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Medication administration process in a residential aged care home: An observational study

Siyu Qian

University of Wollongong, sqian@uow.edu.au

Ping Yu

University of Wollongong, ping@uow.edu.au

David M. Hailey

University of Wollongong, dhailey@uow.edu.au

Ning Wang

Southern Medical University, nw57@uowmail.edu.au

Arnol Bhattacharjee

University of South Florida, abhatt@usf.edu

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Abstract

Aims: To understand the medication administration process in residential aged care homes.

Background: Understanding actual processes that nurses follow is critical to guide improvement efforts and to develop robust systems to ensure safety in medication administration.

Methods: Seven nurses were observed for 12 morning medication rounds at two units of a residential aged care home in Australia. Observations were guided by an activity theoretical framework.

Results: Nurses followed a common work process to administer medication. This process included actions from preparing medication trolley, locating a resident, preparing and administering medication to this person, documenting the administration, to finally checking medication charts to ensure all residents received medication. We identified 15 process deviations that may hinder safe medication administration. Electronic medication administration records appeared to be able to prevent a deviation associated with the paper-based documentation process.

Conclusions: This study elaborated the medication administration process in a residential aged care home and identified process deviations. It suggests a safety checklist that can be used to evaluate nursing practice and improve medication administration process.

Implication for Nursing Management: To develop robust systems for medication safety, nursing managers need to understand the actual nursing process, identify process deviations, and investigate the context in which these deviations occur.

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- 1 and investigate the context in which these deviations occur.
- 2 **Key words:** Activity theory, medication administration, nursing home, safety, workflow

Background

Many people living in residential aged care (RAC) homes take large amounts of medications, with an average of seven to nine per person per day (Elseviers et al. 2010, Szczepura et al. 2011). With complex care needs associated with maintaining residents' activities of daily living, medication administration in this setting is a complex process for nurses 'running a race' to complete a large amount of work within a limited timeframe (Ellis et al. 2012). This process is prone to error; the error rate in medication administration has been found to range from 28% to 40% in RAC homes (Scott-Cawiezell et al. 2007, Young et al. 2008).

Causes of medication errors are often a mixture of system deficiencies and human errors (Vogelsmeier et al. 2007, Dilles et al. 2011, Ellis et al. 2012), resulting from intertwined challenges such as time constraints, high workload, large amount of medication and frequent interruptions (Vogelsmeier et al. 2007, Dilles et al. 2011).

The lack of time to double check medications was ranked the top challenge hindering safety in medication administration (Dilles et al. 2011). In a study conducted by Vogelsmeier et al. (2007), nurses expressed difficulty in providing timely medication to large groups of residents and concerns about not being able to do adequate double checks for accuracy because of time pressure. A recent study in an RAC home found that a nurse administered 315 medications to 35 older people (Qian et al. 2016), spending only an average of 200 seconds with each resident per medication round.

Work environment and poorly designed tools can also hinder safe medication administration. Environmental factors include coordination mechanisms and communication channels (Tariq et al. 2012), distractions and interruptions (Vogelsmeier et al. 2007). Poorly designed tools include medication charts that have missing information (Tariq et al. 2012) and medication trollies (Vogelsmeier et al. 2007). Interaction between these system issues may cause

1 additional medication errors.

2 Gaps in communication, such as poor information exchange among RAC homes, doctors and
3 pharmacies; doctors ordering medications directly from the pharmacy without notifying the
4 RAC homes; and doctors mainly relying on telephone and fax to communicate with the
5 pharmacy are also known to contribute to medication errors (Tariq et al. 2012).

6 While electronic nursing records are being installed in RAC homes to share information
7 among healthcare professionals and to ensure consistent and transparent processes in
8 medication administration, using these records present additional challenges. Although these
9 electronic records are intended to replace paper-based documentation practice, doctors are
10 often reluctant to document electronically because the data cannot be transferred to their own
11 electronic patient record system due to system inoperability (Yu et al. 2013). Technology
12 failure may also harm medication safety. Qian et al. (2015) described the instance of power
13 outages in the middle of a medication round, forcing nurses to rely on their memory to
14 continue medication administration which nearly caused an older person to miss his
15 medication.

