex medication decisions was weighing the benefits of protocols and patient safety. Discussions about balancing whether to follow certain protocols or not largely occurred between pharmacists and doctors, leading to multifaceted debates about the characteristics of medications. Strict adherence to protocols was not always a guarantee of safe medication administration. The pharmacist in the following exchange was concerned about using liquid omeprazole rather than

esomeprazole (Nexium) 10 sachets for an infant patient with significant gastrointestinal dysfunction:

Pharmacist: “Oh so now they nearly blocked the PEG? Like it blocked, they unblocked it...

Registrar: Is it granules or is it solids?

Pharmacist: It's granules.

Registrar: So, it's not actually a solution?

Pharmacist: No.

Registrar: (decisively) Ah well, use omeprazole then (be)cause omeprazole dissolves in....

Pharmacist: (ironically) We're not allowed to; we're not supposed to.

Registrar: (incredulous) Not supposed to use omeprazole?!

Pharmacist: We're not supposed to use the liquid cause we're not making it any more, like the Nexium (esomeprazole)sachets in babies are what we're supposed to be using. It's (omeprazole) not as good (be)cause they crush the stuff and put it in bi-carb (bicarbonate) so when it goes through the stomach a lot of it is inactivated by the acid, so it's about half as good as giving proper entero-coated granules...

Registrar: But going once doesn't go to her stomach so it's fine.

Pharmacist: O that's right. O yeh, that'll work.

Registrar: We probably are going to add some stomach acid to the solution later but I think in the end safety is the priority, (be)cause every line access is a risk.

Pharmacist: I see, well you're exactly right, just change it to omeprazole.

Registrar: Thank you, it's just one of those things and it was important that we tried it but, once it's happened, it would be very hard to convince somebody to do it again." [Obs-Pharm-Neuro-KH-2-4-1]

### Patients prescribed multiple medications

The fifth subtheme for this theme about pharmacists' role in interdisciplinary complex medication decisions was patients prescribed multiple medications. Pharmacists spent considerable time identifying patients prescribed multiple medications, and were observed to proactively seek out doctors to converse with them about possible complications and interactions arising from these medications. Patients prescribed multiple medications are at increased risk of medication error.<sup>14</sup> A pharmacist reviewed the extensive case notes of a 19-year-old male recently transferred from the PICU; he had several congenital conditions requiring long-term pediatric care, and had had a heart transplant. The pharmacist was concerned about transposition dose errors, given the complexity of his medication regimen. She identified the need to change the administration of Caltrate (calcium carbonate), separating it from phosphate by two hours to avoid binding. She informed his doctor, suggesting calcium carbonate needed to be charted twice daily at the same time as magnesium:

Pharmacist: "The Caltrate because it has to be separated! I'm going to get it changed to the same time as magnesium so then they can go together.

Doctor: 10 and 10." (am and pm) [Obs-Pharm-Card-MC-2-3-2]

The pharmacist later told a nurse that the doctor had misunderstood and simply crossed out administration times on the chart, which the pharmacist had subsequently annotated:

Pharmacist: “But I’ve put the times in so that we know that from here in it’ll be 10 (am) and 10 (pm) and we know we’re separating (Caltrate and phosphate)...” [Obs-Pharm-Card-MC-2-3]

### *Factors facilitating pharmacists’ involvement with other health professionals in medication decisions*

The second theme was factors facilitating pharmacists' involvement with other health professionals in medication decisions. The quality of pharmacists’ relationships with doctors and nurses and the hospital’s culture of encouraging open debate and questioning about medication errors, increased pharmacists’ interdisciplinary involvement in medication decisions. Observations demonstrated there were clusters of questions in interdisciplinary decision making rather than a single question generated.

