Focused Ethnographic Observations: Cues to Medication Administration

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This paper describes nursing activities that preceded medication administration during a study of a mobile medication dosage decision-support device used in neonatal and pediatric intensive care settings. These antecedents served as cues to inform researchers that medication administration activities were about to take place so that focused ethnographic observations could be conducted. Cues included visits to the medication room, conversation with another nurse, charting, conversation with physicians, visits to a patient's room, preparation for feeding, conversation with family members, visits from the pharmacy, checking a patient's vitals, and phone conversations. Results will help researchers conduct focused ethnographic observations of medication administration activities more efficiently by decreasing the amount of time spent on holistic observations.

Ethnography is a set of qualitative research methods designed to study people's behavior within their culture (Roper & Shapira, 2000). It is traditionally a holistic approach that describes the context in which human behavior occurs. It takes into account the values and meanings people apply to events, behaviors, and relationships. Ethnographic methods include techniques such as participant observations, unstructured, semi-structured, or structured interviews, and reviews of artifacts such as nursing charts.

Traditionally, ethnography has been used to study an entire culture. However, in recent years, researchers have found focused ethnographies to be valuable in the assessment and design of technology (Blomberg & Burrell, 2012). Ethnographic studies can move from holistic to focused, which is a recommended approach when studying a specific research question in nursing (Holloway, 2009). This is because the holistic approach allows for the identification of key characteristics that can be focused on later in the study. However, this "descriptive" phase takes additional time beyond the study of a specific research question (Holloway, 2009). To decrease the duration of an ethnographic study, it is important to find methods to focus ethnographic observations early in a study, using cues identified by previous research.

Focused ethnography can be beneficial to the study of medication administration. Medication administration is a high-risk task and interventions are needed to reduce errors. Human factors have been shown to account for 65% of fatal medication administration errors (Phillips et al., 2001). These include miscalculations of doses, preparation errors, knowledge deficits, and neglect in administration (e.g., intravenous instead of intramuscular administration).

Focused ethnographies have shown that contextual variables play a significant role in the misuse of medication administration technology, and medication administration errors. In this paper, contextual variables are defined as those factors surrounding but not directly related to the task of medication administration. For example, Patterson and colleagues (2002) studied the context of medication administration by using focused ethnographic observations. The authors reported that the improper use of a bar code medication administration system was associated with factors such as competing demands, interpersonal coordination breakdown, and task-shedding under high workload. Similarly, Taxis and Barber (2003a) reported that contextual variables such as technology, lack of training, and a poor safety culture led to drug administration errors. These studies also suggest that focused ethnography is an effective means of assessing the medication administration context. However, most studies do not describe specific events that precede medication administration. These could help to focus ethnographic observations on medication administration.

Similarly, most studies that used focused ethnographies to study medication administration issues examined technological demands (Jennings, Sandelowski, & Mark, 2011), intravenous medication errors (Taxis & Barber, 2003a; Taxis & Barber, 2003b), or aimed to describe medication administration in

specific settings (Haglund, von Essen, von Knorring, & Sidenvall, 2004). None of these studies provided guidance on how to leverage cues in the environment to focus ethnographic observations on the task of medication administration.

The aim of this paper is to describe cues to help focus ethnographic observations on medication administration activities. Cues are defined as antecedents to medication administration activities. Observations were recorded using note taking during an empirical study that involved the implementation of a mobile medication dosage decision-support device. Throughout this study, we defined medication administration activities as tasks associated with the ordering, filling, and administration of medication. Results will allow researchers to focus their ethnographic observations on medication administration activities, and decrease the amount of time spent on the holistic phase of the observations. The cues identified here may decrease the ambiguity associated with medication administration events that occur at unpredictable times (e.g., some medications must be administered within 30 minutes from the time the order is written; Lilley, Rainforth Collins, & Snyder, 2014).

ETHNOGRAPHIC OBSERVATIONS

Ethnographic observations were conducted as part of a study to assess the impact of the use of a hand-held dosage calculation device on medication errors, and associated human factors issues. Observations began holistically and subsequently became more focused.

