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Medication communication between nurses and doctors for paediatric acute care: An ethnographic study

Concise title: Medication communication

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Medication communication between nurses and doctors for paediatric acute care: An ethnographic study

ABSTRACT

Aims and objectives. To examine how communication between nurses and doctors occurred for managing medications in inpatient paediatric settings.

Background. Communication between health professionals influences medication incidents' occurrence and safe care.

Design. An ethnographic study was undertaken.

Methods. Semi-structured interviews, observations and focus groups were conducted in three clinical areas of an Australian tertiary paediatric hospital. Data were transcribed verbatim and thematically analysed using the Medication Communication Model.

Results. The actual communication act revealed professionals' commitment to effective medication management and the influence of professional identities on medication communication. Nurses and doctors were dedicated to providing safe, effective medication therapy for children, within their scope of practice and perceived role responsibilities. Most nurses and junior doctors used tentative language in their communication while senior doctors tended to use direct language. Irrespective of language style, nurses actively engaged with doctors to promote patients' needs. Yet, the medical hierarchical structure, staffing and attendant expectations influenced communication for medication management, causing frustration among nurses and doctors. Doctors' lack of verbal communication of documented changes to medication orders particularly troubled nurses. Nurses persisted in their efforts to acquire appropriate orders for safe medication administration to paediatric patients.

Conclusions. Collaborative practice between nurses and doctors involved complex, symbiotic relationships. Their dedication to providing safe medication therapy to paediatric patients facilitated effective medication management. At times, shortcomings in inter-disciplinary communication impacted on potential and actual medication incidents.

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Relevance to clinical practice. Understanding of the complexities affecting medication communication between nurses and doctors helps to ensure inter-professional respect for each other's roles and inherent demands. Interdisciplinary education delivered in health care organisations would facilitate greater clarity in communication related to medications. Encouraging the use of concise, clear words in communication would help to promote improved understanding between parties, and accuracy and efficacy of medication management.

Keywords. collaborative practice, communication, ethnography, inter-professional interactions, language, medication communication, medication management, paediatrics, patient safety

What does this paper contribute to the wider global clinical community?

- Inter-professional interactional styles during actual communication acts are shaped by sociocultural and environmental influences, which subsequently affect outcomes relating to safe and effective medication processes, and potential and actual medication incidents.
- Learned and applied use of direct language as used by senior doctors and some nurses would help to support safe medication management.
- Parallel medication activities undertaken by doctors and nurses can result in unsafe care, such as lack of verbal handover by doctors to nurses of documented medication changes.

INTRODUCTION

Safe medication processes for paediatric patients is inherently complex and of paramount importance. Children are constantly developing their verbal and comprehension skills, which impact on their ability to interact. When admitted to hospital, children seek direction from their parents or guardians, who are frequently present during health care encounters (Plevinsky et al. 2015). Children also rely on health professionals to manage their medications appropriately. However, safe processes are hampered by many factors, including effectiveness of verbal and non-verbal communication between health professionals caring for paediatric patients (Manias et al. 2014, World Health Organization 2014). This study examines how communication practices between nurses and doctors in paediatric acute care settings influence medication management.

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BACKGROUND

Medication incidents can occur in up to 20% of paediatric admissions, and such incidents are largely influenced by communication between health professionals (Kidd et al. 2010, Sears et al. 2013, World Health Organization 2014). An Australian audit revealed 34% of paediatric medication incidents related to poor verbal communication between health professionals when children were transferred between clinical settings. In addition, 29% of incidents related to medication documentation, where staff either did not read or misread medication orders (Manias et al. 2014).

The importance of effective communication between nurses and doctors for emergency paediatric care was examined through simulation-based exercises of an Australian children's hospital (O'Leary et al. 2014). Substandard care resulted from poor application of non-technical skills, such as team communication and situational awareness. Fisher and Broome (2011) found well-developed relationships between team members, whereby doctors informed nurses of medication orders and were available to answer questions, and nurses were cognisant professionals who respected doctors. These relationships invoked trust, and facilitated optimal paediatric care. In a quality improvement study conducted in the United States (US), Intrevado et al. (2008) evaluated the benefits of a satellite pharmacy in a paediatric haematology and oncology unit. They found communication between nurses and physicians occurred seamlessly within the single point of contact through the satellite pharmacy. This single point of contact helped to facilitate effective flow of information between health professionals. In a Canadian qualitative study involving focus groups and interviews with physicians, nurses and respiratory therapists, physicians were viewed as the main decision makers, and their authorisation was essential for successful medication management of asthma in hospitalised children (Hurley et al. 2008).

Nurses in a children's ward of an Australian regional hospital were observed to contact doctors for analgesic orders. Yet, they were often frustrated by having to explain to doctors who were inexperienced about paediatric care what patients needed (Smyth et al. 2011). Furthermore, 71% of nurses surveyed by Murphy and While (2012) in the United Kingdom (UK), attributed paediatric medication errors to poor communication between nurses, doctors and pharmacists. As a corollary, breakdown of communication among nurses, and between nurses and doctors was the main cause of conflict in a UK paediatric teaching hospital (Forbat et al. 2016). Parents' experiences of their child's care was negatively affected when medication orders were unclear and communication between nurses and doctors was inadequate, especially throughout the night (Khan et al. 2015).

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Previous research has not focused on inter-professional interactions between nurses and doctors about managing hospitalised children's medications using an ethnographic approach. An ethnographic approach enables attention to be given to communication processes as they actually occur. The main aim was to examine how communication between nurses and doctors occurred for managing medications in inpatient paediatric settings.

METHODS

Design

A focussed ethnographic research design was employed (Higginbottom et al. 2013). Interviews, observations, and focus groups were conducted with nurses and doctors.

Ethical considerations

The university and hospital's Human Research Ethics Committees gave approval for the study. Written consent was gained from nurses and doctors for participating in interviews, observations and focus groups. Verbal consent was also obtained from other health professionals interacting with observed nurses and doctors. Participants were assigned a study code number. Their details remained confidential and accessible only by the research team.