#### **Strong relationships enabling communication**

The first subtheme for this theme about factors facilitating pharmacists’ involvement was strong relationships enabling communication. Pharmacists felt that doctors and nurses were more likely to seek them out and ask medication questions the longer they worked on the ward. They found it difficult to have input to medication decisions when newly on ward or when transferred to wards without assigned pharmacists:

Pharmacist: “So people will ring or page because I’m always around so I know all the staff and I think for me that makes a huge difference. I found when I’ve covered a ward, it’s really hard because the staff don’t know who you are, you don’t know who they are.” [Int-Pharm-Adol-VL-5-5]

Pharmacists also felt the ward specialty doctors were easier to communicate with than “outlier” teams. If a child was admitted to a ward focusing on neurological and gastroenterological disorders, for example, whose diagnosis required input from visiting teams of infectious disease doctors, communication was more difficult:

Pharmacist: “When I first started, I found it a little bit more difficult because you just don’t know who’s who and who to speak to, but now it’s a little bit easier (be)cause you build up a little bit of a relationship; sometimes it’s a bit hard if you get some outliers and you’re not familiar with those teams, but most of the time it’s good.” [Obs-Pharm-Surg-ES-1-2]

Pharmacists were more frequently on the ward than doctors, seen by nurses as easier to approach than doctors, and as intermediaries for dosing queries:

Nurse: “We work quite closely with the pharmacist and the medical team and they (pharmacists) do a lot of, I guess, communicating for us on our behalf with the medical team

if we don't have the opportunity to capture the team on their round. They might call them while they're there, clarify orders, working out infusions, working out dosages." [FG-Nur-Neuro-2-4]

#### Open disclosure of medication errors

The second subtheme for this theme about factors facilitating pharmacists' involvement was the open disclosure of medication errors. The hospital culture fostered open disclosure of medication errors. Doctors and nurses included pharmacists in discussing systemic ways to prevent recurrence of medication errors. The cyclic communication pathway of doctors and pharmacists, with both professionals actively initiating queries, was seen as an integral component of safe prescribing:

Registrar: "I'm very happy with how the pharmacists here can liaise with us back and forth about drug safety, and what's the best way to prescribe something, different formulations, things for discharge. It's really good." [Int-Dr-Cpms(Surg)-FS-P.11-12-3]

#### *Challenges in interdisciplinary decision making*

The third theme was challenges impeding pharmacists' ability to make medication decisions. Challenges affected the extent to which pharmacists could be involved in interdisciplinary interventions, which included: lack of pharmacists in the emergency department; lack of after-hours pharmacy staff; and competing responsibilities for discharge interviews and dispensing,

and case note review. These challenges reduced pharmacists' capacity to prevent medication errors, as they had limited time to examine patients' medical records and conduct medication reconciliation interviews.

#### Lack of pharmacists in the emergency department

The first subtheme for this theme about challenges in interdisciplinary decision making was the lack of pharmacists in the emergency department. Emergency nurses conducted pre-admission medication reconciliation interviews with families, which ward nurses checked on admission. In the emergency department, nurses had to rely on other nurses and on doctors for clarification of decisions on medication reconciliation. Nurses saw pharmacists' subsequent checks as a valuable "third tier" safety strategy, ensuring a common understanding of charted medications:

Nurse: "Talking to the families about their normal regime at home and how they manage medications, what their child has been on, for how long, so getting that history initially, from a nursing perspective; and then the pharmacist will come along and do it again, so often a lot of re-clarifying, confirming, that we're all on the same page, and then, if there's any dosage adjustments or whatnot, we can work back from their initial admission, and look what they normally are on." [FG-Nur-Neuro-2-5]

#### Lack of after-hours pharmacy staff



The second subtheme for this theme about challenges in interdisciplinary decision making was the lack of after-hours pharmacy staff. During the after-hour periods, nurses attempted to communicate with on-call doctors about concerns that nurses had with patients' medications. Pharmacists saw inherent flaws in the duration of time for which the pharmacy service was provided. Since they were only on the wards from 8.30 am to 5 pm, patients could receive incorrect doses prior to pharmacists reviewing charts. Nurses' vigilance in querying doses of newly admitted patients was therefore vital:

Pharmacist: "Like there was an error the other day that a nurse picked up from a patient who came in overnight, and they paged me about it so I went and spoke to the doctor, but because I had been doing all this stuff, the reality is that if the nurse hadn't picked it up, I wouldn't have gotten to the chart till that afternoon. The patient had already had two incorrect doses, and they would have got a third so..." [Obs-Pharm\_Surg\_JL-19-1-1]

The imperative to conduct discharge interviews so that children could be discharged in a timely fashion, enabling the unit manager to free up bed space, meant that medication reconciliation of newly admitted patients was delayed. Pharmacists described the frustration of retrospectively correcting errors, suggesting dedicated pharmacy staff in the emergency department would mitigate this:

Pharmacist: "In other hospitals there's a pharmacist that's dedicated to admission, doing all of the MRF (medication reconciliation forms), the reconciliation forms and

interviews...honestly, when you come to a ward at 8.30 in the morning and you've got five new patients and five discharges, you can't go and do all the MRFs cause all the discharges will be delayed by two hours, so it's not feasible in terms of turnover, waiting time, and the AUM has to get people out of hospital, so yeah, that would make a massive difference." [FG-Pharm-1-6]

Reconciliation interviews were also delayed when pharmacists were called to wards without pharmacy staff during emergencies, and when patients were transferred to wards without pharmacists. They described the confusion of parents when they appeared days after their child's admission to check their usual medications:

Pharmacist: "(Be)Cause a lot of the time you don't get around to see the patient, or there'll be an emergency and you're on a ward that doesn't actually have pharmacy services, and by the time they get to you, they should have had their regular medications charted and they should have received it. Or if they're on ward X say for four days, then they're transferred to ward Y which doesn't have a pharmacist, and in you go in on day five and say 'Hi, I'm here to find out your regular medications...' and they look at you like you're an idiot." [FG-Pharm-1-7]

Competing responsibilities for discharge interviews and dispensing, and case note review

The third subtheme for this theme about challenges in interdisciplinary decision making was pharmacists' competing responsibilities to conduct discharge interviews and dispensing, as well as case note review. Discharge interviews and dispensing discharge medications were prioritized

functions for pharmacists because they facilitated patient throughput. If problems with discharge prescriptions arose, pharmacists sought to interact with doctors to derive solutions to these problems. Another important function, case note review, was regarded as a catalyst for pharmacists to follow up prescribing errors by interacting with doctors and nurses. Pharmacists aimed to peruse approximately 30 patient case notes per ward daily. This goal of case note completions was difficult to realize because of the heavy workload associated with discharge interviews and dispensing.

Having reviewed the case note of a two-year-old heart transplant patient, the pharmacist suspected a prescribing error of Cotrimoxazole (sulfamethoxazole and trimethoprim) written in the medication chart as 2.5 mgs, which should have been 2.5 mls of Cotrimoxazole, three times a week. She verified the dose with the patient's mother; then checked a protocol for the prophylactic dose, establishing it as 2.5 mg per kilo of the trimethoprim component twice a day, three days a week. At 8 mg per ml for a patient weighing 12 kilos, the pharmacist calculated the child was receiving a very low dose of 1.66 mg of trimethoprim per kilo once a day (2.5 ml x 8 mg/12 kg), which she followed up with the prescribing doctor.

Another pharmacist, having reviewed a child's medication chart, paged a registrar to explain a low dose of Cotrimoxazole for a liver transplant patient:

Pharmacist: "A quick question.... So last night he (senior doctor) dispensed him trimethoprim...(and sulfamethoxazole) Bactrim, do you remember what (dose)....? So it says: Give half a tablet at night as directed alternating with Augmentin duo (amoxicillin and clavulanic acid) as directed. Do you know why only **half** a tablet once at night? Like that's a

really low dose...Like he's on a UTI (urinary tract infection) dose, he needs a respiratory infection type dose. (exasperated sigh)...I don't know.

