# Interruptions Then and Now: Impact on Nurses' Clinical Reasoning, Emotions, and Medication Safety



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Nurses transitioning to care and novice-level nurses experience difficulty managing interruptions in the acute care setting, which can result in loss of attention and potential errors. Understanding better the characteristics surrounding interruptions will better guide staff development educators in designing management strategies as well as improving clinical reasoning that supports a culture of safety among staff and professional partners.

**JNPD** 

In the acute care setting, nurses are the last critical safety step in the medication administration process. This activity, which is commonly regarded as complex and high risk, requires the nurse to use established medication administration protocols as well as critical thinking, attention, and decision-making in order to ensure safety and achieve the desired outcomes for patients (Flynn et al., 2016). Interruptions during such high-risk activities increase the possibility of errors that can result in patient harm (Biron et al., 2009; Scott-Cawiezell et al., 2007; Westbrook et al., 2010). The Institute of Medicine estimates that, each year, in the United States, on average 1.5 million preventable adverse drug events occur and patients are subjected to more than one medication error each day (Agency for Healthcare Research and Quality, 2006).

In today's complex acute care delivery environment, frequent interruptions can lead to increased procedural and

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clinical errors (Scott-Cawiezell et al., 2007; Westbrook et al., 2010). Nurses are interrupted approximately 6 times per hour, most commonly during medication administration, which can lead to greater multitasking, heavier cognitive loads, and a greater risk for clinical errors (Biron et al., 2009; Hedberg & Larsson, 2004; Kalisch & Aebersold, 2010; Westbrook et al., 2010). Experienced nurses who have gained competence in the care setting have learned to manage interruptions and cope with them as necessary aspects in the workload (Laustsen & Brahe, 2018). However, novice nurses experience greater difficulty handling interruptions leading to added stress, annoyance, increased time consumption, and reduced quality of decision-making, increasing the potential for errors (Laustsen & Brahe, 2018).

In the past 20 years, an abundant amount of research has been conducted examining types of interruptions, sources, frequency, medication error rates, and effects of interruptions on nurses' work. However, less is known about the specific characteristics of interruptions, such as interruption management strategies, clinical reasoning by nurses, contributions to safety, and how medication technology or system failures produce interruptions (Biron et al., 2009; Hopkinson & Jennings, 2013; Rohde & Domm, 2018). Understanding better the characteristics surrounding interruptions will better guide the nursing professional development practitioner in identifying management strategies for nurses transitioning to practice as well as improving the competence of current acute care nurses. Improving interruption clinical reasoning and management strategies supports a culture of patient safety among nurses and interprofessional partners.

#### BACKGROUND

Nurses in the acute care setting are expected to multitask frequently, respond to care changes, make clinical judgments, and prioritize, all in an environment where conditions change constantly and interruptions are inevitable (Potter et al., 2005; Thomas et al., 2017). Research reveals that nurses' work is nonlinear and engages the nurse in multiple cognitive shifts, both planned and unplanned, throughout their scheduled day. Contributing to frequent cognitive shifting are condition changes, interruptions, workload, system failures, difficulty accessing resources, inconsistencies in communication, alarms, paging/calls, and time-sensitive documentation (Ebright et al., 2003; Hedberg & Larsson, 2004; Potter et al., 2005; Thomas et al., 2017). Research also reveals that medication administration activities are the most interrupted nursing responsibility, leading to higher rates of cognitive shifting, which can result in loss of attention and potential errors (Biron et al., 2009; Ebright et al., 2003; Laustsen & Brahe, 2018; McGillis Hall et al., 2010; Potter et al., 2005; Scott-Cawiezell et al., 2007; Westbrook et al., 2010).

Interruptions have been empirically linked to procedural failures and clinical errors during mediation administration. According to Westbrook et al. (2010) and Scott-Cawiezell et al. (2007), as the number of interruptions increased, so did the frequency of procedural failures, clinical errors, and medication errors.