Sample

The study was undertaken in three clinical settings of an Australian, tertiary, 334-bed, paediatric teaching hospital. Nurses and doctors who provided patient care in these settings and who were employed at least one day per week were eligible to participate. Those who were undergraduate nursing students or either employed by the hospital on nurse bank or through an agency were ineligible to participate. The three wards comprised a medical ward, a surgical ward and a specialist, mixed medical and surgical adolescent ward. These wards were selected to increase the diversity of conditions for which children were treated. The participating settings' specialties included neurology, neurosurgical, complex hepatology and gastroenterology, endocrine, orthopaedics, plastics and maxillofacial, general surgery, burns, urology, rehabilitation and adolescent care.

Data collection

Data were collected from March 2014 to February 2016. Formal information sessions about the study were conducted in each clinical setting. Researchers also explained the study informally during observations. Information sheets were distributed to those who voiced an

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interest in participating and any clarifying questions were answered. Interested staff were given time to consider participating and provide written consent.

Data were collected from one clinical setting at a time to facilitate health professionals' familiarity with researchers and instil confidence from participating nurses and doctors. Observations, or 'shadowing' of consenting nurses and doctors were arranged to be conducted at a medication-intense period of the morning or evening shift for up to four hours' duration. Researchers used an Olympus® DM-5 digital audio recorder to capture conversations during observations with participating nurses and doctors. The device's small microphone was unobtrusively attached to the researchers' clothing during observations. Researchers maintained a discreet distance from the health professionals providing patient care. On some occasions, the researchers left or did not enter a patient's room with the observed participant if a child situated in the room was experiencing distress. Researchers asked clarifying questions of the participant at convenient moments throughout the observation.

Researchers also approached doctors and nurses to participate in an interview. In these interviews, doctors and nurses were asked to share their experiences of communication processes for managing patients' medications. Audio-recorded, one-on-one semi-structured interviews were conducted at a mutually agreeable time with consenting nurses and doctors in a quiet room within the clinical setting.

Audio-recorded focus groups were conducted with groups of nurses in each setting at the change-of-shift morning to afternoon period. Feedback on medication communication processes for each setting was presented to attending nurses. Participants were asked to reflect on their experiences of managing medications for their patients. Table 1 shows the general schedule for the conduct of observations, interviews and focus groups.

Data analysis

Thematic analysis of transcribed data was conducted using Ritchie and Spencer's (1994) 'Framework'. Firstly, familiarisation of all data occurred by reading through the verbatim transcribed files and listening to audio files. All data collected for the study were carefully read, with particular attention focused on communication occurring between nurses and doctors.

Secondly, using the structure of the Medication Communication Model (Manias 2010), data were coded, and labels were developed and mapped against the three dimensions of this Model. The first dimension of the Model involves examination of environmental and sociocultural antecedents to the actual communication act, and included the structure of ward

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rounds, effect of interruptions, time of day, and beliefs and values about the nature of the interdisciplinary relationship. The second dimension involves analysis of the actual communication act, including words used during actual interactions, what is important for nurses and doctors who speak about patients' medications, what is shared during interactions, and by whom, who is silent in interactions, what is said during communication, what aspects are prioritised in medication management, body language and demeanour and actual words used. The third dimension of the Model involves determining the outcomes of the actual communication act, including whether safe and effective medication processes result and the nature of medication-related incidents. Tracked comments within the transcripts comprised the labels that were then organised into common topics.

Thirdly, an index was incrementally created from interviews, observations and focus groups, by numerically ordering main themes and related sub-themes. The data were revisited and marked accordingly.

Fourthly, data were charted by moving relevant data pieces according to the formulated index, into an Excel spreadsheet. Participants' study code and transcript pagination were attached.

Lastly, mapping and interpretation occurred. This process resulted in developing associations between themes and sub-themes.

Rigor of the research process

Rigor of the research process was addressed in many ways. The specific researcher who conducted a particular observation, interview or focus group was the individual who transcribed the audio-file verbatim. Detailed field notes were written and included in each transcription to aid clarity and context for analysis by the various research team members. Derived themes and sub-themes were shared among all team members, discussed and general consensus was achieved of the analysis process (Armstrong et al. 1997). Focus groups were conducted following interviews and observations, to provide participants with feedback and seek confirmation of early stage analysis, thus supporting validation of analysis.

RESULTS

In audio-recorded observations of 200 hours, 40 nurses interacted with 30 doctors about patients' medication needs. Each observation was approximately 3.5 hours in duration. Audio-recorded semi-structured interviews were conducted with eleven nurses and seven doctors. In addition, 59 nurses from the three clinical settings participated in one of six audio-recorded focus groups (Table 2). Participating nurses ranged in age from 22 to 65 years, with

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nine months to 49 years of post-registration experience. Participating doctors were between 26 to 52 years of age, and held various clinical positions, including residents, registrars, and consultants.

Complexities of interdisciplinary communication for medications encompassed the actual communication act between nurses and doctors. Sociocultural and environmental influences and outcomes of the actual communication act also affected interdisciplinary communication (Figure 1).

Actual communication act – Complexities of interdisciplinary communication for medications

Two main themes emanated from the actual communication act. These were: professionals' commitment to effective medication management and influences of professional identities on medication communication.

Professionals' commitment to effective medication management

Nurses and doctors were dedicated to providing safe care within their scope of practice. Communication focused on ensuring prescriptions were correct and appropriate. In interactions between nurses and doctors, communicating about organising the right prescription came either from the nurse or doctor.

All levels of nurses and doctors were observed to query, suggest, and update changes on patients' medication orders. Nurses often assessed patients' current medication orders and initiated conversation with doctors, suggesting that patients would benefit from commencing a new medication. For instance, a nurse caring for a 16-year-old girl post-operatively asked,

Nurse: And [we need] some anti-emetics. Because when she's been getting up, she's just been feeling a bit woozy. So she has been on a PONV [post-operative nausea and vomiting] chart but it's expired...great, thank you very much.

Resident doctor: That's alright (NUR-Surg-3).