16 One typical human error is deviation from standard processes, as defined in RAC guidelines
17 (Jiang and Yu 2013). Verrue et al. (2011) conducted a cross-sectional observational study in
18 112 wards of 76 Belgian RAC homes. They observed a post-prescription practice in about 70%
19 of the wards, in which a medication was ordered and delivered before a doctor's prescription
20 was received. This was in violation with the regulatory requirement that medication ordering
21 and delivery must comply with an authoritative prescription. Vogelsmeier et al. (2008)
22 conducted an observational study to explore the workarounds to electronic medication
23 administration records in five RAC homes. They found that nurses document activity before
24 doing it, violating corporate documentation policies.

Frontline nurses have direct contact with residents on a daily basis. Their practice has a significant impact on residents' care quality and safety. Practice guidelines have potential to improve care quality (Grimshaw and Russell 1993) and reduce risky practices (Woolf et al. 1999). Based on current evidence-based best practice, the Australian Government Department of Health and Aging has published "Guiding principles for medication management in residential aged care facilities" (DoHA 2012). Following these principles, many RAC homes are developing, implementing and evaluating specific policies and procedures to support quality and safety in medication management in the local context.

Understanding the actual process that nurses follow to conduct medication administration activity is critical to guide improvement effort (Vogelsmeier et al. 2007, Ellis et al. 2012) and to develop safe and robust systems (Grigg et al. 2011). Therefore, this study aimed to investigate the following issues in an RAC home: the structure of medication administration activity; processes that the nurses follow to conduct this activity; and process deviations that may impede safety of medication administration.

Activity theory

Activity theory is a framework to understand the structure and conduct of human activity, as performed as a social process. According to this framework, human activity is composed of six interactive components: subject, object, tools, rules, community and division of labour (Engeström 1987). The subject represents an individual or a group of people performing the activity. The object is the desired goal of the activity. The tools are physical artifacts, skills, language, and knowledge that are used by subjects to perform the activity (Engeström 2000, Ngoma and Igira 2012). The rules are explicit or implicit routines, guidelines and policies which determine why and how the subject may act while performing the activity. The community represents the social context or all actors involved in the activity system and the

division of labour describes the roles of the actors involved in the activity. These components interact with or influence each other to shape how an activity is done.

This framework has been successfully applied to study healthcare work activities in patient discharge (Lin et al. 2013, Sadeghi et al. 2014) and collection of maternal and child health data in community (Ngoma and Igira 2015). Therefore, it is considered appropriate for this study.

Methods

Settings

The study was conducted in two units of a non-profit RAC home in Australia. One unit (Unit 1) had 38 beds and the other (Unit 2) had 40 beds. The average age of residents at these two units was 83 years old, and residents' average length of stay was 12 months. Ninety-seven percent of residents required a high level of care. Unit 1 had used the tool of electronic medication administration records for 18 months at the time of the study, and Unit 2 used paper-based medication charts. Each unit had one nurse responsible for administering medication to all residents during a work shift. The medication management system used was multi-dose medication aid with sachets. Both units shared one medication room. Each unit had a care office, a kitchen, a dining room and a living room. The study was approved by the Ethics Committee at the authors' university and all study procedures were preapproved by the management at this RAC home. Nurse participants all gave written consent to be observed.

Participants and sample size

Seven nurses with responsibility for medication administration gave consent to be observed. This included one registered nurse (RN), four endorsed enrolled nurses (EEN) and two medication-qualified personal care workers (PCW) with Certificate IV level II in Medication Management awarded by the Australian Technical and Further Education colleges (see Table

1) These PCWs were considered as equivalent to nurses for the purpose of medication administration. The term “nurse” will hereforth be used to collectively refer to RNs, EENs and medication-qualified PCWs.

Insert Table 1 here.

These nurses worked regularly in the two units and covered at least 80% of the staff in the morning shifts per fortnight. Therefore the sample size was considered sufficient for collecting data representative of medication administration work in the study site. The observed nurses administered prescribed medication, but not drugs of addiction.

Historically, nurses who conducted medication rounds also helped with other care activities such as preventing a fall of a resident, assisting a visiting doctor and transferring a resident to a hospital. Multiple activities made it difficult for them to complete medication administration safely and on time. To address this problem, a new division of labor was designed to free these nurses from those activities so that they could fully concentrate on their rounds. Those activities would be undertaken by another RN on duty and non-medication qualified PCWs.

