

INTERVENTIONS TO REDUCE MEDICATION ERRORS

by

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A DNP Project Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Nursing Practice

Capella University

September 2017

Abstract

Medication errors are the most commonly identified errors occurring in every healthcare setting costing billions of dollars per year. They have the potential to cause death to a patient or increase hospital length of stay. A root cause analysis (RCA) was conducted after a nurse was interrupted several times during the medication administration process and gave medications to the wrong patient. Also, the number of medication errors for the post-operative, medical-surgical unit had increased to nineteen over one quarter. Distractions and interruptions of nurses during the medication administration process have been identified as a relatable factor causing medication errors. The Iowa Model was used to help guide the process of implementing several evidence-based strategies. Fourteen nurses from the unit completed the medication administration error reporting survey, and 71.43% strongly agreed that nurses are interrupted to perform other duties while administering medications. The strategies for the intervention included in the multipronged approach to reduce interruptions during the medication administration process were staff education; medication surveys; medication administration checklist; “Do Not Disturb” medication signs; staff voluntarily wearing medication vest; and observers that used the tool modeled after the California Nursing Outcomes Coalition. The project focus was on registered nurses (RN) on a post-operative, medical-surgical unit who were expected to comply with the evidence-based strategies. Twenty-one medication observations were completed with 17 interruptions, and it was noted that the RNs wore the medication vests during half of the observations. The medication error rate for the unit was ten at the beginning of the project and decreased to six errors by the end of the 12 weeks.

Keywords: medication errors, medication administration, interruptions, patient safety, interventions

Interventions to Reduce Medication Errors

Distractions and interruptions of nurses during the medication administration process have been identified as the leading cause of medication errors ([MEs], Craig, Clanton, & Demeter, 2014). A medication error is identified as a preventable event that may cause or lead to harm of a patient while in the care of a healthcare professional (Smeulers, Onderwater, Van Zwieten, & Vermeulen, 2014). Errors noted while administering medicines are commonly recognized as occurring in healthcare setting, costing a national average of \$44.7 billion dollars per year (Randolph, 2013). The medication errors are projected to harm over a million patients per year (Randolph, 2013). In terms of U. S. hospital operating expenses, MEs accounts for \$46 million per day and consumes an average of 16% per patient cost, which causes a strain on patient care budgets (Zimmerman & House, 2016). It is estimated that 40% of a nurse's inpatient time is spent on medication management-related activities during each patient's hospital admission (Hemingway, Baxter, Smith, Burgess-Dawson, & Dewhirst, 2011).

Medication errors continue to be a significant patient safety issue, and a long-standing threat to patient safety in the healthcare setting (Hayes, Powers, Davidson, & Jackson, 2014). The frequent interruptions and the dramatic increase in medication errors occurred for registered nurses working on a post-operative, medical-surgical in a 150-bed medical center that provides primary, secondary, tertiary, and inpatient mental health care in the Southern part of the United States. The unit has 48 beds with 15 semi-private rooms. The unit serves as an overflow for medicine patients, and provides pre and post-operative care to general, thoracic, and vascular patients.

Problem Description

The adult inpatient post-operative, medical-surgical unit was very busy as the nurses

admitted patients for surgeries on all shifts. Because the unit was very busy, the nurses are often interrupted during their medication administration times to answer phone calls, questions from patient/family, and to provide care to other patients. The problem for registered nurses (RNs) on the unit was the frequent interruptions while administering medications to patients. The unit also experienced an increase in the number of medication errors over the last several months. A root cause analysis (RCA) was conducted on the unit after a nurse was interrupted several times during medication rounds and administered medications to the wrong patient. The RCA was also conducted because of the increased number of medication errors that had occurred on the post-operative, medical-surgical unit over the last several months. The nurse scanned the patient's armband and scanned the medications before it was realized that there was not any water on the bedside table nor was there any water on the medication cart. After returning with the water and the opening of the medications, the nurse noticed that there were not any medication cups on the cart to administer the medicine. While returning with the medicine cups, the nurse was stopped by a staff member and was asked to help turn a patient. After all the interruptions, the nurse reentered the patient's room and gave the medications to the patient in Bed B instead of the patient in Bed A. A recommendation from the RCA team was to develop a plan to minimize interruptions during medication rounds.