Similarly, a nurse from the adolescent ward assessed an anxious, overtly-upset female patient and rang the doctor for an order,

Nurse: She's just hysterical in her room and I was wondering if I could get some lorazepam or something written up. She's just saying she's got pain, and she's just very, very anxious and she's sort

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of screaming. And we're offering her some Endone [oxycodone] but she just says that she's in too much pain to take it. And we're wondering if I could get her something to calm her down a little bit. Or maybe just even diazepam? If you want to do an over-the-phone order? (NUR-Adol-11)

Often, nurses queried with doctors about the planned duration of medication orders. Doctors also exchanged information with nurses on patients' medication orders. Altering pain relief to ensure patient comfort for procedural interventions prompted such a dialogue,

Anaesthetic registrar doctor: So she's going down for x-ray?
Nurse: Yeah at 11 [a.m.]
Anaesthetic registrar doctor: So I've written her up some oxycodone for once she's back from x-ray.
Nurse: Yep. Good, because she's not clicking it enough [patient controlled analgesia]. I reckon she'd get more coverage from Endone [oxycodone] (NUR-APN[Surg]-1).

Doctors and nurses communicated about titrating the medication dose and frequency for prioritising patient care. A nurse explained to the pain team registrar how her allocated patient, who had had an abdominal tumour resected, obtained pain relief with increased opioid doses, and how she had assessed the change:

Nurse: Yesterday we turned his ketamine down, but over the course of the day I turned it back up again. Because he just wasn't really coping and he was more sore, and he just didn't even want to move. Where he moves quite well in bed on his own, he just couldn't do it yesterday. He was crying, and much worse than he was. So we turned it up to 1.5 [mg/kg] and then that still really wasn't cutting it. So then just before I left yesterday at about 3 [mg/kg], we turned it up to 2 [mg/kg] again. He seems much better now (NUR-Surg-20).

Nurses' focus on the right medication dose and frequency resulted in asking doctors for changes to prescribed medications. For instance,

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Pain team nurse: And the other thing also, is having some extra, um he's [4-year-old patient] got 25 [mcg] of clonidine. We could even do like 15 to 30 [mcg]. And when he has his dressing done I've asked the nurses to give him a bolus of morphine, plus the clonidine, like half-an-hour or so before. So are you happy?

Resident doctor: Yep. Yeah, that's fine (NUR-APN[Surg]-2).

The influence of professional identities on medication communication

While nurses and doctors were dedicated to providing safe care within their scope of practice, they performed their roles with differing communication styles. Most participating nurses and junior doctors' use of indirect language differed to that of senior doctors and a few nurses. Doctors' lack in verbally informing nurses of changes to medication orders impacted on patients and nurses.

Roles for prescribing and administrating medications were clearly demarcated. Yet, nurses, irrespective of seniority, and junior resident doctors tended to use tentative language for managing the process. Nurses often suggested changes to medication orders using plural, first-person pronouns rather than identifying the suggestion as their own through single, first-person pronouns. For example, "so we were just wondering if we could change her maybe to an infusion today?" (NUR-Surg-3). In addition, nurses used tentative words such as "just", "maybe", "do you mind", "sort of", "how about", and "can I hassle you" (RN-Neuro-37). An instance of a nurse using tentative language conflicted with the fact she did indeed need a valid order for the patient's glucose tolerance challenge, "sorry to bother you, it's not really that important" (NUR-Adol-6).

Twelve instances were observed where senior nurses used direct language when speaking with doctors about patients' medication needs. These nurses asked for changes to current medication orders. For instance, "He doesn't want to take anything orally and is really sore. Can I get that changed to IV?" (NUR-Surg-20). Nurses also sought clarification around current medication orders, such as the patient's intravenous (IV) infusion rate:

Resident doctor: Switch it up, continuous.

Nurse: Yeah, sure. 85 mL an hour?

Resident doctor: Yep, and then we'll see how she [10-year-old patient] goes (NUR-Neuro-24).

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In one instance, the nurse asked for a new medication order as the 14-year-old patient was now tolerating oral food and fluids, specifying the medication and a change in dose:

Nurse:	((to resident doctor)) Can you change this to oral?
Resident doctor:	Ranitidine? Can we just do IV slash oral [IV/oral on the medication order]?
Nurse:	No. it's a different dose.
Resident doctor:	Is it?
Nurse:	Yeah, it's totally different.
Resident doctor:	Are you sure?
Nurse:	Yep (NUR-Neuro-36).

Resident doctors also used tentative language when speaking with nurses about prescribed medications, or in response to nurses' questions about them. In contrast, only one registrar was observed to use tentative language. After the medical teams' review, resident doctors supported medication changes when speaking with nurses by using plural, first-person pronouns, "We're just kind of reducing the pain relief" (observation of RN-ADOL-2) and "We'll just need to increase her fluid drip on maintenance…and *we'll just* see how she goes from here on out" (NUR-Surg-3). Resident doctors also deferred to the patient's allocated nurse for how and where to prescribe medications, "And so, where do you want it? Do you want me - If I just change it here, is that alright? And initial it? [referring to medication chart]" (NUR-Surg-4). Another resident doctor was conferring with a nurse about an ordered dose of flucloxacillin that was greater than the dose recommended in the guidelines for a 10-year-old child:

Nurse:	Then everyone questions it. So I don't know if you'd like to make a little note or something.
Resident doctor:	Yeah.
Nurse:	So that…you don't have to get paged constantly.
Resident doctor:	Is this, I wonder if it's just because it's rounded up, or can we just go down to 1.2 grams, because then that would be fine, wouldn't it? Because that might even be easier to draw.
Nurse:	1.19 [grams]. So it's 50 [mg] per kg.
Resident doctor:	Oh, ok. So that sounds ok (NUR-Surg-2).

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In contrast to junior doctors' communication style, senior doctors such as registrars, consultants and fellows, and some senior nurses were observed to use direct language for medication communication. They conveyed information and directed activity clearly, using declarative language and closed questions. All senior doctors were observed to use direct language for medication communication, except for the one instance mentioned earlier. For example, a consultant used clear, concise language when giving the nurse an order,

Consultant: Make sure you write down to call if there's concerns about seizure intensity and things to discuss within her meds. [medications]. We're hoping to not give her anything, and take her to surgery still clean, then she'll come back on medication (observed NUR-Neuro-36).