Data collection

In our study setting, the morning medication round would usually commence at 7 am and continue until 10 am. During this three-hour period, we captured rich information by observing nurses activities during the entirety of the morning medication round.

Twelve medication rounds were observed from August to September 2013; six in each of the two units. The study was concluded when no additional pattern emerged other than those previously captured, i.e., when data saturation was reached (Fetterman 1998). Consequently the sample size was considered adequate.

1 The observation was guided by the six dimension of activity theory. A nurse (the subject) was
2 shadowed continuously by the first author during the process of administering medication to
3 the residents. Field notes were used to record the nurse's demographic data, date of
4 observation, tools used and work processes. Other data captured included other care staff (the
5 community) who worked with the study subject and their roles (division of labour) in
6 medication administration. Also informal rules for the activity and the oral explanation the
7 participant provided about the rationale for their decisions to work in a certain way were
8 collected.

9 The RAC home also gave the researchers access to formal organisational rules and
10 documents, such as policies and guidelines on medication administration, and the medication
11 incident reports for the previous seven months. This enabled the observer to reconstruct the
12 rules of medication administration, as practiced at this home, and identify instances when
13 processes deviated from those rules.

14 Deviation from the standard medication administration process was a safety hazard. A safety
15 checklist (see Table 3) developed by a research RN with extensive work experience in RAC
16 homes was used to identify these deviations. The checklist contained 45 rules for the
17 medication administration process, which were used to record which rules were followed in
18 four categories: always, not always, never, and not observed.

19 The specific context in which these deviations were observed was also recorded. We did not
20 provide immediate feedback about these deviations to individual nurses, but reported our
21 study findings to the RAC home in written format for corrective actions. However, we did
22 provide verbal feedback to the nursing manager in a face-to-face meeting. Nurses were
23 de-identified to the manager and the care home to ensure that their relationships were not
24 affected by the study.

Data analysis

Data analysis was conducted concurrently with the data collection process. Field notes were transcribed into Word and analysed using content analysis [26]. The three research aims guided the medication administration observation coding system: ‘activity structure’, ‘work process’ and ‘process deviations that may impede medication safety’. The primary code ‘activity structure’ was further structured into six components of an activity system, i.e. subject, object, tools, rules, community and division of labour. Field notes were read line by line to highlight keywords that could map to one of these six components. The ‘work process’ code included two main sub-codes: common medication administration process and differences in individual practices. Lower level sub-codes included location of medication administration, sequence of actions and priority of tasks. The ‘process deviations’ code included three occasions where deviations occurred but were not captured by the safety checklist. As the observation progressed and more data were collected, new sub-codes were created and added under each main code.

A diagram depicting the common work process of the morning medication round was drawn using the workflow mapping method developed by Kmetz (2010). It was then validated by the participating nurses, with further revisions based on their feedback.

Results

The structure of the medication administration activity

Based on our activity theoretic lens, the subject of the medication administration activity was a nurse, whose object was to treat and/or manage symptoms of illness (see Table 2). A nurse subject used several physical tools to achieve this object. These included a medication trolley, medications, and documentation tools (e.g. the medication administration records). Given the sensitive nature of these tools (especially medications), they were stored under lock and key in the medication room, and accessible only to the nurse on shift. There were two medication

trolleys in the medication room, one was for Unit 1 and the other for Unit 2. Both had name tags on them. The trolley had three drawers. The top two drawers contained multiple compartments, tagged with each resident's name and room number. The bottom drawer was bigger and stored taller medication bottles, insulin kit and puffers. The top of the trolley had sufficient room for nurses to prepare medication and for keeping medication administration records, water jar, pill crusher and a multi-compartment plastic container for storage of eye drops. The trolley also had a slightly slanting extension on which nurses put the spoon holder.

Insert Table 2 about here

Rules used to govern this activity included policies and guidelines for medication administration, documentation and hand sanitising. The community of care provision was nurses, non-medication qualified PCWs, doctors and pharmacists. The division of labour was that nurses conducted medication administration and wound care. The non-medication qualified PCWs provided personal care i.e. assisting with activities of daily living, such as showering, dressing and eating. Doctors prescribed medications and pharmacists dispensed them.