Participants

Sixty-four nurses (62 females) were recruited from four neonatal and pediatric intensive care units in two hospitals. The number of nurses per unit ranged between five and 28. Each hospital had both a neonatal and pediatric intensive care unit. The mean age of the nurses was 33.7 years. They had between four and 353 months of clinical experience (M = 90.13, SD = 86.59).

Setting

Neonatal and pediatric intensive care units were selected because patients in these units do not always receive standard adult doses of medication and thus have a higher risk of medication errors (Stratton, Blegen, Pepper, & Vaughn, 2004). Due to the wide range of patient body weights, medications frequently require bedside dose calculations.

The neonatal units consisted of large open rooms with infants lying in either radiant warming beds (a bed with a heater above it) or isolates (small, heated, clear plastic boxes). Patients who were severely ill or required isolation due to infections were cared for in small rooms next to the larger rooms. In the pediatric units, all patients were in private rooms. One hospital used electronic charting whereas the other used paper charting. Each unit had between 15 and 41 beds with between 20 and 72 nurses working in each unit. Each nurse worked three, 12-hour shifts per week. Shifts were either 7:00 a.m. to 7:00 p.m. or 7:00 p.m. to 7:00 a.m. Nurses cared for between one and four patients depending on the level of care each patient needed. Critically ill patients were often cared for by a single nurse.

Technology

Observations were focused on the deployment of a mobile decision-support device for dose calculations. This research was funded by the Department of Defense who was interested in the potential use of the device by nurses in combat settings while calculating doses for pediatric and neonatal patients. The device allowed nurses to search a database of drugs, enter the prescribed dose, and enter the patient's weight. The device calculated the volume of the dose and the rate of administration. It also alerted nurses to doses that were out of range for the patient's weight as determined by the hospital pharmacy. The dose could then be changed or the alert could be overridden. Reasons for overriding the warnings were entered into the devices by the nurses.

Participant Observations

The ethnographic study consisted of two six-month phases. The first phase (pre-intervention) was conducted before the devices were deployed. The nurses began to use the devices in their routine patient care practice approximately 115 days after the devices were deployed. At this point, the intervention phase of the study began. Two graduate research assistants with backgrounds in experimental psychology were trained on ethnographic observations using a written protocol

along with verbal instructions on how to record observations. They conducted a total of 100 hours of observations, evenly divided between the two study phases, the four different units, and each 12-hour shift (i.e., the night and day shift). The research assistants observed one nurse at a time. The same group of nurses was observed for the pre-intervention and intervention phases of the study with the exception of three nurses who discontinued their employment during the study. Observations were never linked to individual nurses to maintain anonymity and confidentiality.

The research assistants were not nurses and therefore could not participate in the work activities of the nurses, but they did interact with nurses during the observations by asking clarifying questions ("observer as participant" approach; Holloway, 2009). These informal contextual inquiries were used to augment the observations. This method is consistent with methods recommended by Roper and Shapira (2000).

Focusing of Observations

Following Holloway's (2009) suggestion that ethnographic observations move from holistic to focused, we initially observed every aspect of the nurses' work as the events occurred. For example, we recorded all conversations, tasks, events, and decision-making processes associated with medication administration. As the study progressed and we learned more about the nurses' tasks, we began to anticipate medication administration events as the result of other occurrences. Subsequently, we began to focus the observations by using these antecedents as cues. This focusing of observations occurred during both phases of the study.

Resulting Cues to Medication Administration

Information provided in a current nursing textbook (Lilley et al., 2014) suggested several antecedants to medication administration. These included washing hands, confirming doses with a pharmacist, consulting a drug reference, reviewing a medication administration record, visiting the medication room, and confirming doses with other nurses. As outlined below, our results confirmed some of these antecedents, and identified different ones.

To identify antecedents in our observation records, all occurrences of words beginning with "admin" were found in our notes. We determined whether each was a medication administration event. If so, the immediately preceding event was recorded and classified. A total of 107 unique medication administration events were identified. These included medication administration, verification of doses, ordering of medications, adjustments of doses, and charting. Using a post-hoc approach, we classified the antecedents into 11 categories. See Table 1 for a list of the number of times each antecedent preceded a medication administration event.