## Significance of Interruptions

Three reviews have been conducted examining the significance of interruptions and their impact on the safety of nurses' work. Studies by Biron et al. (2009), Westbrook et al. (2010), Hopkinson and Jennings (2013), and Hayes et al. (2015) agreed that interruption rates were approximately 6.7 per hour, a potential contributor to medication errors; nursing staff were the most frequent sources; and the medication room was the most frequent location. Hopkinson and Jennings recommended for future research to decrease the focus on interruption frequency and evaluate work systems such as medication bar coding and scanning that produce interruptions in order to identify sources for improved medication safety. This type of interruptions halts the nurse's activities and requires different cognitive patterns for completion. Biron et al. recommended a better understanding of interruption characteristics, including sources, primary and secondary tasks, and management strategies by nurses in order to decrease interruption frequency. Hayes et al. recommended that, given the complexity of nurses' work, it was important to understand how nurses respond to and manage interruptions in order to improve medication administration safety.

#### **Interruption Management Strategies**

Recent literature by Laustsen and Brahe (2018) and Rohde and Domm (2018) has attempted to evaluate the coping strategies and clinical reasoning of nurses during medication administration interruptions. The authors discovered that, given the frequency of interruptions, nurses often became used to them and at times were not aware they occurred. Common management strategies were dependent on the reason for the interruption, clinical reasoning, and prioritization skills. Unfortunately, the literature did not explore the in-depth reasoning and recommended further analysis in the future. Lausten and Brahe also identified feelings of frustration and annoyance with interruptions during the study but found an acceptance of fellow nurses' small talk as a form of cooperation and a positive working climate among colleagues. Overall, the studies shed light on how nurses respond and function amid interruptions but fell short on identifying specific management strategies and critical thinking.

## **Problem Description**

Currently on the project unit, nurses have become increasingly frustrated with the amount and frequency of interruptions during medication administration. Nursing staff have cited primary sources as rounding medical teams, transport personnel, other nurses, phone calls, laboratory personnel, pagers, and alarms. Fearing a potential for increased errors, an evaluation of medication errors was conducted, and no significant fluctuations were noted. However, medication error reporting does not collect data on interruptions as a potential cause. In an effort to reduce interruptions, staff have placed no interruption signage outside and inside the medication room. Unfortunately, nurses remain frustrated at the amount of interruptions around the medication room and during administration.

Given the current problem, abundance of previous research, and the multiple studies conducted to evaluate interruptions and their effects, it is clear that understanding and reducing interruptions are key to improving patient safety. Efforts to evaluate interruptions are further supported by national organizations, such as The Joint Commission (2018) and the Agency for Healthcare Research and Quality (2006), which have made reducing interruptions during medication administration a priority for patient safety.

#### Purpose

Because of the gap that currently exists between interruptions during medication administration and nurses management strategies, the purpose of this quality improvement project was to evaluate the characteristics of interruptions during medication administration as well as investigate nurses' clinical reasoning, management strategies, emotional responses, and level of intrusion in order to identify professional development improvement strategies.

# **METHODS**

The project was conducted on a 32-bed, inpatient, acute care pulmonary, medical-surgical unit within a large academic hospital in the Midwest. Two data collection methods were used, including surveys and observations, to determine the characteristics surrounding interruptions during the medication administration process. The project was reviewed by the institutional review board and was considered not regulated. All participants (including nurses and nursing students) were informed of project goals and that their participation was voluntary.

The medication administration period and interruption data collection encompassed the following phases of medication administration: preparation, retrieval, administration, and documentation. Types of interruptions for analysis included person (nurses, physicians, unlicensed assistive personnel [UAP]), systems (bar code error, alarms, pagers), self (personal phone, family concerns), good/helpful (reminders, smart pumps, computerized protocols), and other. The primary task encompassed the nurse's original task to complete all phases of the medication administration process. The secondary task refers to the nurse stopping the primary task (medication administration) after an interruption to address the secondary task (e.g., phone call, condition change, missing medication).

Student nurses volunteered to participate in gathering survey data from registered nurses (RNs), also known as mentors, while on the unit project site for clinical. Students were selected for participation because of their expected presence on the unit and partnership with nurse mentors for their clinical experiences.

Prior to beginning data collection, students attended a short information session by the primary investigator on the background of medication administration interruptions, project framework, risks to care safety, types of interruptions, how to recognize an interruption, and aims of the project. They also participated in a pilot session for gathering data to establish tool validity.

Students conducted 10 days of observations (2 days a week for 5 weeks) during RN mentor medication administration. After an identified interruption and management of such, students conducted the interruption survey in a real-time format, encouraging a free-flow discussion guided by specific questions embedded in a Qualtrics survey. Survey items consisted of demographic questions (age, experience, degree), closed-ended questions (type of interruption, stage), open-ended questions (describe the interruption; how does that make you feel?), and Likert-scale questions (none, a little, moderate, or a great deal) for perceived level of intrusion. Analysis used a descriptive format and identification of common themes by the primary investigator and coauthors.