Work process in medication administration

Common work process

A common medication administration process started with any resident who was ready for medication. It included identification and preparation of the medication trolley, medication administration for each resident, final check of documentation and tidy up the trolley (see Figure 1A). When the nurse started preparation of the trolley, she or he cleaned the trolley first and put the medication administration record on it, electronic record for Unit 1 and paper-based record for Unit 2.

1 The medication administration process included actions of locating the resident, preparing
2 and taking the medication to them, preparing the resident for administration, administering
3 medication and documentation (see Figure 1B). This process could occur in a resident's room,
4 a dining room, a lounge room or a corridor, depending on where the resident was and how the
5 medication should be given. For example, providing medication via a percutaneous
6 endoscopic gastrostomy (PEG) feed happened in a resident's room for the sake of protecting
7 the person's privacy. Otherwise, the nurse would push the medication trolley around the unit
8 for several rounds to find and medicate all the residents.

9 Insert Figure 1 about here

10 The object of aged care nursing was to meet the needs of residents; the nurses prioritised their
11 tasks to meet these needs, following the organisational rules. For example, they attended to
12 residents who needed insulin before 8 am, the time when breakfast was served. Insulin might
13 be the only medication given to these residents at this point, other medication was given later.
14 Nurses gave nebulisers to residents who needed these after breakfast. They attended to the
15 residents who needed a PEG feed at the end of the medication round.

16 During the round, the nurse might also fulfil other living needs of the residents, such as
17 turning on a TV, comforting depressed residents, communicating with peers and visitors to
18 exchange information about residents, checking information about unfamiliar medication and
19 dealing with incidents such as a resident fall. Nurses recognized the importance of good
20 rapport with a resident for smooth personal interaction. They used communication tools such
21 as calling a resident by the person's preferred name, providing medication in accordance with
22 the person's habit (e.g. using a spoon or not), remembering their medication schedules and
23 other successful strategies to persuade a person who refused to take medication. One nurse
24 mentioned that it was also important not to be worried about time or, at least, not to appear to

be concerned with it; because the residents could sense it and react negatively, even to the point of refusing the medication.

Differences in individual practices

While a common work process was followed, differences were observed. For example, the majority of nurses followed the order of residents' room numbers to administer medication and then moved to the dining room. But PCW1 started from the rooms in a particular corridor, believing that medication administration for residents living in that area would take her the longest time and doing it first would be more efficient and quicker.

Nurses were also observed taking out a resident's medication from the refrigerator at different times. EEN2 took out the medication in the middle of the round right before medicating the person, while the others took it at the beginning of the round.

Instead of attending to residents one by one, both EEN1 and PCW1 were observed to prepare medication for the next resident while witnessing and overseeing the present one to take medication. This happened only when the two residents were at the same place (e.g. the lounge) and the present one did not need assistance with taking medication. This was in compliance with the organisational guideline.

Process deviations that may impede medication safety

Fifteen process deviations were identified during field observation. Twelve were identified using the checklist (see Table 3) and three by the observer. For example, nurses did not "compare a resident with his or her photo", "explain actions or purposes to residents" and "wait at least one minute between puffs of multiple inhalations". The contexts in which these process deviations were observed are presented in Table 4.

A process deviation associated with the use of paper-based medication charts was that nurses

1 did not “sign the appropriate medication record immediately after giving medication”. This
2 was observed in two contexts: documenting before providing medication to a resident and
3 documenting for several residents at once in the dining room. These actions were not seen
4 when nurses used the electronic medication administration records.

5 The three process deviations identified by the observer were preparing medication for two
6 residents at one time; interruption to the medication administration process caused by the
7 physical condition of the medication trolley and the floor; and not checking the presence of a
8 resident before preparing their medications (see Table 4).

9 **Discussion**

10 Activity theory provided a comprehensive theoretic framework to analyse the structure of
11 medication administration activity in two units in an RAC home. We identified the subject
12 and object of the activity, the tools nurses used to conduct the activities, the communities
13 these nurses collaborated with and their division of labour.