There were many instances of registrars, consultants and fellows using direct language when explaining to nurses about changes required for patients' medication plans. While senior doctors were observed to use this form of communication, they did so courteously; one consultant politely let the nurse know the patient's infusion pump was alarming, "I was coming to get you as I know you're busy. Because, yes, his infusion's gone through and it's just beeping away on the ward" (observed NUR-Neuro-28). Also, a registrar doctor when queried by a nurse on the dose she had prescribed, politely acknowledged her error,

Registrar doctor: What's wrong with the meds [medications]?
Nurse: So he's [7-year-old] normally on 4 milligrams on hydrocort [hydrocortisone]
Registrar doctor: ((interrupts)) No, no, that's a high dose ((defensive tone)).
Nurse: Um, ((hesitating)) so it's triple the dose… So is it 12 milligrams?
Registrar doctor: ((doing the maths under her breath)) Yeah actually yeah, it's 12…that's right. You're right, thank you (NUR-Neuro-39).

Senior doctors also used direct language when seeking information about patients. Introductory type questions were common by senior doctors doing their rounds of reviewing patients, such as, "How's he been overnight?" (DR-Surg-22). More specific questions usually followed. For instance, a registrar anaesthetist asked a clinical nurse specialist, "Has he [15-year-old patient] had any adverse effects with gabapentin?" (APN[Surg]-2)

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A few senior doctors were observed to educate nurses on their prescribing rationale. For instance, a registrar doctor ceased an order for Nurofen [ibuprofen], and explained to the nurse, "If he's [10-year-old] not eating, he's not really peeing. I'm just a bit concerned about his kidneys…he just needs to drink a bucket load. Otherwise, he's getting drips" (NUR-Adol-1). Another registrar doctor wanted itraconazole serum levels collected from the patient "before he takes the tablets" (NUR-Adol-1).

Senior nurses and advanced practice nurses (APNs) were observed to use direct language. Specialist nurses had specific knowledge and experience, and they commanded respect from doctors who often sought their advice about medications. For instance, the Anaesthetic Registrar asked the APN for her opinion, which she gave succinctly:

Anaesthetic registrar:	I don't know why he [4-year-old patient] doesn't have tramadol.
APN:	He doesn't need it, probably, if they're giving everything else.
Anaesthetic registrar:	Oh. At least sort of 20 minutes before physio [physiotherapy] you give him a bolus of morphine (APN[Surg]-1).

APNs were members of a specialty team with treating doctors who cared for particular patients in a clinical area, for example, those patients requiring extensive pain relief and diabetes management. The doctors' respect for APNs' opinions was more apparent compared to interactions observed with other nurses providing patient care. For example, senior doctors' respect for the specialist nurses was recognised by a Visiting Medical Officer (VMO). The VMO sought the pain team nurse's opinion while on a pain team patient review round, "How do you find Tramal [tramadol]? [Be]cause as a GP [general practitioner], I wasn't that excited about Tramal" (APN[Surg]-1). Likewise, an APN and endocrinology registrar engaged to determine best care for their patient:

APN:	And we want to see if he [16-year-old] needs 14 units rather than 12 ((units)).
Endocrinology registrar:	I think we should go up in the Lantus [insulin glargine] ((dose)) tonight at this stage.
APN:	I have. 22 ((units)) [of insulin] (APN-13).

Information on patients' medications was also shared in parallel between doctors and nurses. The medical team comprising the resident, registrar, consultant, and occasionally the fellow, reviewed patients with the bedside nurse often present. Discussions on patient

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progress and needed medications were carried out between the doctors. On these occasions, contributions made by the nurse caring for the patient were not included in the doctors' interactions while planning ongoing patient care.

Use of casual language between all levels of nurses and doctors was observed, such as "drink a bucket load"; "just beeping away"; "bitten me before"; and "she's got the green light from the boss" (NUR-Surg-2). As shown in the following observation:

Nurse: Yeah. She's sort of sitting there. I think she sort of forgets to click it [patient controlled analgesia]. Cool. Sounds like a plan.

Anaesthetic Registrar: Easy. Or take it down before if you want, you can give her some oxycodone whenever you reckon (NUR-APN(Surg)-1).

There were many instances where doctors did not verbally inform nurses about documented changes to medication orders. A nurse in a focus group (FG-Surg2-NUR) explained, "The problem comes when they don't tell anyone. When they just change it on the med [medication] chart and write a note." Similarly, a nurse from a different ward shared,

Nurse: Doctors amending drug orders that have already been there for a few days. So you've read it as say, Drug A given twice a day, and then that's happened. And then they've come along and crossed off and changed it to three times a day.

Researcher: But not let you know?

Nurse: Well, it makes it look like it's only been given twice a day when the order says three times a day and they haven't clarified when (FG-Adol-NUR).

One nurse in a focus group (FG-Adol-NUR) thought doctors ensured they verbally handed over the addition of a medication for a patient when it was considered "a bit more urgent". Nurses gave reasons for why they thought doctors omitted verbally telling them of changes to patients' medications. They perceived doctors were too busy to take the time to find a nurse (FG-Surg2-NUR); doctors were from outlier teams (FG-Neuro2-NUR); and some nurses thought doctors did not care if nurses missed changes and thus medication administration to patient. According to one nurse, "they also don't even really care if you miss it either" (FG-Adol-NUR). Furthermore, nurses in one focus group thought doctors considered their job was completed once the prescription was written (FG-Adol-NUR). Thus, nurses believed

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documenting a medication order did not necessarily mean that the message had been communicated to them. Others thought doctors were not aware of nurses' routine in accessing patients' medication charts, that is, nurses had planned at the start of the shift when medications were due, "You know when something's due, and that's the only time you've looked at the med. [medication] chart" (FG-Surg2-NUR).

