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# Understanding the information dynamics of medication administration in residential aged care facilities (RACFs): A prerequisite for design of effective ICT systems

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**Abstract.** Medication information is a critical part of the information required to ensure residents' safety in the highly collaborative care context of RACFs. Studies report poor medication information as a barrier to improve medication management in RACFs. Research exploring medication work practices in aged care settings remains limited. This study aimed to identify contextual and work practice factors contributing to breakdowns in medication information exchange in RACFs in relation to the medication administration process. We employed non-participant observations and semi-structured interviews to explore information practices in three Australian RACFs. Findings identified inefficiencies due to lack of information timeliness, manual stock management, multiple data transcriptions, inadequate design of essential documents such as administration sheets and a reliance on manual auditing procedures. Technological solutions such as electronic medication administration records offer opportunities to overcome some of the identified problems. However these interventions need to be designed to align with the collaborative team based processes they intend to support.

**Keywords.** Medication administration, aged care, information exchange

## Introduction

The medication process is a complex subsystem in the delivery of care in residential aged care facilities (RACFs) [1]. Prescribing, ordering, preparing, administering and monitoring medications are reliant on coordinated information exchange among the geographically dispersed stakeholders (RACFs, doctors and community pharmacies) [1]. Medication administration has been identified as the most time consuming and vulnerable stage of the entire RACF medication management process [2-4]. Although it may appear as a simple nursing task, the combination of polypharmacy and the medical complexity of residents' care needs make it an intricate process in RACFs [5]. The unique operational context of RACFs with low ratios of registered nurses (RNs) to other care staff elevates risks to medication safety [6]. Timely exchange of medication information between stakeholders (doctors, community pharmacists, allied healthcare professionals and RACF staff) is the primary mechanism to monitor residents' clinical

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status [5, 7]. Inaccuracies or miscommunication of information gathered in the medication administration process can be detrimental to residents’ safety. Studies report on the poor quality and accuracy of medication information in RACFs [8]. There is a paucity of studies that identify practices which affect the quality of collected information. In this qualitative study we aimed to identify determinants in the RACF medication administration process which impose risks on the quality of gathered information.

**1. Methods**

Data were collected at three RACFs in metropolitan Sydney, Australia. The selected sites were part of a large non-profit organisation. The RACF sites described their information and communications technology (ICT) arrangements as a mixed (hybrid) system involving paper and ICT. However, all the key medication-related procedures were paper based. One of the authors, collected data over three months (May to September 2011) during which 22 days (74 hours) were spent observing aspects of RACF work related to the medication administration (Table 1). Field notes and photographic images of the artefacts used were the prime source of data. Observations were conducted during day shifts (7 a.m. to 3 p.m.) and included at least two rounds of medication administration (breakfast and lunch). The interviewees were recruited using purposive sampling methods, based on their involvement in the medication administration process (Table 1). Selected members of the quality management team were interviewed to gain an understanding of the quality concerns relevant to medication administration. All interviews were audio-taped, professionally transcribed and verified by one member of the research team that checked the accuracy of the transcript with the audio. The analysis was carried out with the help of qualitative analysis software NVivo [9]. One of the authors performed the initial open coding of the data for content pertaining to the description of the different stages of the medication administration process [10]. The initial coding was shared with the other authors and was reviewed to identify the need for any restructuring of the coding scheme [11]. Revision and finalisation of themes was achieved via triangulation and consensus between all researchers (AT, AG and JW) [12]. Member checking of results occurred through follow up interviews with site managers and quality team manager.

**Table 1.** Data Collection Summary

<b>RACF Site A</b> (58 residents)	<i>Interviews (average time per interview: 25 minutes)</i> 1 doctor, 1 care manager, 1 deputy care manager, 3 staff members <i>Observations (Total time: 28 hours, Average time per session: 4.5 hours)</i> 3 doctors, 1 care manager, 1 deputy care manager, 7 staff members
<b>RACF Site B</b> (46 residents)	<i>Interviews (average time per interview: 29 minutes)</i> 1 care manager, 1 deputy care manager, 1 nursing consultant, 3 staff members <i>Observations (Total time: 26 hours, Average time per session: 4.5 hours)</i> 4 doctors, 1 care manager, 1 deputy care manager, 8 staff members
<b>RACF Site C</b> (26 residents)	<i>Interviews (average time per interview: 25minutes)</i> 1 deputy care manager, 1 nursing consultant, 2 staff members <i>Observations (Total time: 26 hours, Average time per session: 4.5 hours)</i> 2 doctors, 1 care manager, 1 deputy care manager, 4 staff members
<b>Quality Team</b>	<i>Interviews (average time per interview 35 minutes)</i> Sample: 1 quality manager, 2 members of the quality management team

## 2. Results

All RACFs receive regular medications packed as dose administration aids (DAAs). The type of DAAs packed by the community pharmacy in this study was the “Weekly Webster pack” [13]. RACFs also receive a large amount of non-packed medication, e.g. liquid medication, patches, and Schedule 8 (S8) medications (drugs of addiction such as morphine and oxycodone). Medication is sometimes administered by the registered nurses (RN), but the majority of medications are administered by care staff, who have in general less training in the handling of medication than qualified nursing staff. During administration they sign for the whole pack rather than individual medications.