Registrar: Will you just double check it after?

Pharmacist: I can double check it. I will do." [Obs-Pharm-Neuro-KH-2-4-1]

Pharmacists' capacity for daily review of case notes was inhibited by the large volume of discharge interviews, admission reconciliation and discharge dispensing:

Pharmacist: "Even just a day like today where I've only been able to do discharge scripts, so realistically I've only seen two patients' charts today. It's just staffing problems....so from a pharmacist's point of view I need to prioritise discharges first, and then I try to do admissions and then chart reviews for other patients." [Int-Pharm-Surg-JL-1]

## **Discussion**

In this ethnographic study, new and comprehensive knowledge has been generated about the content of pharmacists' interdisciplinary role in medication decisions. Pharmacists were integral to medication decision making, which included complex medication decision making, involving off-label prescribing, clarifying administration issues when protocols were absent or ambiguous, mediating administration conundrums between patient safety and inflexible protocol adherence, and maintaining heightened vigilance when patients received multiple medications. Facilitators in decision making comprised strong relationships among pharmacists, doctors and nurses,

thereby enabling communication, and having a culture that supported open disclosure of medication errors. Challenges in decision making related to the lack of availability of pharmacists in the emergency department, limited after-hours pharmacy staff, and competing responsibilities for the conduct of discharge interviews and dispensing, with case note review.

Pediatric hospital pharmacists are required to maintain high professional standards of medication safety in an era of increasing fiscal restraint. Beneficial therapeutic outcomes have been demonstrated for patients when pharmacists are included in pediatric health care teams.<sup>17</sup> Most prior research involving pediatric hospital pharmacists has focused on reducing rates of adverse drug events (ADEs) and medication errors.<sup>6,18</sup> Whilst acknowledging the importance of quantifying the outcomes of pharmacist interventions, there is lack of concrete knowledge of the process of how pharmacists communicate across disciplines, and of the factors that facilitate and inhibit their ability to do so. Thus, the results of this study provide new knowledge that inform theoretical developments of pharmacists' role in decision making.

Prior studies have described the extent of off-label prescribing in pediatric populations,<sup>1</sup> leading to calls for clinical trials in pharmacotherapy in child populations to garner evidence of efficacy, but few have described the role of the pharmacist in off-label application.<sup>19</sup> Wide variation in pediatric medication protocols, for example, in intensive care sedation practices,<sup>20</sup> has been previously described. There is little evidence about the part that pharmacists play in mediating drug administration when protocols do not exist, or when their interpretation is confusing.

Though interdisciplinary collaboration has long been considered axiomatic in pediatric inpatient care,<sup>7</sup> the way that this policy is translated in practice remains largely inchoate. In this

study, the strength of pharmacists' inter-professional relationships stimulated effective medication interactions while challenges to these interactions, the lack of an emergency department pharmacist, limited access to after-hours pharmacy expertise, and pressure of discharge planning, had an impact on decision making. The study revealed an open, vigorous and actively fostered culture of collaboration about medication decisions between disciplines. Studies cite doctors' lack of rational prescribing skills,<sup>21</sup> a deficit that hospital pharmacists are well equipped to rectify.<sup>22</sup> In particular, junior doctors valued pharmacists' information, not just about the rationale for prescribing antibiotics or proton pump inhibitors (PPIs), but the strength of medications, the amounts per bottle or box, their possible adverse effects, and their pediatric application when doctors had mostly prescribed for adults. There was a palpable camaraderie between registrars and pharmacists who worked closely together on wards.

This study provides new knowledge about how pharmacists collaborate with nurses as well as doctors. Communications informing medication decisions were principally dyadic, that is, between pharmacists and doctors, or nurses and pharmacists, rather than concomitant discussions between the three disciplines. Triadic interactions tended to occur when specialist nurses such as pain team or transplant nurses discussed medications with doctors and pharmacists. The dyadic nature of most medication decisions may reflect residual hierarchical power relationships between disciplines. Nurses in focus groups, for example, suggested they needed to feel confident and experienced before contacting senior doctors about medication issues. The ease with which nurses communicated with ward pharmacists and junior doctors, however, seemed more a matter of propinquity than hierarchy: pharmacists were regularly on ward, shared nurses' knowledge of patients' conditions and medications and could resolve queries swiftly.