Excessive demands for doctors' time was recognised by one nurse, "We're always really busy…the medical team, maybe they're time poor as well, but I find that they don't really communicate a lot verbally to us" (NUR-Surg-45i). Indeed, a number of doctors shared how time pressured they were. For example, "I have worked as a resident now for a number of years, so I know how busy the cover resident jobs can be" (INT-Dr1), especially after hours, "at night, when obviously it's reduced staffing and we're in higher demand sometimes" (INT-Dr2). Similarly, a consultant explained to a nurse how busy the team was and could not wait for the patient to be located for review, "We've got a huge list. I'm really sorry but I can't wait. We'll be back" (NUR-Neuro-33).

Sociocultural and environmental influences – Symbiotic interdisciplinary relationships

Sociocultural and environmental influences involved symbiotic interdisciplinary relationships between nurses and doctors. Three themes included: nurses being proactive to fulfil their role, nurses challenged to fulfil their role, and doctors' dominant role.

Nurses proactive to fulfil role

Professional identities on medication communication were affected by nurses' confidence to actively engage with doctors. Nurses' focus to fulfil their role that culminated in safe medication administration prompted many queries about medication orders and why certain medications were not ordered. For example, a nurse shared how "I talk to doctors mainly about doses or adverse reactions. Or why they're [patients] still on it. Like today, I queried why somebody was still on oxybutynin, like after they don't have a catheter anymore" (RN-Adol-1i). During interviews, doctors showed respect for nurses' familiarity with appropriate doses for children, "you do very much rely on nurses' knowledge, to realise I suppose that it's either a really inappropriately low or high dose for the situation" (Senior Res1).

Nurses recognised doctors had demanding roles and often needed prompting to update medication orders. NUR-Adol-2i explained in an interview,

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Nurse: …For some of your surgical post-op. [post-operative] patients, they'll [consultants] say "Cease the IV anti's [antibiotics] after 48 hours", but the resident may not have seen that or has forgotten that, and it's just something to remind them about.

Seniority of nurses also influenced active engagement with doctors in all three clinical settings. For example, the nurse-in-charge of a shift considered it appropriate to query senior doctors on whether an opioid infusion was to continue (DR-Surg-22). Engagement between senior doctors and nurses, and senior nurses' persistence with senior doctors resulted in effective medication communication.

Nurses reminding doctors of patients' medication orders, met not only the patients' needs, but also fulfilled the nurses' perceived role responsibilities. These role responsibilities included appreciating when nurses discovered dose errors, "I'd say they probably are exhausted, we can all make mistakes, I suppose" (FG-Neuro1-NUR). Therefore, nurses were proactive to fulfil their role by using clinical judgement and taking the initiative to communicate with doctors.

Overall, nurses found doctors approachable in responding to their queries. This situation was particularly important for resident doctors, who were initially paediatric medicine-naïve. Nurses proved to be residents' guiding allies. Nurses shared their experiences of teaching junior medical staff and offered helpful ideas about how communication could be more effective with them, "Every time new residents come on…maybe we could just make a booklet…particularly in our specific population…that would be very helpful" (FG-Surg2-NUR).

Both parties were proactive in fulfilling their roles with each other. For example, the pain management service registrar doctor fostered the relationship and found "good value in face-to-face communication. And if that's not possible, at least a phone call" (DR-CPMS[Surg]). Nurses appreciated the respect and trust some doctors displayed towards them, "I think it's a real respect because we're, it's shared, interdisciplinary" (FG-Neuro2-NUR). The importance of effective relationships was also raised in one nursing focus group,

Nurse: That relationship that you have with them [residents] makes it a lot easier to get things done. Because they trust you, they know your capabilities. You know them, so it just helps (FG-Surg2-NUR).

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Nurses spoke of the medical hierarchical structure for medication management, "There is a pecking order here, and we're supposed to call the resident" (FG-Surg1-NUR). Junior doctors were usually the ones present on the ward and whom nurses asked for medication orders. One nurse explained to the researcher how working relationships benefited from junior doctors' consideration of nurses' needs:

Nurse: Oh well, you see especially with all our residents that come through, the baby doctors. You know the ones that spend that little bit extra time, probably like saying to the nurses, "Like is there anything else, etc.?" They end up being loved by everyone. You know their job is just…it ends up making their job a million times easier because you see like a doctor trying to get something done, if they've been nice in the past, everyone will run to help them (NUR-Neuro-33).

Nurses challenged to fulfil their role

Residents were allocated to a ward for 12 weeks and then rotated to another. They usually did not have prior paediatric experience, nor experience of the many paediatric specialties. Therefore, nurses were confronted by junior doctors who were often hesitant to accede to nurses' requests for medication orders. Furthermore, junior doctors still had the responsibility attached to prescribing, including the right to deny a prescription, as nurses shared in a focus group, "they sort of think that they're kids so we shouldn't give them [patients] these drugs. Whereas they need them. So it's a fight" (FG-Surg3-NUR).

Nurses also frequently spoke of their frustration with junior doctors who refused to listen to their knowledge based on extensive paediatric experience. For instance, nurses often asked resident doctors to chart analgesia for patients,

Nurse: We have doctors who aren't so keen on prescribing how we would like them prescribed. They're quite low doses of things…below therapeutic levels…like they're new doctors to paeds, [paediatrics] and they don't have much experience, they don't like changing it [the medication] (NUR-Surg-44i).

Similarly, nurses shared in a focus group their frustration with residents' lack of knowledge for paediatric dosing parameters and commonly used medications,

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Nurse: Most of them have never done paeds. [paediatrics] before. So then they get here, and it's just quite specialised.

Nurse: So calculations, because everything is weight-specific here. Whereas adults it's just "Ok, this is what you're on." You're an adult, these are your anti's [antibiotics].

Nurse: But also, they don't like to use tramadol in children.

Nurse: Or diazepam (FG-Surg3-NUR).

Nurses' access to medication orders out-of-hours was an important environmental influence. Resident doctors were often unfamiliar with the patient, the specialty's particularities of medications and dosages, such as the following nurse stated,

Nurse: Because the after-hours resident doesn't often know the patient, which is a safety thing, they just don't feel comfortable charting it. But then it can be detrimental to the patient, because they have pain (NUR-Surg-44i).