The focus of the project was to determine how a multipronged approach to reducing interruptions during medication rounds would affect the medication error rate for the unit. The Joint Commission has acknowledged that interruptions to healthcare providers while providing clinical treatments have contributed to medical errors that could have been prevented (Craig et al., 2014). The effective strategies used to reduce distractions during medication administration rounds included medication protocols, staff education, staff wearing medication vests, and the

“Do Not Disturb” signs (Fore, Sculli, Albee, & Neily, 2013). The aviation “sterile cockpit” principle states that the flight crew is not to be interrupted or engaged in any other activities during the takeoff and landing of the plane; this principle has also been used in healthcare setting to reduce distractions while providing medications to patients (Fore et al., 2013)

Available Knowledge

The literature review revealed journal articles related to interruptions during medication errors. The use of the Cumulative Index to Nursing and Allied Health Literature (CINAHL) resulted in 3,600 peer reviewed articles using the search term *nurses* and *medication errors* from January 2010 – August 2016. An additional search included the search terms *nurses*, *medication errors*, and *hospitals* resulted in seven articles during the same timeframe. Another search with the term *nurses*, *medication errors*, and *interruptions* during medication administration from January 2010-August 2016 resulted in 62 peer reviewed articles. The final search using CINAHL during the same time frame with the search term *medication errors*, *data collection tool*, and *interruptions* during medication administration resulted in eight articles. The PubMed health website resulted in 5833 articles using the search term *nurses* and *medication errors* using the same time frame. In addition, using the search term *medication errors* and *medication interruption data collection tool* resulted in 233 articles using the same time frame. Titles and abstract of articles were reviewed to select the articles that would fit the following PICOT (problem, intervention, comparison, outcome, time) question; In registered nurses on a post-operative unit, how does the implementation of a multiprong approach to reduce interruptions during medication administration times affect the rate of medication errors over 12 weeks?

Medication administration errors (MAE) are a major challenge for healthcare providers, healthcare systems, and patients (Conrad, Fields, McNamara, Cone, & Atkins, 2009). The two

highest perceived causes of medication errors were listed as nurse exhaustion and nurse distraction (Unver, Tastan, & Akbayrak, 2012). Distractions and interruptions during medication administration, such as phone calls, and unnecessary conversations with peers can cause medication errors (Capasso & Johnson, 2012). Distractions and interruptions are attributed to 43% of MEs that occur to hospital staff (Craig et al., 2014). Interruptions during medication rounds cause a decrease in the workflow and efficiency of the nursing staff (Craig et al., 2014). Interruptions can be defined as any emergent or non-emergent event that stops the activity being performed to carry out another task (Craig et al., 2014). Non-emergent interruptions can be defined as those that are not life threatening and can wait until the nurse completes the medication round (Craig et al., 2014). Emergent interruptions are those that are considered life threatening and require an immediate response (Craig et al., 2014).

The types of MEs acknowledged by nurses are providing medicines at the incorrect time, incorrect dose, and omitting the medications (Randolph, 2013). There are also personal and organizational factors that contribute to MEs. Personal factors include not following the policy and procedures of the organization, lack of medication protocols, fatigue, stress, and the nurses receiving insufficient information in the planning and administering of the medicine (Randolph, 2013). The greatest facility issue related to MEs was identified as distractions and interruptions while nurses were administering medicines (Randolph, 2013). Other factors include an increase in the nurse-to-patient ratio; poorly transcribed prescriptions; and insufficient medication packages and labels (Randolph, 2013).

The safe and effective administration of medications is one of the foundations of nursing practice, and requires clinical judgement, professional vigilance, and critical thinking during all phases of the process (Hayes et al., 2014). The Joint Commission and other accrediting agencies

require hospitals to establish programs to identify and prevent MEs (Hertig, Hultgren, & Weber, 2016). Nurses are in the best positions to recognize and prevent MEs before the patient's safety is compromised (Hayes et al., 2014). The responsibility for preventing MEs are on the facility and the individual nurse (Lim & Honey, 2014). The administration of medicines is a complicated process for medical-surgical nurses caring for six or more patients (Cooper, Tupper, & Holm, 2016).