Despite the importance of interdisciplinary interactions in hospital health care, very little research has been undertaken about how pharmacists work in collaborative teams with doctors and nurses to make medication decisions. In a cross-sectional survey study undertaken in Cuba, investigators examined nurses' and physicians' views about the pharmacist role in health care.<sup>23</sup> Of the sample (N=763), nurses and physicians perceived the pharmacists' integration with the health care team was fair (50.7%) rather than good (32.1%) or excellent (2.1%). Common barriers for communication were lack of time of physicians and nurses (33.4%) and lack of time of the pharmacist (33.4%). While this study involved seeking out nurses' and doctors' perceptions, pharmacists were not included as respondents. In a phenomenological study involving doctors, nurse practitioners and pharmacists in Canada, interviews were conducted about their working relationships in the inpatient medical setting.<sup>24</sup> All participant groups believed that the integration of pharmacists into health care teams improved patient outcomes by facilitating medication decision making between themselves, continuity of care and medication safety. While pharmacists indicated that they developed trusting relationships with nurse practitioners and doctors, they struggled with the increased workload required to integrate within the health care team. It appears as though the ability to participate in dyadic interactions in making medication decisions is generally readily accomplished. However, to facilitate triadic interactions requires a greater level of coordination and time commitment, as reflected in the results of this study.

Ill-defined medication procedures have been associated with an increased risk of medication error.<sup>25</sup> Pharmacists were viewed by staff as primary authorities about medication issues, particularly in making complex decisions. Pharmacists gave direction when unusual medications

were prescribed or administered, working collegially with staff in the absence of protocols or when guidelines were ambiguous.

There were several limitations of the study: The degree of interdisciplinary engagement about medication issues may be more common in pediatric teaching hospitals than in non-teaching hospitals or adult teaching hospitals. It should be noted that since only a subset of wards and types of patients were included in the decision sample, the results obtained may not be applicable to all types of clinical settings. There may have been a degree of participant bias: though staff generally became more comfortable with observers the longer observations progressed, the prospect of being “shadowed” by an audio-taping researcher was unpalatable to some nurses and pharmacists. This situation arose for about 10% of the participants observed. Nevertheless, no participant who agreed to be observed withdrew from the study and all data collected were retained. Health professionals generally felt more comfortable about being shadowed with increased familiarity involving observations with researchers. The research team implemented diverse strategies to encourage familiarity and comfort with being observed. Extensive periods of time were spent in the study sites, gaining participant reassurance about the process and what was expected. The digital audio-recorder was a small item, which was positioned in the researcher’s pocket. Only a small microphone was visibly present on the researcher’s lapel. These aspects about the equipment helped to facilitate participant familiarity and comfort. As participants generally felt at ease relatively quickly, there was no need to discard very early data. More confident staff may have self-selected for participation. It is unlikely that only health professionals who were self-assured about their medication decision making agreed to participate, and that only exemplary practices were displayed. As indicated in the results, the complexities of practice demonstrated various situations and outcomes of decision making.



Though prior studies have examined the way children<sup>26</sup> and families<sup>27</sup> interact with hospital staff about medication decisions, this research was confined to inter-professional collaboration. This study was conducted during a paper-based system of recording medication, prior to the hospital's introduction of an electronic medical record (EMR). Pharmacists expressed anxiety about the extent to which thorough face-to-face discussions about complex medication decisions would occur post EMR implementation, speculating that electronic systems would not preclude the need for meticulous deliberation about medication. Nevertheless, the findings are applicable to medical, surgical or specialty clinical settings where pharmacists have a role in pediatric care. More studies are needed internationally to document the role of pharmacists regarding interdisciplinary medication decision making. Despite the possibility of these limitations, it is very likely that the results obtained in the study were an accurate reflection of what happened in actual practice.