Access to reduced medical staffing in out-of-hours also impacted on nurses providing patient care, "So evening, any time after hours is really difficult. We can wait hours to get someone to review a child and that's a long time. It's horrible, that's the worst" (NUR-Surg-1). Subsequently, inter-professional conflict between nurses and doctors existed.

The inherent medical culture influenced the nature of verbal medication communication with nurses. Doctors said they expected nurses to clarify ordered doses if unsure, to discover changed orders versus verbally handing over the change, to administer ordered medications correctly and to appreciate their time-constrained role. On the other hand, nurses were the professionals administering the medications to patients and as such, were keen to perform this activity safely without error. Nurses perceived their role involved clarifying medication orders with doctors when they were unsure of the orders' appropriateness, or if they thought a change to a current order was needed.

Doctors' dominant role

The hierarchical nature of the inherent health care system, whereby doctors prescribe and nurses administer medication, meant the doctor had the ultimate decision for medication management. To achieve this end, senior doctors exuded confidence, and were polite in the

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manner of their communications. However, as elicited through interactions between APNs and senior doctors, it was apparent these doctors respected the APNs' opinions to a greater degree when deciding patients' ongoing care; they practised collaboratively. The environment culture meant these specialty doctors and APNs were professionally familiar with each other as they were a constant group. They had a routine pattern of interaction to review patients, conducting patient rounds together to plan care. APNs were actively engaged in medication management. For instance,

Anaesthetic registrar:	Even, to make it easier. Why don't you give a PRN [as required] dose of this [clonidine] now, and then go on to the regular after, at 2 [mcg/kg].
APN:	Well, you could do that as well…That would probably be easier. I wouldn't mind that (for a 4-year-old patient after spinal fusion surgery) (APN[Surg]-1).

Outcomes of the actual communication act – Commitment to effective communication and impact on medication incidents

Outcomes of the actual communication act involved two themes. These were communication of nurses and doctors to effective medication communication, and impact of miscommunication towards potential and actual medication incidents.

Commitment to effective medication communication

Participants recognised the demands of each other's role and actively sought to foster interdisciplinary care to achieve desired outcomes for patients. The provision of safe medication care of paediatric patients resulted from nurses' and doctors' continued communication efforts. The teamwork culture between nurses and senior doctors facilitated patients' medication needs. Nurses' persistence with senior doctors also helped to ensure effective medication management. In addition, nurses felt that doctors who verbally handed over to them changes made to patients' medication orders, facilitated safer care. Conversely, the lack of communication was "what really kills you" (FG-Neuro1-NUR).

Impact on medication incidents

Actual medication incidents included: incorrect doses for the child's weight, incorrect route and frequency orders, mis-documentation when orders were written over the original one at a later date, incomplete orders, medications not administered due to doctors not verbally

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handing over to the nurse that a new order had been made, missed doses due to medication administration times not written, multiple medication charts with the same medication prescribed on two charts, and patients having incorrect identification bands. For example, one doctor described how nurses drew his attention to a prescribing error prior to the medication being administered,

Doctor: The nurses are excellent. I had a nurse come up to me on one of my cover shifts and I had incorrectly dosed flucloxacillin for a child and it was actually twice the dose because when going from IV to oral, you actually halve the dose, which is sort of counter-intuitive (INT-DR2).

A nurse updated her colleague on having the patient's analgesia order corrected before administering, "So I've gotten the doctor to chart your Panadol [paracetamol] and Nurofen [ibuprofen] again because they wrote it wrong. They wrote like a gram of Nurofen" (NUR-Neuro-25).

Omitted verbal interactions about medication changes also sometimes led to missed doses, for example, phosphate and vitamin D. A nurse in the focus group gave an example of a doctor not telling a nurse of an order where a double dose was given,

Nurse: We had a patient who, we checked their therapeutic drug level for an antibiotic, and so one of the doctors had circled a box on the drug chart. It had been given earlier that day, it was a daily administration, but then circling it again that day…it [tobramycin] was given twice (FG-Adol-NUR).

DISCUSSION

This study has elicited the complexities of medication communication practices between nurses and doctors in paediatric settings. The dedication of these health professionals to safe medication care was apparent. Nurses queried doctors on medications ordered and not ordered; doctors exchanged ideas with, and some explained to nurses about prescribed medications. Sociocultural and environmental influences, and inter-professional interactional styles during the actual communication act affected potential and actual medication incidents.

Both professional and organisational factors influenced nurses and doctors' communication patterns. Professionally, the nurses' role demands safe medication

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administration to fulfil the edicts of the Nursing and Midwifery Board of Australia (2006). Participating nurses, irrespective of post-registration years of experience, had acquired the role identity of the registered nurse, who has a professional responsibility to administer medications by being able to "describe and adhere to legal requirements for medications" (Nursing & Midwifery Board of Australia 2006, p. 2). Nurses not only adhered to the five rights of medication administration (right drug, dose, time, route, patient), but critically assessed medication orders, taking into account their clinical knowledge of paediatric requirements and satisfying the organisation's sixth 'right', the right to refuse. They liaised with doctors and managed their environments to achieve safe outcomes for patients. Similarly, nurses from a children's hospital, focussed on improving their clinical reasoning skills for safe medication administration, taking into consideration the patients' age and developmental level (Mullen & Asher 2007). In Smyth, Toombes and Usher's (2011) work, nurses were also concerned about making decisions to choose appropriate analgesics to ease paediatric patients' post-operative pain.

Likewise, doctors' professional role in medication management reflected medical role demands. The medical ideology of being scientifically and technically correct described doctors' professional role identity (Apker & Eggly 2004). Furthermore, doctors' training prepared them to practise autonomously (Ivory 2015), within an embedded medical hierarchy (Thomson et al. 2015). Fiordelli et al. (2014) found resident doctors felt they were "everybody's lackey" (p. 319) and their most important attributes for success were planning skills and diplomacy with other staff and patients' families. Residents' roles in the current study were similarly pressured and time constrained.