14 A common work process was followed by all nurses to conduct medication administration.
15 However, differences in practice were observed among individual nurses. The first difference
16 related to how nurses did their medication round e.g. starting from a particular corridor or
17 following the room number. In discussion with the nursing manager of the RAC home, she
18 suggested that nurses might develop their own processes as long as they completed the round
19 within the specified time period. The second difference was in the timing of removing a
20 medication from the refrigerator- at the beginning of the round or at the time of
21 administration. The manager suggested that the latter be the best practice. The third
22 difference was observed when two residents were at the same place. Some nurses medicated
23 the residents one by one. Others overlapped the administration process for the two persons -
24 witnessing one of them taking medication, while preparing medication for the other. Such

1 practice presents a potential risk to medication safety because the process might be
2 interrupted and the nurse could walk away without finishing it. It therefore provides an
3 implication for medication practice for improvement. The above differences in practice might
4 be caused by variations in nurses' perceptions of which process was most efficient to
5 complete their work.

6 This study identified 15 process deviations that were potentially harmful to medication safety.
7 Three of these (see Table 4 items with asterisk) were identified by the observer and
8 subsequently added to the checklist. There should be no exceptions to policies or guidelines,
9 although there was room for flexibility in terms of whether or not nurses had always
10 compared a resident with his or her photo. The reason for the nurse behaviour was because
11 they were familiar with the residents who had been living in the RAC home for a period of
12 time. Not comparing the resident with his or her photo could occur when nurses used
13 paper-based medication charts, but not when they used the electronic system which showed
14 the photo profile page before allowing access to the signing page.

15 Another process deviation was that some nurses did not sign the paper-based medication
16 charts immediately after administering medication to a resident. They did so before
17 administration or after administering to several residents. This practice could be motivated by
18 a wish for efficiency in documentation. These sub-optimal actions were eliminated with the
19 use of the electronic medication administration records which confined a nurse's access to
20 only one screen of medication record for one resident at a time. As a consequence, the
21 electronic system standardised the documentation process by enforcing the correct procedure

22 Other deviations from medication administration processes were likely to be caused by time
23 constraints. Examples included preparing medication for two residents at a time and not
24 waiting at least one minute between puffs of multiple inhalations. Both frontline nurses and

managers should be aware of and understand these process deviations, their causes and the possible adverse consequences so as to improve practice and medication safety. Practice appraisal is a crucial part of practice development to identify needs for change and contributes to developing evidence base (Moule et al. 2017), the safety checklist might be useful for nursing managers to conduct rapid and ongoing evaluation of nursing practice.

Limitations

As the study was conducted in one RAC home, the generalisability of the results might be limited by the local organisational policy and staff behaviour. Direct observation may have a potential Hawthorne effect, which means that study participants under observation might change their work behaviour (Ampt et al. 2007). However, we found that the participants seemed to be comfortable with the observer and carried out their activities as usual; perhaps because they were experienced with giving in-job training, including demonstration to nurse students. They were also used to working under the observation of visitors of the residents, who were often present in the RAC home.

Nurses were not formally interviewed to ascertain why they undertook some of the 'unsafe' practices. This is a limitation of the single method observational study design, although informal conversations provided certain answers.

Conclusion

This study applied activity theory to investigate medication administration activity in an Australian RAC home. It presented the medication administration process, as conducted at the RAC home. Process deviations that may hinder safe medication administration were identified and the context in which they occur were presented. The safety checklist developed in this study may help RAC nursing managers conduct on-going appraisal of nursing practices in their homes and to improve the medication administration process.

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1 **Table 1. Characteristics of nurses.**

Nurse	Gender	Number of years conducting medication administration	Number of morning shifts worked per fortnight at Unit 1	Number of morning shifts worked per fortnight at Unit 2
RN1	Female	5 months	0	1
EEN1	Female	7 years	6	2
EEN2	Female	8 years	4	0
EEN3	Female	13 years	3	0
EEN4	Male	8 years	1	3
PCW1	Female	7 years	0	6
PCW2	Female	6 months	0	1

2 RN: registered nurse. EEN: endorsed enrolled nurse. PCW: medication-qualified personal
3 care workers with Certificate IV level II in medication management.