Medication errors are a major concern and a national patient safety issue affecting the quality of care being provided to patients (Lim & Honey, 2015). Medication errors for this facility have the potential to cause adverse events, such as death or prolonged lengths of stay, which is a concern for nursing leadership. The cost of adverse medication events to a patient, family, and healthcare providers range from \$2,660 to \$8,650 above the average treatment cost (Zimmerman & House, 2016). The increased organizational costs are the results of longer hospital stays and patient mortality (Hayes et al., 2014).

Rationale

The Iowa Model was chosen for this project because the model can be used by staff nurses, educators, and healthcare organizations to help guide the process of implementing evidence-based strategies for improvement in the clinical setting (White & Spruce, 2015). The model has an algorithm and allows the use of bullet points to follow the approach clearly. The model also allows for the identification of a potential clinical problem, piloting the project to potentially change the clinical problem, and the evaluation of the project for sustainment. The Iowa Model focuses on collaboration within the organizations that allows nurses to question current nursing practices to determine if improvement is needed based on the current research (White & Spruce, 2015).

Medication errors are costly to the patients, families, and facilities due to additional treatments, which can initiate an extended length of stay. The Iowa Model suggests the team approach by creating an interest and awareness in the implementation of strategies, and gaining the knowledge to sustain the project (White & Spruce, 2015). These strategies can assist with building organizational support and connecting with other clinicians to provide high-quality cost-effective healthcare (White & Spruce, 2015). The focus of the project was on registered nurses; however, medication errors can be caused by pharmacists, pharmacy technicians, licensed practical nurses (LPNs), and physicians.

Specific Aims

The fact that most patients receive a significant number of medicines while hospitalized is associated with the greatest number of MAEs, whether harm is caused or not (Keers, Williams, Cooke, & Ashcroft, 2013). The education of medication management is important for nursing practice and patient safety (Lim & Honey, 2014). This project will help to analyze and prioritize interruptions that are experienced by registered nurses during medication administration process, and to eliminate interruptions that could potentially cause negative patient care outcomes (Cooper et al., 2016).

The specific aim of the project was to reduce MAEs by implementing a multipronged approach during medication administration times that would decrease the number of medication errors on the unit. In addition, the goal was to identify the nurses' perceptions as to why MEs occurred on their unit, and the number and type of interruptions that occurred during medication rounds. This multipronged approach can assist practicing nurses with the idea to stop and reflect before moving forward during medication administration rounds (Nelms & Treiber, 2011). For this project, an interruption was defined as a break in performing a medication related task that

lasted longer than ten seconds (Kositis & Jones, 2011). The results of this evidence-based practice approach to reduce the number of medication errors, and to identify the types of interruptions that occurred during the medication administration process will be disseminated to other areas within the facility.

Methods

The initial method used for the project was the discussion with all the nursing staff on the post-operative, medical-surgical unit regarding ways to reduce medication errors. The registered nurses were given a week to complete a medication administration survey via a link created in survey monkey. During the first week, the “Do Not Disturb” medication signs were placed on the medication carts, in the medication room, and on the information board in the nursing unit. A week after the administration of the survey, the registered nurses were asked to voluntarily wear a “Do Not Disturb” medication vest twice a day during the main medication hours. The medication checklist that was visible on the medication cart, included the seven medication rights, medicine cups, syringes, alcohol pads, tongue depressors, pill crushers, IV tubing, gloves, and hand sanitizers. The list was placed on the medication cart as a reminder to the nurses to stock the cart with the necessary items before beginning medication rounds. Other staff members were asked to divert interruptions during medication times when the RNs were wearing the medication vests. In addition, selected observers monitored the RNs during their medication rounds using a data collection tool modeled after the California Nursing Outcomes Coalition.

Context

The shortage of nursing staff caused the unit to become extremely busy. The nursing staff was often interrupted during medication administration times for various reasons from patients, family members, and staff. The unit experienced an increase in medication errors, an

RCA was conducted, and a plan was initiated to reduce the amount of interruptions the nurses experienced during their medication rounds. The nursing leaders, nurse manager, and the clinical nurse leader supported this project, as this unit was leading the facility in the total number of unit medication errors. The unit is opened twenty-four hours a day, seven days a week, with a patient census ranging from 33- 37. The unit consists of a nurse manager, two assistant nurse managers, 22 full-time RNs, four part-time RNs, seven LPNs, and 17 nursing assistants. The unit currently needs to fill 15 vacant RN positions as the nursing staff only works eight-hour shifts.