Deeper understandings of nurses and doctors' roles can be gained from identity theory (Burke & Stets 2009). Individuals develop self-meanings for their role, in this case, as nurses and doctors. Each person seeks to have their identity verified, or affirmed. Nurses were observed to identify with their role as professionals who only administered medications they understood to be correct for their patients. Doctors were also observed to identify with their role as professionals who efficiently prescribed appropriate medications for patients. How these professionals went about achieving these goals, or had their identity confirmed was influenced by organisational factors, and the necessary collaborative nature of providing acute paediatric care.

The organisation's structure and function influenced medication communication between nurses and doctors in a number of ways. Resident doctors, with whom nurses could frequently communicate, were assigned to individual wards on a rotating basis. They were present throughout the day and evening shifts. Ward nurses and doctors came to know and

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trust each other over time, positively influencing communication about patients' medication needs. As Eklöf et al. (2014) found, patient safety flourished from communication between constant inter-professional groups. Creswick and Westbrook's (2010) and Tamuz et al.'s (2011) findings support this study's findings, of nurses at times guiding and answering residents' questions on patients' medication needs, especially after hours. However, difficulties arose from junior doctors being the only after-hours medical staff. They were responsible for contacting senior doctors if needed. As Arabadzhiyska et al. (2013) found, after-hours junior doctors experienced many interruptions while attending to medication related tasks, thus increasing the risk for error. Indeed, nurses in the present study voiced difficulties in obtaining correct medication orders from resident doctors during out-of-hours.

Furthermore, the organisational pattern of ward rounds influenced communication patterns between nurses and doctors. The pain management and diabetes service clinical teams observed on ward rounds embraced their role of providing patient care by openly sharing ideas, irrespective of the professional group to which they belonged. Unlike the interdisciplinary paediatric cardiology team in Birkeland et al.'s (2013) study, the pain and diabetes teams were satisfied with their communication modes and appreciated each other's professional role. However, medication changes arising from other medical team ward rounds were not always communicated to nurses. As Liu et al. (2013) found, doctors and nurses' role demands negatively influenced available time for informing others of medication changes.

Within these demands, nurses and doctors fulfilled their roles for medication management, of necessity. Collaboratively, their roles existed because of the health care environment. Not only had each professional group acquired role identities, working in relation to the other in the clinical environment, nurses and doctors also acquired a social identity (Stets & Burke 2000). That is, nurses and doctors worked on wards, within specialties, within a paediatric hospital, for which they developed a sense of belonging in their groups at various levels, with shared values and the mutual goal to implement best practice for patient care (Haslam et al. 2009). In fact, participants articulated the difference made for flow of communication when the team was a constant group.

While values and goals were shared, patterns of customary interactions occurred. Within this social milieu, most nurse participants managed their discordant role identity in being an experienced professional who was dependent on doctors' orders (Snelgrove & Hughes 2000). They linguistically manoeuvred with doctors to achieve the desired outcome. Nursing staff of a tertiary hospital in the United States described similar skills (Apker et al. 2005) for group cohesiveness. They "carefully guided conversations with physicians to influence the

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interaction…sometimes swallow[ed] their pride [to] accommodate the hierarchy…[or] subverted the hierarchy by limiting their suggestions to physicians who will accept them" (Apker et al., 2005, pp. 102-103), all to achieve what they thought were the best outcomes for patients. Similarly, nurses in Propp et al.'s (2010) study used diplomatic communication practices and individualised their communication to suit each doctor to achieve safe outcomes for patients. As a corollary, Garon (2012) found nurses felt empowered when they spoke up and were heard. In this study, nurses who instead used direct language akin to senior doctors, met with doctors' learned preference for concise, objective information.

Language used by doctors also reflected their acquired social identity. As Pekukonis (2014) explained, profession-centric language and behaviours are learned through training with mentors, role models and teachers. The medical profession actively engages to embed the power their directions hold within the institution (Currie et al. 2012), intra- and inter-professionally (Milne et al. 2015). At times, registrar doctors were observed to be disrespectful to nurses by ignoring their presence through no verbal communication, providing only written orders, or speaking abruptly (Milne et al 2015). Instead, junior doctors served as the conduit between senior doctors and nursing staff. Likewise, Lewin and Reeves (2011) reported findings of parallel working and hierarchical power differentials with the medical team, and between doctors and nurses. As in Gotlib Conn et al.'s (2009) study, some inter-professional communication was asynchronous; that is, it occurred through the written form by doctors in patients' medication charts and progress notes for nurses' action. This process reinforced isolation between the professions and hierarchies. Costello and Thompson (2015) found further lack of effective communication between doctors and nurses from poor understanding of the other's role, and doctors' disrespect for nurses that resulted in ineffective collaborative care.

Communication patterns between junior doctors and nurses may explain developing social identities where the other is considered a co-member of the group (Bartunek, 2011). Many observed interactions around medications were between nurses and junior doctors. Weller et al.'s (2011) study of junior doctors and newly graduated nurses found they aimed for inter-professional collaboration, without competition between their complimentary roles, for patient care. As Ibrahim et al. (2013) posited, early stages of medical careers is the prime time to foster collaborative engagement with other health care professionals, thus promoting improved patient safety. Most nurses and junior doctors may have used tentative language attempting to develop these collaborative relationships.

Similarly, nurses skilled in communication and relational behaviours have been found to improve team function and patient safety (Propp et al. 2010). Empowering nurses with these

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skills, along with medicines' drive to improve respectful interactive practice within their autonomous roles (Ivory 2015) could improve recognition and acceptance of the others' role and social identities (Bartunek 2011) for paediatric patient care. Indeed, as observed with advanced practice nurses and medical teams, effective communication resulted through inter-disciplinary information sharing and collaborative problem-solving (Brock 2013).

In this study, the Medication Communication Model was helpful in examining the complexities surrounding communication between doctors and nurses about managing hospitalised children's medications. In examining the sociocultural and environmental dimension, influences relating to varying levels of experience of doctors and nurses, their social identity, professional values and goals, and the organisational structure of the clinical settings were elucidated. The communication acts elaborated on the actual words conveyed for determining the right prescriptions for patients, and titration of the right dose and frequency of medication, and on use of direct, indirect and casual language. In examining the outcomes of communication, a teamwork culture between nurses and doctors facilitated patients' medication needs and effective medication management, but miscommunication sometimes led to actual and potential medication incidents. Through use of the Model, it has been possible to illuminate the complex dynamics of medication communication between nurses and doctors.