4

5

1 **Table 2. The structure of the medication administration activity**

Component	Medication administration activity
Subject	One nurse
Object	To treat and/or manage symptoms of illness for residents
Tools	<p>Medication trolley</p> <p>Medication</p> <p>Pill crusher</p> <p>Thickened fluid for mixing the crushed pills</p> <p>Spoons/cups/tissue paper/a jar of water or juice</p> <p>Pathology waste rubbish bin/ rubbish bag</p> <p>Medication reference book</p> <p>Knowledge about medication administration</p> <p>Knowing about residents</p> <p>Watch/time management skill/task prioritising skill</p> <p>Verbal communication/telephone</p> <p>Hand sanitising tools (water, paper towels, alcohol-based hand sanitiser, gloves)</p> <p>Documentation tools (i.e. electronic medication administration records*, paper-based medication charts, paper-based pain patch documentation book, paper-based insulin documentation book, paper note, handover sheet, handwriting skill, reading and writing skill, knowledge about nursing documentation)</p>
Rules	<p>Medication administration policies and guidelines</p> <p>Documentation policies and guidelines</p> <p>Hand sanitising guidelines</p>
Community	<p>Nurses including RNs, EENs and medication-qualified PCWs</p> <p>Non-medication qualified PCWs</p> <p>Doctors and pharmacists</p>
Division of labour	<p>Nurses conducted medication administration and wound care</p> <p>Non-medication qualified PCWs provided personal care i.e. daily living activities such as showering, dressing and eating. They may also conduct medication administration if they are medication endorsed.</p> <p>Doctors prescribed medications and pharmacists dispensed medications.</p>

2 * Electronic medication administration records were only used in Unit 1.

3

1 **Table 3. A safety checklist for the medication administration process.**

No.	Rules	Always	Not always	Never	Not observed
	Identification and preparation of medication trolley				
1	Trolley is tidy, organised and clean	√			
2	Prepare trolley with appropriate equipment e.g. water jar, medication cups, water cups, alcohol gel, a box of gloves, a box of tissue, crusher, spoons, medication charts, fresh thicken fluid/ fruit puree/any other medium for mixing crushed medication	√			
3	Medications kept in order	√			
4	Trolley locked			√	
5	Trolley must never be unattended when unlocked		√		
	Medication administration and documentation				
6	Take trolley to a resident, open medication chart at the right resident and check medication order for time of day	√			
7	Wash hands before and in between residents		√		
8	Check a resident's name, photo, special considerations in medication chart and medication order	√			
9	Check medication charts for right dosage and time	√			
10	Take the medication to a resident	√			
11	Compare a resident with his or her photo		√		
12	Call a resident by name and waits for response	√			
13	Ensure that a resident has swallowed medication by giving a glass of water	√			
14	Explain action or purpose to a resident		√		
15	Medications should not be given to another staff member to administer				√
16	Sign the appropriate medication record immediately after giving medication		√		
17	Document medication not given correctly on medication chart and in progress notes (e.g. medication errors)	√			
18	Make notation of any discrepancies in a resident's medication record of any medication that may need review/re-ordering on spare sheet of paper in trolley	√			
19	If a resident refuses, leave and reapproach 10-15 min later. If resistance remains, ask another qualified staff member to give medication. If meeting with consistent refusal, inform GP and the resident's next of kin. Record refusal on med chart and in progress notes				√
20	EEN and medication-qualified PCW should seek the permission of the RN on duty to administer a pro re nata medication to a resident		√		
	Tablets				
21	Remove medication case and open case in the correct manner (if using packed medication), or open medication trolley drawer and select correct container	√			
22	Check medication pack label for correct resident	√			
23	Turn pack over to check medication name, dose and time of administration on the back of the multi-dose sachet before tearing off		√		
24	Check medical officer's order and clarify illegible or unclear orders or allergies				√
25	Remove the correct dose from the sachet	√			
26	Again check the back of multi-dose sachet for right time			√	