#### *Implications for practice*

The input of hospital pharmacists to interdisciplinary complex medication decisions is particularly important in pediatric settings, where medication calculations require heightened vigilance regarding children's weight and developing physiology. Pediatric inpatient safety is optimized when hospital pharmacists are well integrated into interdisciplinary teams, and when hospital cultures foster the active involvement of pharmacists in patient care. Dedicated pediatric emergency department pharmacists and 24-hour access to pharmaceutical resources would reduce errors of medication reconciliation and prescribing.

## **Conclusions**

In the settings investigated within this study, hospital pharmacists demonstrated a pivotal role in making interdisciplinary pediatric medication decisions, particularly complex decisions. Their information and advice was valued highly and actively sought by doctors and nurses. Further descriptive research into the interdisciplinary roles of pediatric hospital pharmacists is required.

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## References

1. Corny J, Bailey B, Lebel D, Bussieres JF. Unlicensed and off-label drug use in paediatrics in a mother-child tertiary care hospital. *Paediatr Child Health* 2016;21:83-87.
2. Wood BS. *Children and Communication: Verbal and Nonverbal Language Development*. Prentice-Hall, Inc.: Englewood Cliffs, New Jersey, 1976.
3. Kaushal R, Jaggi T, Walsh K, Fortescue EB, Bates DW. Pediatric medication errors: what do we know? What gaps remain? *Ambulatory Pediatrics* 2004;4:73-81.
4. Manias E, Kinney S, Cranswick N, Williams A. Medication errors in hospitalised children. *J Paediatr Child Health* 2014;50:71-77.
5. Tripathi S, Crabtree HM, Fryer KR, Graner KK, Arteaga GM. Impact of Clinical Pharmacist on the Pediatric Intensive Care Practice: An 11-Year Tertiary Center Experience. *The Journal of Pediatric Pharmacology and Therapeutics : JPPT* 2015;20:290-298.
6. Kaushal R, Bates DW, Abramson EL, Soukup JR, Goldmann DA. Unit-based clinical pharmacists' prevention of serious medication errors in pediatric inpatients. *Am J Health Syst Pharm* 2008;65:1254-1260.
7. Fortescue EB, Kaushal R, Landrigan CP, et al. Prioritizing strategies for preventing medication errors and adverse drug events in pediatric inpatients. *Pediatrics* 2003;111:722-729.
8. Rixon S, Braaf S, Williams A, Liew D, Manias E. Pharmacists' Interprofessional Communication About Medications in Specialty Hospital Settings. *Health Commun* 2015;30:1065-1075.

9. Creswick N, Westbrook JI. Who Do Hospital Physicians and Nurses Go to for Advice About Medications? A Social Network Analysis and Examination of Prescribing Error Rates. *J Patient Saf* 2015;11:152-159.
10. Basak R, Bentley JP, McCaffrey Iii DJ, Bouldin AS, Banahan Iii BF. The role of perceived impact on relationship quality in pharmacists' willingness to influence indication-based off-label prescribing decisions. *Social Science & Medicine* 2015;132:181-189.
11. Gazarian M, Graudins LV. Long-term reduction in adverse drug events: an evidence-based improvement model. *Pediatrics* 2012;129:e1334-1342.
12. Zhang C, Zhang L, Huang L, Luo R, Wen J. Clinical pharmacists on medical care of pediatric inpatients: a single-center randomized controlled trial. *PLoS One* 2012;7:e30856.
13. Hammersley M, Atkinson P. *Ethnography: Principles in Practice*. 3rd ed. Routledge: London, 2007.
14. Goodson L, Vassar M. An overview of ethnography in healthcare and medical education research. *Journal of Educational Evaluation for Health Professions* 2011;8:doi: 10.3352/jeehp.2011.3358.3354.
15. Ritchie J, Spencer L. Qualitative data analysis for applied policy research. In: Bryman A, Burgess RG, (eds.) *Analyzing Qualitative Data*. London: Routledge, 1994.
16. Kunac DL, Kennedy J, Austin NC, Reith DM. Risk factors for adverse drug events and medication errors in paediatric inpatients: Analysis by admission characteristics. *Journal of Pharmacy Practice and Research* 2010;40:290-293.