Intervention(s)

Once there was a need identified for the project on the unit, the team leader for the project gathered relevant literature related to the topic, and presented the information to the team. The team consisted of a pharmacist, assistant nurse manager, clinical nurse leader, and the patient safety nurse. The initial steps of the intervention were to obtain buy-in from the front-line staff nurses and the key stakeholders. In addition, staff education on the medication administration process, the “Do Not Disturb” signs and vest were used during the project. The first component was to dispense the medication administration error reporting survey during the first week of the project. The survey asked the nurses to rate their perception on reasons why medication errors occur on their unit, reasons why medication errors are not reported, and the perceived number of times they are interrupted during their medication rounds (Wakefield, Uden-Holman, & Wakefield, 2005). The second component incorporated the use of the “Do Not Disturb” signs and nurse’s voluntary wearing the medication vests. The medication signs were visibly displayed at eye level on all the mobile medication carts. The signs were also displayed in a prominent location in the medication room. The goal of the signs in the different areas was

to inform others that medications were currently being administered to the patients and that a quiet environment was needed (Fore et al., 2013).

The nursing staff were encouraged to stock their medication carts before beginning their medication rounds with the supplies listed on the medication checklist and water to reduce the risk of returning to the medication or supply room to gather items needed during the medication process. The third component was to establish a no interruption zone that staff members were asked to protect the medication nurse by diverting any possible interruptions while medications were being administered to the patients. The final component was the evaluation of the intervention. The clinical observers were educated on the project and trained on the use of the data collection tool modeled after the California Nursing Outcomes Coalition. The trained clinical observers directly observed the nurses administering medications to their patients and recorded the results on the data collection form.

Study of the Intervention(s)

Effective strategies used to reduce distractions during medication administration included medication protocols; staff education; staff wearing medication vests; and “Do Not Disturb” signs (Fore et al., 2013). In addition, staff members were asked to voluntarily intercept distractions to protect nurses during their medication rounds (Fore et al., 2013). Most importantly, agencies seeking to improve healthcare recommend that nurses are observed sporadically to identify the specific number of MEs rather than believing that nurses will deliberately report their own MEs (Flynn, Evanish, Fernald, Hutchinson, & Lefaiver, 2016).

The aviation “sterile cockpit” principle that has been used in healthcare setting to reduce distractions and interruptions was the approach used for this project. In addition, the feedback from the staff was used to assess the impact of the intervention. The additional evidenced-based

strategies to reduce the medication error rate on the nursing unit were staff education, staff voluntarily wearing the medication vests, and the “Do Not Disturb” signs. The direct observation of the nursing staff during the medication rounds was found to be the most useful method to track the type of interruptions the nurses were experiencing. The data collection tool used by the selected observers, the staff feedback, and the unit medication error rate reported from pharmacy were the indicators used to establish if the outcomes were due to the interventions.

Measures

The Medication Administration reporting survey was a measure used as a means of providing confidential information to the stakeholders of the organization regarding the thoughts of the registered nurses and the medication administration process. This survey was previously used to explore the relationships between the nurses’ perceptions of their organizational culture regarding medication errors, the implementation of quality improvement methods to prevent medication errors, and the reporting of medication administration errors (Wakefield et al., 2005). The use of the signs and medication vests were inexpensive items used during the project implementation time. The average cost of one medication error can cost thousands of dollars, and two hundred disposable medication vests only cost \$170.00, which is inexpensive compared to the cost of just one medication error. The selected observers used the tool modeled after the California Nursing Outcomes Coalition to monitor the RNs for interruptions during their medication rounds. This tool was used in a prior medication error prevention project and the reliability was 100% with ten observations on 30 medication passes (Cooper et al., 2016). Direct observations have been found to be the best available method for determining the prevalence of

medication administration errors (Keers et al., 2013). The unit has a clinical nurse leader and she will continue the observation process at different intervals during the medication rounds.