Limitations

Findings may not be applicable to non-tertiary paediatric hospitals, or paediatric wards within general hospitals. In addition, the medication prescriptions were paper-based; electronic prescribing and patients' records are increasingly being used due to technological changes. Further research should involve eliciting how electronic prescribing impacts on medication communication between nurses and doctors. There is the possibility that an observer effect occurred. However, observers continually emphasised that their intent was not to judge but rather to understand the messiness of how medication communication took place. Prolonged interactions with participants led to increased familiarity, which meant that they were unlikely to change how they behaved and acted.

CONCLUSION

Medication communication between nurses and doctors was a complex, symbiotic relationship. Their dedication to provide safe medication therapy to paediatric patients was hindered at times by inter-disciplinary communication shortcomings. Complexities in

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medication communication involved developing an understanding of the formative effects of nurses and doctors' professional roles and social identities.

RELEVANCE TO CLINICAL PRACTICE

Effective communication between nurses and doctors is necessary to allay medication incidents for children. Since professional roles are engendered throughout training, dedicated inter-professional respect for each other's role and inherent demands is necessary. Interdisciplinary education delivered in health care organisations can facilitate greater clarity in communicating about medications. Joint consensus to use direct language, and concise, clear words can promote improved understanding between parties, and accuracy and efficacy of medication management.

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Table 1 General schedule for observations, interviews and focus groups

What roles are played by nurses in communicating with doctors about medications?
What roles are played by doctors in communicating with nurses about medications?
What words are used during actual interactions between doctors and nurses?
How is language used in interactions between doctors and nurses?
How does communication between doctors and nurses affect the ways in which medications are managed for hospitalised children?

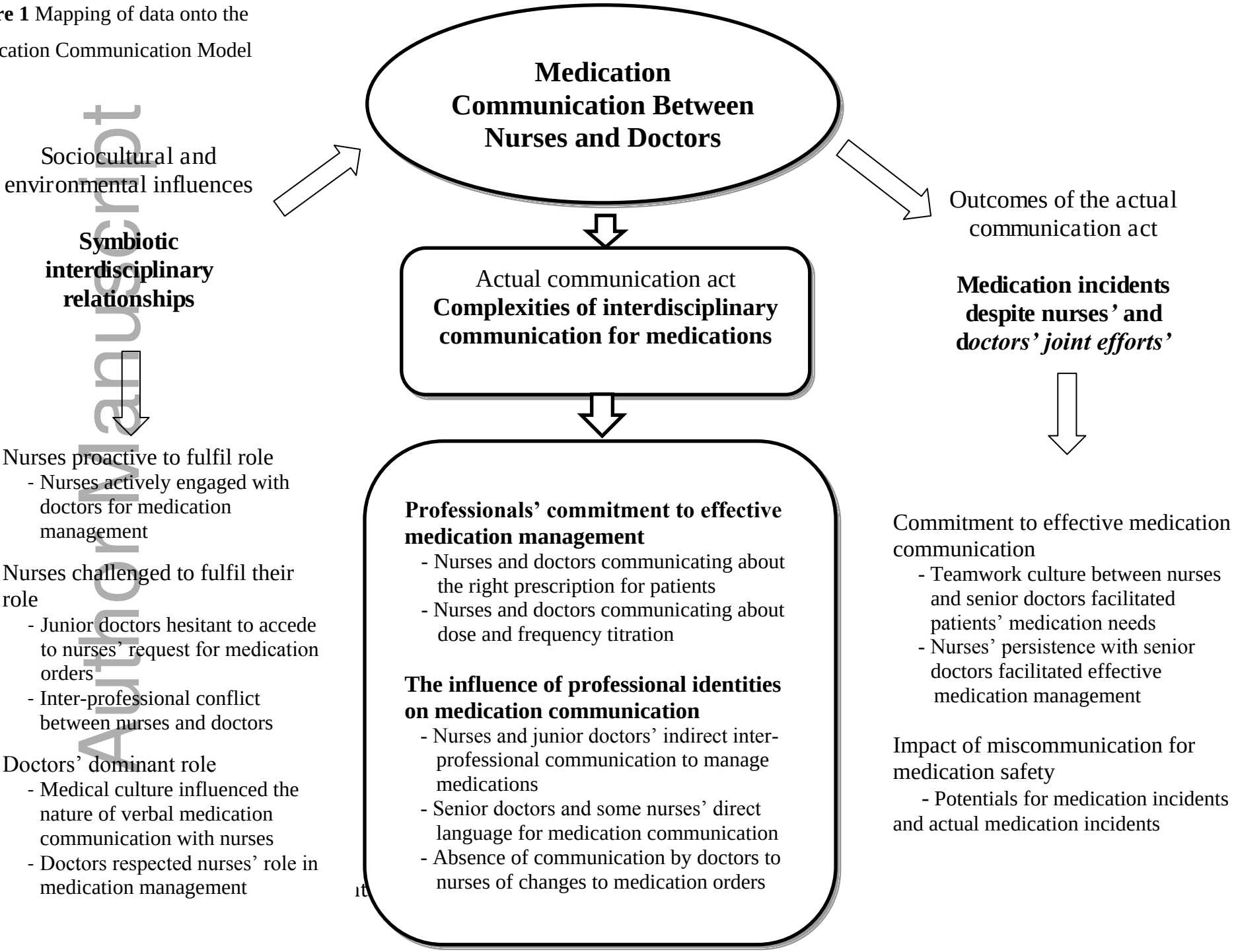
Table 2 Sources of data collected

Source of data	Number involved
Observations	200 hours overall Medical ward - 75.5 hours Surgical ward - 61.25 hours Specialist care, and mixed medical and surgical adolescent ward - 63.5 hours
Individual interviews	11 nurses 7 doctors
Focus groups	6 focus groups comprising 59 nurses

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Figure 1 Mapping of data onto the Medication Communication Model



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