17. Larochelle JM, Ghaly M, Creel AM. Clinical pharmacy faculty interventions in a pediatric intensive care unit: an eight-month review. *J Pediatr Pharmacol Ther* 2012;17:263-269.
18. Chua S, Chua H, Omar A. Drug administration errors in paediatric wards: a direct observation approach. *Eur J Pediatr* 2010;169:603-611.
19. Brussee JM, Calvier EA, Krekels EH, et al. Children in clinical trials: towards evidence-based pediatric pharmacotherapy using pharmacokinetic-pharmacodynamic modeling. *Expert Rev Clin Pharmacol* 2016;9:1235-1244.
20. Kudchadkar SR, Yaster M, Punjabi NM. Sedation, sleep promotion, and delirium screening practices in the care of mechanically ventilated children: a wake-up call for the pediatric critical care community\*. *Crit Care Med* 2014;42:1592-1600.
21. Choonara I. Rational prescribing is important in all settings. *Arch Dis Child* 2013;98:720-720.
22. Gallagher RM, Gallagher HC. Improving the working relationship between doctors and pharmacists: is inter-professional education the answer? *Adv Health Sci Educ Theory Pract* 2012;17:247-257.
23. Dupotey Varela NM, Oliveira DRd, Sedeño Argilagos C, et al. What is the role of the pharmacist?: physicians' and nurses' perspectives in community and hospital settings of Santiago de Cuba. *Brazilian Journal of Pharmaceutical Sciences* 2011;47:709-718.
24. Makowsky MJ, Schindel TJ, Rosenthal M, Campbell K, Tsuyuki RT, Madill HM. Collaboration between pharmacists, physicians and nurse practitioners: a qualitative investigation of working relationships in the inpatient medical setting. *J Interprof Care* 2009;23:169-184.

25. Velo GP, Minuz P. Medication errors: prescribing faults and prescription errors. *Br J Clin Pharmacol* 2009;67:624-628.
26. Moore L, Kirk S. A literature review of children's and young people's participation in decisions relating to health care. *J Clin Nurs* 2010;19:2215-2225.
27. Lucas PJ, Cabral C, Hay AD, Horwood J. A systematic review of parent and clinician views and perceptions that influence prescribing decisions in relation to acute childhood infections in primary care. *Scand J Prim Health Care* 2015;33:11-20.

Table 1

Pediatric hospital pharmacists' role in interdisciplinary decisions about medication: themes and subthemes

Major Themes	Subthemes
Complex medication decisions	<p data-bbox="594 541 959 579">Use of off-label medications</p> <p data-bbox="594 646 971 684">Infrequently used medication</p> <p data-bbox="594 751 1174 789">Lack of protocols and ambiguity of protocols</p> <p data-bbox="594 856 1295 894">Tension between protocol adherence and patient safety</p> <p data-bbox="594 961 1114 999">Patients prescribed multiple medications</p>
Facilitators in decision making	<p data-bbox="594 1052 1174 1089">Strong relationships enabling communication</p> <p data-bbox="594 1157 1334 1194">Culture encouraging open disclosure of medication errors</p>
Challenges in decision making	<p data-bbox="594 1257 1334 1362">Lack of emergency department pharmacy staff – effect on medication reconciliation</p> <p data-bbox="594 1430 1044 1467">Limited after-hours pharmacy staff</p> <p data-bbox="594 1535 1308 1640">Competing responsibilities for discharge interviews and dispensing, and case note review</p>