Analysis

A descriptive quantitative data analysis using percentages was used via survey monkey to collect the nurses' perceptions of why medication errors occurred on the unit. The registered nurses were asked a series of question and using the Likert scale answered 1-6 (1 = *strongly disagree*, 2 = *moderately disagree*, 3 = *slightly disagree*, 4 = *slightly agree*, 5 = *moderately agree*, 6 = *strongly agree*). In addition, data was collected when clinical observers used stop watches to monitor if an interruption lasted longer than ten seconds. If the interruption was longer than ten seconds, the type of interruption was recorded. The unit's medication error rate was collected prior to the project and at the end of the project. During the 12 weeks, 21 observations occurred during the medication administration rounds.

The approach to reduce medication errors has proven to be effective in the clinical setting; however, staffing was a variable that reduce the number of RN observations. Therefore, it is possible that additional project implementation time would have provided additional statistical data. Also, the use of the medication vest was voluntary, and not all staff supported the use of the wearing the medication vest.

Ethical Considerations

The facility's intervention review board (IRB) is subject to review all data collected on patients or employees. The board was informed of the purpose of the project and supporting research data was provided. Also, the board was informed that the staff would be asked to voluntarily complete an anonymous electronic survey regarding medication errors. The staff was informed that there would be no repercussion for non-participation. The principal investigator

was an employee of the facility but no conflict of interest was identified. The facility's IRB determined that the project was a qualitative improvement project and did not pose a threat or harm to the patients or employees. The results of the facility's IRB were submitted to the principal investigator's educational institution for their approval. It was determined that there were no apparent ethical issues and the project was implemented.

Results

There were 14 out of 22 RNs who voluntarily took the survey and 71.43% indicated that nurses are interrupted while administering medications to perform other duties. The survey also reported that 78.57% of nurses agreed that the unit's staffing levels were inadequate, which contributed to medication errors. There was a total of 21 observations; however, 14 observations noted that the registered nurses were voluntarily wearing the "Do Not Disturb" medication vest. Also, it was noted that 17 interruptions occurred during the medication administration process for the following reasons: phone (four), physician (two), another patient (one), another RN/staff (four), to obtain supplies (two), and to obtain additional medications (four). The medication error rate for the unit was ten at the beginning of the project and decreased to six errors by the end of the 12 weeks.

Discussion

Medication errors have been a significant problem within healthcare organizations; however, there are various reasons why the errors occur. It was discovered on this unit that interruptions did occur; however, the focus was to determine the type of interruptions. It was important for this project that nurses wore the "Do Not Disturb" medication vest, and that the available staff members intercepted any interruptions. In addition, a medication checklist was placed on all the medication carts as reminders to the nursing staff to stock their carts with the

necessary supplies before their medication rounds to prevent any interruptions to the medication administration process.

The project revealed there is a need to continue to stress the importance of medication safety. There were 21 observations collected and the staff members were interrupted at least half of the time during those observations. The unit's medication error rate decreased from ten errors at the beginning of the project to six errors at the end of the 12 weeks; however, the stakeholders must continue to stress the importance of reducing interruptions during medication rounds. Also, it is important that staff members are available to intercept interruptions. Staff members voiced concern of being reported to nursing leadership by the patients, families, or physicians if they did not assist when call upon during their medication rounds.

Summary

The key finding revealed during the anonymous survey that ten out of the fourteen nurses that responded to the survey indicated that nurses are interrupted during medication administration to perform other duties. The 11 of the 14 nurses strongly agreed that staffing levels were inadequate, which could potentially contribute to medication errors. Most of the staff nurses were on board with wearing the disposable medication vest during the medication administration times; however, there were a few that objected to wearing the medication vest because of its appearance.

The results of the project indicate that interruptions will occur to nurses during medication administration even with interventions in place to discourage the interruptions. However, non-emergent interruptions must be prevented and team building skills must be addressed with the staff to intercept these interruptions. The strengths of the project are the multipronged approach strategies used to reduce interruptions during medication administration,

and with additional time other clinicians can grow to respect the interventions that were being used. The project revealed that the staff nurses are interrupted during the medication administration process, and they were mostly interrupted by phone calls, another RN/staff member, and returning to the medication room to obtain medications (see Appendix).

Interpretation

The intervention of the project identified that interruptions during the medication administration process is a problem for this unit. The findings revealed that additional education is needed for clinicians to protect the nurses during medication administration. As identified in literature, nurses need to feel empowered to speak up for themselves to discourage unwanted interruptions during medication administration (Fore et al., 2013). It was anticipated that the nursing staff would be skeptical regarding the use of the medication vest as the wearing of the vest was voluntary; however, at least half of the RNs did comply with wearing the medication vest.