#### **Data Analysis**

From 10 student observations, we identified and collected surveys from 41 medication administration-interrupted events for analysis. Data were evaluated for themes and common characteristics in order to identify nurses' reasoning, management of interruptions, and safety procedures. Frequency distributions and means were used to describe types of interruptions, by whom, stage of medication administration, prioritization of primary or secondary tasks, intrusion level, and emotional response.

## RESULTS

The medication interruption events (n = 41) included nurses interrupted while attempting to complete the original primary task. Nurses interviewed after identification of an interruption ranged in age from 20 to 59 years, primarily female (71.4%), with a BSN-level education (69%) and 3–5 years (26.2%) of experience (see Table 1).

#### Type, Frequency, and Stage of Interruptions

The most frequent type of interruptions was due to other people (61.9%), followed by systems (28.6%) and good/ helpful (4.8%). The people interrupting most frequently were found to be other nurses with non-patient-related talking in the medication room (14.3%), followed by families (11.9%), respiratory therapy (RT; 9.5%), and phlebotomy and physicians at 7.1% each (see Table 2).

The stage in which an interruption occurred most frequently was during administration (50%), followed by preparation (28.6%). Interruptions occurring during the administration stage were most frequently a result of people (57%; families, RT, and physicians/phlebotomy) and systems (33%; missing medications) during the administration phase.

### **Primary or Secondary Task**

Data further revealed that nurses were more likely to remain on the primary task of medication administration, 52.4% (n = 22), rather than address the secondary task, 45.2% (n = 19), when interrupted. Nurses' decision-making when encountering an interruption revealed a prioritization theme of "important" or "not important" when deciding to stay on the primary task or address the secondary task.

#### Reasoning for addressing the secondary task

A common theme for nurses choosing to address the secondary task was the determination of "important." The decision-making surrounding importance (a) included the interruption affected care, (b) included safety, (c) required a medication decision, or (d) was time sensitive. These "important" aspects were key deciding factors for stopping the primary task of medication administration to address the secondary task. Examples include phone calls from the laboratory for critical values, missing medications, phlebotomy requests, patient condition changes, calls from physicians, and urgent call lights. Nurses reported the following:

Requires a medication decision

If I am receiving a call from the lab I know it is important. Assessing the situation (critical value), if it wasn't important they would not call us on the phone.

We addressed the situation by giving the patient the medication that she wanted then continued with the rest.

n <sup>a</sup> (%)    17  (40.5)    12  (28.6)    9  (21.4)    2  (4.8)    10  (23.8)    30  (71.4)
17  (40.5)    12  (28.6)    9  (21.4)    2  (4.8)    10  (23.8)    30  (71.4)
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10      (23.8)        30      (71.4)
10      (23.8)        30      (71.4)
10  (23.8)    30  (71.4)
30 (71.4)
0
10 (23.8)
29 (69.0)
1 (2.4)
0
6 (14.3)
11 (26.2)
10 (23.8)
9 (21.4)
4 (9.5)
0
20 (47.6)
20 (47.6) 0
20  (47.6)    0

Safety

The patient was having difficulty breathing and the patient's safety was the most important thing. I needed to help the patient breathe.

The rest of the team was busy. I walked past the room, knew the tech would be busy. Easier to address while passing instead of letting the light sit on urgent.

#### Affected care

The patient's needs were urgent and he would have been left to handle himself for a long period of time.

The Nurse Practitioner (NP) interrupted in the patient room while I was administering medications. I had to hold the administration because the NP was informing about the discharge plan for later today. Finding out the discharge plan was very important and I should not step out or interrupt the provider.

TABLE 2	Interruption Sources	and Frequ	ency
Valid		Frequency	%
Nurse, non-patient-related talk		6	14.3
Family member		5	11.9
Bar code error		2	4.8
Missing medication		4	9.5
Pager		1	2.4
Phone		1	2.4
Call light		1	2.4
Transport		1	2.4
Physician/medical team order change		1	2.4
Nursing student		1	2.4
Patient condition change		1	2.4
Nurse, patie	ent-related talk	1	2.4
Medication dispensing system		1	2.4
Person/reminder		1	2.4
Respiratory therapy		4	9.5
Phlebotomy		3	7.1
Physician call		1	2.4
Lab call		1	2.4
Tech/unlicensed assistive personnel		1	2.4
Physician/medical team		3	7.1
Patient		1	2.4
Total		41	97.6

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Time sensitive

I was going to change the dressing anyways so it was advantageous to have them take it off right then. Better to have them change it now. Phlebotomy interrupted me in the medication room. They needed a lab draw at that specific time.