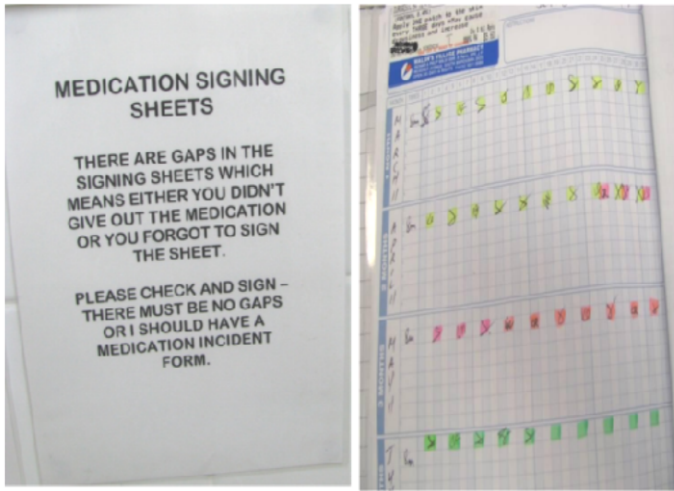
**Pre-administration:** Activities at this stage include preparing the medications and administration sheets. Medications for one resident are often spread over more than one pack. This requires staff to ensure that Webster packs for the same resident are physically tied together to avoid missed dosage errors. For non-packed medications and PRNs (as-required medication) staff manually check the drug stock and expiry dates on a regular basis to ensure they are appropriate for administration. Some key hazards identified included: a) refilling the same medication box therefore mixing up medications with different expiry dates; b) inaccuracies in S8 drug record maintenance; and c) poor PRN stock management (Table 2). Participants reported recurring instances of where the wrong drug labels were placed on administration sheets (Table 2). The administration sheets have a large number of small signing slots; staff sometimes mistakenly sign under the wrong date (Figure 1). As explained by the participants this is common for medications which are required to be administered on weekly or fortnightly basis. Managers therefore need to manually highlight the administration dates on the sheets prior to the administration of the drug (Figure 1).

**Table 2.** Pre-administration- Leading quotes and observations

<p>“One of the things that often gets missed is if there have been new short terms” (Quality Team Member)</p> <p>“There were boxes of Movicol and I turned up to see they [boxes] were all being repacked... they would have different batch numbers, different expiry dates” (Quality Team Member)</p> <p>“Oral morphine: – ordine – pre-dispensed bottles are not being entered in S8 drug book when discarded after expiry date to be written in last page in S8 drug book” (Minutes staff meeting)</p> <p>“The label of drug X sometimes gets on administration sheet of drug Y” (Quality Manager)</p> <p>“Staff are to continually check the PRN packs to ensure they are in stock” (Quality Manager)</p>
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**During Administration:** Activities at this stage include cross checking the contents of the pack against medication charts, administering the medications (executed in RACFs’ dining rooms) and signing the administration sheets. Staff are required to crosscheck the Webster packs with the medication chart for every round. This is vital as the residents’ medications change frequently. Missing out this check may result in missed dosage errors; often the case with newly added short term medications (e.g. antibiotics) which are packed separately (Table 3). This process also allows staff to identify any packing errors made by the pharmacy. In such cases staff need to record the packing error on a post-it note and administer dosage from the following day medication pack (if packed correctly) and put the incorrect pack aside for repacking. The sites were often short staffed at the morning rounds which at times resulted in

administration delays. Residents requiring pre-breakfast medications (like insulin) were observed being given medications during breakfast. For residents requiring administration in their rooms, staff took the required medication to the room, leaving the administration sheet folder at the trolley which sometimes resulted in missed signatures (Table 3). Staff were frequently interrupted and observed signing the sheets after the completion of the administration rounds (Table 3). During administration rounds staff also recorded the list of low stock medications on post-it notes (Figure 2). Along with the administration of medications, staff also take residents’ vital signs (e.g. blood pressure) when required. The vital sign results are recorded on plain paper and are then entered on the electronic system (Figure 2). As described by the IT manager this double handling often results in discrepancies in data entry (Table 3).