As a result of the project, the type of interruptions was easily identified. In addition, the key stakeholders had the ability to view the results of the survey and identify ways to reduce the potential medication errors and make changes to the current medication policy. In addition, the evidenced-based strategies heightened the staff awareness of the type of non-emergent interruptions that occurred on the unit. The project also revealed the nurses did not feel that the other staff members supported them enough to intervene when interruptions occurred.

Limitations

One limitation of the study was that the survey was only given to RNs, and only the RNs were monitored during the medications administrations times. In this facility, medications are given to the patients by RNs and LPNs. The medication errors are charged to the unit because

that is the location of the patient, whether the error was committed by an RN, LPN, physician, pharmacist, or pharmacist technician. However, an electronic signature is required to access medications, and the pharmacy department is aware of exactly who caused the medication error. In addition, the survey did not address errors in prescribing or dispensing medicines. The observation data collection tool was only used in one area of the hospital for twelve weeks, which will not capture the total causes and types of interruptions in the facility during medication rounds. The nurses were aware that the initial implementation of the project was only for 12 weeks, which could affect the medication error rate for the unit. Once some of the RNs knew who the observers were on the unit, they would wear the medication vest during the medication rounds. The observers were asked to not collect data on the same nurse.

Another limitation to the project was the Emergency Department (ED) calling report on patients transferring to the unit during main medication administration times. The evening shift primary medication time had recently been changed from nine pm to five o'clock pm. Five o'clock pm is the time the clinics close and the physicians transfer their patient care load to the after-hour physicians. If the patients in the ED have not been discharged or transferred prior to the evening shift, the ED nurses would call report to transfer patients during the evening shift primary medication time. During that time, the unit did not have sufficient staff and the calls generated frequent interruptions to the nurses on the unit. The RNs were the only staff members wearing the medication vest, and they are the ones that are to obtain the report on the incoming patients.

The Chief Nurse for the ED and the ED Nurse Manager was made aware of the frequent interruptions, and they did work with the staff to minimize the interruptions to the nurses during the five am and five pm medication times. The emergency room nurses were encouraged to try

and call the report before the main medication administration times. The ED core measures suggest that all patients in the ED should be discharged or transferred to a higher level of care within six hours of their admission. Due to these measures, there was a concern for the patients in the ED who had lengthy wait times. The Chief of Staff was notified and agreed to work with the ED physicians to transfer patients to their designated areas as soon as possible. The stakeholders were on onboard with the strategies to reduce interruptions during the medication administration process; however, they did not want the patients to remain in the emergency room for any additional time because RNs were administering medications.

The last limitation was that the nurses are allowed to wear their own scrubs, and the medication vests was not easily identified on some of the scrubs that were worn by the staff nurses. Also, an increased in the number of interruptions could have been caused because the vests were not easily identified on some scrubs. In addition, due to the staffing problems during the time of the project implementation, LPNs were used often to administer routine medications.

Conclusions

Nurses play an important role in administering and managing medications, and monitoring the effects of medicines on their patients. Preparation and administration of medications require a nurse's undivided attention. The desired state was to implement a process to minimize non-emergent interruptions by having a structured environment during the designated medication times that would allow the nurses to administer medications safely. The front-line nursing staff must have buy-in to the medication safety project initiative to improve the patient care outcomes, and to decrease the number of medication errors on the unit.

The findings of this project revealed a useful approach for the facility in addressing and implementing measures to reduce medication errors. The pharmacy department tracks the location and types of medication errors, and the clinical nurse educators provides education to the nursing staff to reduce medication errors. However, the facility must continue with the culture of “no blame” when a medication error is identified to encourage the nurses to report medication errors, as well as “near misses”.

The direct observations and staff feedback was essential to the continuation of the project. The managers and the educators in the facility must continue to observe for the use of the “Do Not Disturb” medication signs and vests. In addition, the nurses must be complimented for voluntarily implementing a practice change to their current medication process. The project is sustainable and will be given to the clinical nurse leader on the other inpatient unit to implement. The project will include the LPNs and the RNs on all inpatient units.

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Appendix. Types of Interruptions