Addressed the phone call from the physician, it was time sensitive patient situation.

#### Reasoning for maintaining the primary task

Analysis of nurses that reported maintaining the primary task of medication administration (n = 22) frequently did so if the interruption was determined to "not be important" at the time. Nurses' decision-making in determining "not important" included (a) UAP inquiring about a bath, (b) other nurses conversing in the medication room, (c) family talking during administration, (d) bar code errors, and (e) RT conducing care. Of the 22 encounters in which nurses reported they maintained their primary tasks, the most frequent source of interruption was both other nurses talking in the medication room (n = 5) and family members (n = 5). This was followed by RT, bar code errors, and physicians. Nurses reported the following:

*In the medication room I was distracted by a fellow nurse during morning medication administration. Fellow nurse asked about children.* 

A family member presented a picture to me in the middle of scanning and education. Respiratory came in and needed to use the computer.

#### Intrusion level with secondary task

In situations when nurses addressed the secondary task, the level of intrusion most commonly noted was *a little*. However, three episodes resulted in a *moderate* amount of intrusion, and one interruption caused *a great deal of intrusion*. During the interruption that elicited the greatest amount of intrusion, the nurse reported the following:

As I was scanning and giving medications to the patient, as well as educating the patient on what meds they were receiving, a group of physicians came in for rounds and began working with the patient. I stopped and waited for the doctors to finish.

Interruptions that elicited a moderate amount of intrusion included missing medications, engaging in nonpatient-related talking with colleagues in the medication room, and patient condition changes (see Table 3).

### Intrusion level maintaining the primary task

Intrusion levels while maintaining the primary task were predominately *a little*, followed by *a moderate amount*. Interruptions that elicited a moderate amount of intrusion were associated with RT entering the room, family members

TABLE 3      Intrusion Levels During Interruptions				
Interruption Characteristics	n <sup>a</sup>	%		
Intrusion level total				
No intrusion	4	9.7		
A little	26	63.0		
Moderate	10	24.3		
A great deal	1	2.4		
Intrusion level addressing secondary task				
No intrusion	2	10.5		
A little	13	68.4		
Moderate	3	15.7		
A great deal	1	5.2		
Intrusion level remaining on primary task				
No intrusion	2	9.0		
A little	13	59.0		
Moderate	7	31.8		
A great deal	0			
<sup>a</sup> Sample size, $N = 41$ . Numbers may not add to total due to missing data.				

talking, and non-patient-related talk in the medication room. Nurses reported the following:

A fellow nurse started a conversation about a professional baseball game.

Husband of patient tried to engage in conversation while I was hanging IV medications. The tech came in during administration to ask the patient if they wanted a bath.

# *Emotional response to interruptions (primary and secondary)*

The overall responses (n = 41) were primarily "no change in feelings" (54.8%), followed by frustration (16.7%) and annoyance (11.9%). Situations that elicited feelings of frustration, annoyance, or irritation with both primary and secondary tasks were associated with other professionals, such as RT, phlebotomy, UAP, and physicians, who interrupted during administration, seeking to complete their tasks without acknowledgment of the nurse's current medication activities. Frustration was also associated with missing medications during system-related interruptions.

## Management of Interruptions

Management strategies reported in this project focused on nurses maintaining the primary task (n = 22) as reasoning

for addressing the secondary task was presented earlier. Nurses in the project were most frequently interrupted by both other nurses with non-patient-related talking in the medication room (n = 5) and family members (n = 5). Despite reporting a moderate level of intrusion with these encounters previously, nurses reported they frequently ignored the talking in the medication room or from family member during administration by focusing on their primary task (45%). Data showed that with only 3 of the 10 encounters did the nurses address the interrupting person directly and politely ask that they wait as medications were a priority.