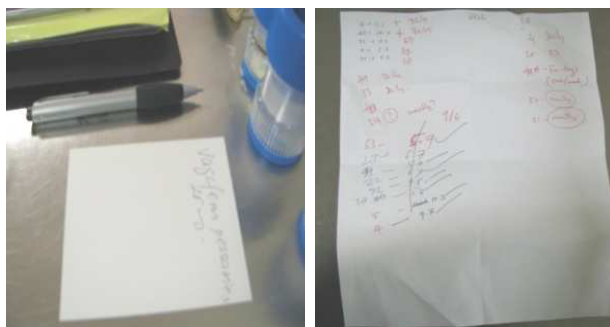
**Figure 1. Left:** Alert regarding gaps in signing sheet **Right:** Signing sheet with highlighted dates

**Table 3.** During administration- Leading quotes and observations

<p>“The signatures for administration of pre-breakfast medication like creams after shower are being done by the staff during breakfast administration” (Observation, Site B)</p> <p>“Staff signed the treatment sheet before insulin was administered to the resident” (Observation, Site C)</p> <p>“Most common are missing signature errors. Staff sometimes forget to sign the administration sheet when they administer medications inside rooms” (Care staff, Site A)</p> <p>“At this stage we still need to ensure that vitals are entered into the system properly” (IT Manager)</p>
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**Post-Administration:** This stage includes activities such as verbal handover of information to the incoming staff, updating electronic progress notes of residents, writing notes (if required) for the doctors’ in the communication book, notifying pharmacies of packing errors and audit of administration records. Within RACFs post-administration communication tended to be verbal. Staff communicates a range of medication related issues including packing errors, residents’ who have refused medications and low stock medications to their managers. If any resident refused a medicine or part of it, staff members place an ‘R’ in the administration sheet for the

whole dosage as they are not qualified to identify the medicines (all of which are located in the same pre-packaged container) which were refused by the resident. In such cases they also update residents' progress notes with information about the colour or shape of the refused medication which might help doctors to identify which medicines have been missed. The internal audit of the administration record is performed manually on a weekly basis. The staff members prepare the paper-based audit report for the manager. Managers then review these reports and report any errors (if required) on medication incidents reports accordingly.



**Figure 2.** Left: Order reminders during administration Right: Vital signs recorded on plain paper

**Table 4.** Post-administration- Leading quotes and observations

“Where we sign we just put R. We say one of the tablets she’s not taking. We just can inform in progress notes” (Care staff, Site A)

“The only thing that really, from a medication point of view, gets put into the electronic form is just comments about specific medications” (Quality Manager)

“I just do it manually and give it to the manager, auditing is done just on the paper” (Care staff, Site A)

### 3. Discussion

The findings highlight how the routine process of medication administration in RACFs relies on a complex interaction of information intensive tasks. At present, the studies investigating medication management in RACFs rely on retrospective record review of medication records [14, 15]. Retrospective error data becomes meaningless without understanding of the actual context in which errors are made [14, 15]. The prospective qualitative approach in this study assisted the identification of issues with due attention to the associated contextual factors. Within the RACFs there was an emphasis primarily on what information needs to be collected with limited attention to how it is collected and used to improve medication safety. The information gathered is not time stamped and offers limited evidence if special requirements for medications (e.g., requiring an empty stomach) are being met. The complex paper based administration records are difficult to audit and offer limited support in medication monitoring [16]. Practices like manual stock management, double handling of vital signs data and manual audits are inefficient and unsafe. In the existing system instances which may place a resident at serious risk of harm are difficult to identify in a timely fashion. Early

identification of problems is important as remediation often requires the attention of doctors and/or pharmacists who are located remotely from the RACFs [8]. Despite having ICT to support other care processes there is little or no technological support for medication administration showing underutilization of this potential resource. Electronic medication administration records (eMAR) can streamline information practices in RACFs by enabling real-time information exchange, automated stock management, electronic audit reports and provide prompts for monitoring that links clinical parameters (like vital signs) to medication administration [17]. Such systems require careful integration of the clinical and administrative aspects of information and its timely exchange with external stake holders like community pharmacies [16, 18]. An eMAR for such collaborative contexts needs to support meaningful information exchange across heterogeneous platforms in real time [18]. Limitations in workflow integration and interoperability can decrease the value of any implemented system by encouraging workarounds [19]. Designers need to study all stakeholders of the system to be aware of the complexities of their work the tasks, processes, technologies used, contingencies, and constraints [19]. Careful implementation of such integrated systems can actively engage community pharmacists to frequently review and monitor medications [18]. This may support the limited availability of full time RNs to administer medication. Doctors can also facilitate the reduction of morning hour workload by considering which medications can be administered in the afternoon or evening instead of mornings [7]. RACFs need to shift emphasis from counting the frequency of medication errors to an examination of factors within the system that contribute to these errors.

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