The most common antecedent to medication administration was a visit to the medication room. This was the immediate antecedent to 21.5% of the medication administration events we identified. Each study unit had at least one medication room where medications were stored (although sometimes nurses temporarily kept other medications with them while they worked). A visit to this room usually indicated that the nurse was going to retrieve a medication or serve as a witness to another nurse who was retrieving a medication that was a controlled substance.

Table 1

The frequency of cues preceding 107 medication administration events.

Cue	Frequency
Visits to medication room	23 (21.5%)
Conversation with another nurse	20 (18.7%)
Charting	15 (14.0%)
Conversation with physician	10 (9.3%)
Visits to patients' room	9 (8.4%)
Preparation for feeding	6 (5.6%)
Conversation with family	6 (5.6%)
Visit from pharmacy	5 (4.7%)
Checks a patient's vitals	4 (3.7%)
Phone conversation	2 (1.9%)
Other	7 (6.5%)

The second most common cue to a medication administration event was when a nurse had a conversation with another nurse (18.7%). Nurses often discussed a patient's medications with another nurse. These discussions might lead to decisions regarding medication administration. For example, prior to administering a medication, two nurses discussed the compatibility of a medication with intravenous fluids a patient was receiving. Nurses also frequently verified

doses with another nurse prior to administering the dose.

Charting was the third most common antecedent to a medication administration event. Nurses were charting immediately before 14.0% of the medication administration events we identified. While charting, the nurse might notice abnormalities or unexpected changes in a patient's status. In such cases, nurses contacted the physician who would order or change the dose of a medication.

An interaction that frequently preceded medication administration was nurse–physician conversation (9.3%). Such conversations might occur face-to-face during rounds (i.e., when the physician visited each patient and received a report on his/her status), or by telephone. For example, after a physician received a report from a nurse during rounds, the physician ordered a change in the patient's medications. Medication orders could occur after a phone conversation with a physician regarding a patient's status or a after a nurse called the physician to discuss a significant change in patient status. These interactions could also occur with a physician who was on-call in the unit.

Nurses' visits to patients' rooms also precipitated medication administration events. This occurred for 8.4% of all medication administration events identified. A nurse might visit a patient's room to perform a group of tasks at the same time. For instance, on one occasion, a nurse visited a patient's room to perform an assessment along with the administration of several doses of medication.

Two surprising antecedents were associated with 5.6% of medication administration events. These included preparations for feedings as well as conversations with family members. Sometimes nurses would mix medications with food or administer medications at the same time giving the patient food. Conversations with patients' parents arose from parents administering medications themselves (e.g., oral medications) or from discussions with the nurse regarding the medications being administered.

The least common cues to medication administration events were visits from the pharmacy (4.7%), assessment of patients' vital signs (3.7%), and phone conversations (1.9%). These low percentages are surprising. One might expect a visit from the pharmacy to have a closer relationship with medication administration events. Likewise, the assessment of a patient's vital signs might lead to a change in medications due to abnormalities in the patient's status. Also, one might expect a nurse's phone conversations to be with a physician who might order changes to medications.

Antecedents that did not occur more than once were classified as "other." These included drawing residual food from patients' stomachs, admitting a new patient, helping another nurse, sudden vital sign changes, swaddling the patient, retrieving medical equipment, and silencing an alarm.

Summary and Conclusions

This paper describes cues that can help to focus ethnographic studies of medication administration activities. Cues included visits to the medication room, conversations other nurses, charting, conversations with physicians, visits to patients' rooms, preparation for feeding, conversations with family members, visits from the pharmacy, checking a patient's vitals, and phone conversations.

Some of the cues we identified were anticipated by a nursing textbook (Lilley et al., 2014) we consulted: visits to the medication room, interactions with other nurses, and conversations with the pharmacy preceded medication administration in our study. Surprisingly, visits by the pharmacy preceded only 5% of the medication events we observed.