#### **Safety Management Strategies**

Strategies used by nurses when encountering an interruption or returning to the primary task after an interruption were analyzed in order to determine reasoning and types employed. Despite nurses reporting they ignored the talking from other nurses in the medication room, all reported that they double-checked or restarted the rights of administration process either in the medication room (during retrieval stage) or at the bedside (during administration stage) for additional safety. Several nurses reported reasoning for ignoring the talking in the medication room as (a) they could avoid confrontation and (b) lack of recognition an interruption occurred due to the normalcy and frequency of it.

Another overarching theme with nurses' safety management strategies with interruptions was the reliance on "scanned" or "unscanned" medications with medication bar coding systems. This was represented by nurses' reports of "piles" of scanned or unscanned medication during administration at the point of delivery to the patient. Most of the nurses reported using this process, explaining that a scanned medication is one that has undergone the nursing rights of medication process during preparation, retrieval, and administration safely with nursing judgment and computerized medication bar code scanning. This process allows nurses to pause their primary task or return to the medication task with the personal security of medication administration accuracy. Nurses safety decision-making when returning to the primary task after addressing the secondary task was reported as using scanned or unscanned "piles"; however, they all reported "rechecking" or "double checking" the medications despite their scanned or unscanned status.

# DISCUSSION

Findings from this project support previous research that medication administration is the most frequently interrupted activity, and it commonly occurs in the medication room by other nurses (Biron et al., 2009; Ebright et al., 2003; Kalisch & Aebersold, 2010). More recently, with the adoption of electronic medical records and medication bar coding systems, nurses are encountering new sources of interruptions that require them to utilize alternative means to manage this issue. In this project, system-related interruptions (missing medications and bar code errors) produced a moderate level of intrusion and required the nurse to stop the activity and problem solve. This requires cognitive shifting by the nurse due to the break in continuity and a higher potential for medication errors (Biron et al., 2009; Ebright et al., 2003; Hopkinson & Jennings, 2013; McGillis Hall et al., 2010; Potter et al., 2005; Westbrook et al., 2010).

Contributing to newer knowledge in the field, this project identified nurses' reasoning, intrusion level, emotional responses, and management techniques amid interruptions. Nurses' reasoning during an interruption centered on the determination of "important" or "not important" when managing the interruption. A significant finding was that despite the nurses' determination of "not important" with nonpatient-related talking in the medication room and missing medications, both produced moderate levels of intrusion and the use of additional safety strategies, suggesting a greater potential for medication errors.

Project findings also revealed that other nurses talking in the medication room not only caused an intrusiveness to the work but feelings of frustration. Despite this, nurses frequently ignored the interruption, which aligned with previous findings from Laustsen and Brahe (2018) that nurses allow small talks from colleagues in an effort to keep good working conditions. All the nurses interrupted in the medication room by colleagues during this project reported that they double-checked or repeated the medication rights for added safety, suggesting that the nurses may actually recognize the interruption and the potential risks but do not have the confidence to address their colleagues.

This project identified previously unknown data about how nurses utilize "piles" of scanned or unscanned medications during administration at the point of delivery for safety. Nurses reported that when interrupted, they are able to resume the task quickly but consistently include a recheck of the rights of medication administration for added security.

#### Limitations

This quality improvement project is limited by a small cohort sample in only one adult acute care setting. Capturing inclusive interruption types may have been reduced by only 5 weeks of observations, occurring mainly on the day shifts. Some situational bias may exist due to the nurses' knowledge of the project as well as student's ability to document accurately nurses' responses when gathering data.

## **CONCLUSIONS**

Medication administration requires critical thinking, focus, and attentiveness to reduce errors and improve patient safety. Failing to recognize an interruption or engaging colleagues in non-patient-related talking in the medication room significantly increases the potential for medication errors. Nursing professional development practitioners have an opportunity to prepare and educate newer nurses in clinical reasoning methods that support improved management of interruptions. Developing interruption recognition skills and management techniques further support both novice and experienced nurses in managing interruptions for greater safety within the acute care setting.

In this current age of complexity, nursing must prepare beyond the current use of signage and determination of no-interruption zones to use of personal management strategies for medication safety. Findings suggest that nurses need support in developing interpersonal communication strategies to directly address not only their colleagues but also others initiating interruptions during the process of medication administration. Interventions to support the nurse's ability to address colleagues and other professionals could include simulation, communication scripting, virtual reality scenarios, and role-play. These interventions allow nurses to identify various interruption types and safely practice communications patterns to address the interruption source professionally. In addition, involvement of interdisciplinary team members would create a stronger culture of safety and interruption awareness as well as maintenance of working environments.

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