	and resident name				
27	When crushing medication, ensure the total dose is crushed and administered to a resident	√			
28	Ensure that all medications are crushed between 2 liners apart from sachet administration aids which enable crushing within the sealed packet	√			
29	Clean equipment thoroughly between crushing each medication				√
30	When tablets and capsules are to be given together, crush the tablets first.	√			
31	Discard any tablets that fall on the floor				√
	Transiderm patches				
32	Remove the patch from outer cover, write date and time of application in appropriate spot on patch	√			
33	Remove the back film appropriately	√			
34	Attach patch to resident's chest and rotates site	√			
35	Ensure that previous patch is removed and discarded appropriately	√			
	Liquid medications				
36	Gathers appropriate mixture	√			
37	Again checks medication order against label on bottle for right medications, right dose and right time	√			
38	Pour medication into medication measure at eye level		√		
39	Check a resident's name, photo and medication order against label on bottle		√		
	Puffs				
40	Wait at least one minute between puffs of multiple inhalations of the same drug		√		
	Storage of medication				
41	Check the date on the medication bottle	√			
42	Insulin in use and stored at room temperature must be discarded in 21 days for cartridges and 30 days for vials				√
43	Creams should have an opening date and be discarded after 30 days				√
44	Medication requiring refrigeration are monitored for opening dates and stored at appropriate temperatures	√			
45	Eye drops and ointments should be stored in separate containers or bags for each resident to prevent cross contamination. Individual residents' name should be documented on the bag or container	√			

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1 **Table 4. The contexts in which process deviations were observed.**

No.	Rules	Finding	Context
Identification and preparation of medication trolley			
1	Trolley locked	Never	The medication trolley was never locked, whether in the medication room or during the process of medication administration.
2	Trolley must never be unattended when unlocked	Not always	Trolley was unlocked and parked in the corridor outside of a resident room, when the nurse was in the room administering medication to the resident. The trolley was out of the sight of the nurse. There were people including residents with dementia passing by the trolley while the nurse was in the room.
Medication administration and documentation			
3	Wash hands before and in between residents	Not always	Nurses did not wash hands after medicate each resident in the dining room where a group of residents were having lunch.
4	Compare a resident with his or her photo	Not always	Nurses did not compare a resident with the photo before administering medications to the person.
5	Explain action or purpose to a resident	Not always	Nurses brought medications to a resident, did not verbally explain the action or purpose, but started chatting with the resident.
6	Sign the appropriate medication record immediately after giving medication	Not always	Nurses documented before taking medication to a resident. Nurses administered medications to residents in the dining room, then signed the medication records of these residents altogether.
7	EEN and medication-qualified PCW should seek the permission of the RN on duty to administer a pro re nata medication to a resident	Not always	On one occasion, when a resident asked for a pro re nata medication to ease his pain, the nurse gave it to him without seeking the permission of the RN on duty.
8	*Prepare medication for two residents at one time		When administering medication in the dining room, a nurse prepared medication for two residents at one time.
9	*Interruption to the medication administration process caused by the physical condition of the medication trolley and the floor		The medication spoon holder was placed on the slightly slanting extension of the medication trolley. When a nurse was pushing the trolley passing the joint between two sections of the RAC home, the spoon holder was bumped off the trolley and spoons fell on the floor. As a result, the nurse had to bring these spoons to the washing room, interrupting the work process.
10	*Did not check the presence of a resident before preparing medications for the person		On one occasion, a nurse did not check whether a resident was in the room or not before preparing the medication. By the time she brought the medication to the resident's room, she realised that the person was not there. This resulted in the nurse temporarily storing the prepared medication in the person's compartment in the medication trolley and moved on to the next resident. This procedure may lead to the error of

			missed medication as it was similar to a description of the cause of a missed medication in a medication incident report: "Missed morning medication. Resident was not in room when I went to give her medication. Inadvertently did not give at a later time."
	Tablets		
11	Turn pack over to check medication name, dose and time of administration on the back of the multi-dose sachet before tearing off	Not always	Nurses began to prepare medications directly without checking the information on the back of the multi-dose sachet.
12	Again check the back of multi-dose sachet for right time and resident name	Never	Nurses never checked the medication administration time and resident name for a second time for any resident.
	Liquid medications		
13	Pour medication into medication measure at eye level	Not always	When preparing liquid medication for residents, nurses did not measure the liquid medication at eye level, rather they put the measuring cup on the medication trolley and directly poured the liquid into the cup. Only one nurse was observed to measure the liquid at eye level.
14	Check a resident's name, photo and medication order against label on bottle	Not always	Nurses did not always check this information against the label on the bottle.
15	Wait at least one minute between puffs of multiple inhalations	Not always	Nurses only waited for a few seconds between puffs of multiple inhalations. Only one nurse was observed to wait at least one minute between puffs. During the waiting time, she went to get another medication from the refrigerator.

1 *Additional process deviations not identified by the checklist, but observed.

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Fig 1. A common process of the morning medication round and the process of medication administration for a resident.