However, not all of the cues we identified were suggested by the nursing textbook. Charting, conversations with physicians, visits to patients' rooms, preparation for feeding, conversations with family members, checking a patient's vitals, and phone conversations preceded medication administration in our study, but were not discussed in the textbook.

Conversely, some of the cues that were suggested by the nursing textbook were not reliable cues to medication administration. Hand washing, consulting a drug reference, and reviewing a medication administration record did not precede medication administration in our study.

These cues to the initiation of medication administration activities provide a possible starting point for ethnographers who wish to focus a study on medication administration. For instance, our results suggest that an ethnographer could start an investigation by focusing their observations on the medication room and paying close attention to conversations between nurses, instead of simply shadowing nurses. Of course, focusing observations on

multiple cues will result in the identification of more medication events than focusing on just one cue.

Although holistic observations of an entire spectrum of activities are beneficial, focused observations might result in more efficient conduct of ethnographic studies due to the more restrictive scope of events that are observed. Such observations may elucidate the causes of medication errors and possibly lead to strategies that can be used to mitigate these errors.

There are several limitations of our study. First, our classification of the cues was determined post-hoc. This may have led to a bias on the part of the researchers to find common categories. Further work is required to validate these categories. Second, we did not quantify the probability that each cue was not followed by a medication administration event. Thus, some of our cues may result in false alarms. Third, we did not determine whether using these cues actually reduces the need for holistic observations or increases the likelihood of observing medication administration events. To determine if these benefits are achieved, future work could compare observations which focus on these cues to traditional techniques in which initial holistic observations transition to focused observations. Finally, the cases we identified in our empirical study were based on ethnographic observations in four pediatric and neonatal intensive care units in two hospitals. Consequently, ethnographic researchers who wish to focus on medication administration in other settings should conduct similar holistic observations to confirm that the cues described in this paper are reliable cues in their settings

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NON-ENDORSEMENT DISCLAIMER

REFERENCES

Blomberg, J., & Burrell, M. (2012). An ethnographic approach to design. In J. A. Jacko (Ed.), *The human-computer interaction handbook: Fundamentals, evolving technologies, and emerging applications,* (3rd ed.) (pp. 1025-1052). New York: CRC.

Greenough, A., & Milner, A. D. (1992). Respiratory support using patient triggered ventilation in the neonatal period. *Archives of Disease In Childhood*, *67*, 69-71.

Haglund, K., von Essen, L., von Knorring, L., & Sidenvall, B. (2004). Medication administration in inpatient psychiatric care: Get control and leave control. *Journal of Psychiatric and Mental Health Nursing*, *11*, 229-234.

Holloway I. (2009). *Qualitative research in nursing and healthcare.* Oxford, United Kingdom: Wiley.

Jennings, B. M., Sandelowski, M., & Mark, B. (2011). The nurse's medication day. *Qualitative Health Research*, *21*, 1441-1451.

Lilley, L. L., Raynforth Collins, S., & Snyder, J. S. (2014). *Parmacology and the Nursing Process* (7th ed.). Atlanta, GA: Elsevier.

Patterson, E. S., Cook, R., & Render, M. (2002). Improving patient safety by identifying side effects from introducing bar coding in medication administration. *Journal of The American Medical Informatics Association*, *9*, 540-553.

Phillips, J., Beam, S., Brinker, A., Holquist, C., Honig, P., Lee, L. Y., & Pamer, C. (2001). Retrospective analysis of mortalities associated with medication errors. *American Journal of Health-System Pharmacy, 58*, 1835-1841.

Roper, J. M., & Shapira, J. (2000). *Ethnography in nursing research*. Thousand Oaks, CA: Sage Publications.

Stratton, K. M., Blegen, M. A., Pepper, G., & Vaughn, T. (2004). Reporting of medication errors by pediatric nurses. *Journal of Pediatric Nursing, 19*, 385–392.

Taxis, K., & Barber, N. (2003a). Causes of intravenous medication errors: An ethnographic study. *Quality and Safety in Health Care*, *12*, 343-347.

Taxis, K., & Barber, N. (2003b). Ethnographic study of incidence and severity of intravenous drug errors. *British Medical Journal*, *326*, 684-687.