Nurses' Perceptions of the Causes of Medication Errors: An Integrative Literature Review

By: Peggy Hewitt

Abstract:

Most nurses first hear the phrase "medication error" during their basic professional education. Concern for jeopardizing patient safety by committing a medication error traditionally has been instilled deeply into student nurses. Medication errors are a very real and frightening event in health care, and they deserve the concern associated with them. A 2000 report by the Institute of Medicine (IOM), which indicated 44,000-98,000 people die each year in hospitals due to medical errors, focused national attention on patient safety and awareness of potential harm (Kohn, Corrigan, & Donaldson, 2000).

Before the IOM publication To Err is Human: Building a Safer Health System (Kohn et al., 2000), little published research existed regarding medication errors in nursing. A Cumulative Index of Nursing and Allied Health Literature (CINAHL) search revealed only five research articles related to nursing and medication errors from 1995 to 1999. However, since the IOM's report, numerous studies have explored best practices for safer medication administration. Studies have evaluated medication reconciliation (Kramer et al., 2007; Nester & Hale, 2002; Varkey et al., 2007), the use of computerized physician order entry, (George & Austin-Bishop, 2003), the use of medication protocols (Manias, Aitken, & Dunning, 2005), improvement of nursing students' math skills in order to reduce medication errors (Wright, 2004), and discussions of barriers to medication error reporting (Madegowda, Hill, & Anderson, 2007; Mayo & Duncan, 2004; Stetina, Groves, & Pafford, 2005; Ulanimo, O'Leary-Kelley, & Connolly, 2007).

Keywords: medication error | literature review | medicine administration

Article:

***Note: Full text of article below

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The prevention of medication errors is crucial in health care. Because nurses are usually the final point of delivery in the medication administration process, they also are often the ones who commit a medication error. This integrative review of the literature examines nurses' perceptions of the causes of medications errors and their implications for nursing.

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Note: A related article on the topic of medication errors entitled "A Nurse-Patient Partnership Program to Improve Medication Safety: Ask Your Nurse about Your Medication" can be found in the May/June 2010 issue of *MedSurg Matters!*, the official newsletter of the Academy of Medical-Surgical Nurses.

Most nurses first hear the phrase "medication error" during their basic professional education. Concern for jeopardizing patient safety by committing a medication error traditionally has been instilled deeply into student nurses. Medication errors are a very real and frightening event in health care, and they deserve the concern associated with them. A 2000 report by the Institute of Medicine (IOM), which indicated 44,000-98,000 people die each year in hospitals due to medical errors, focused national attention on patient safety and awareness of potential harm (Kohn, Corrigan, & Donaldson, 2000).

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In the current fast-paced, demanding field of health care, medication errors continue to occur despite efforts to reduce such events. A medication error can occur at any point during the medication delivery process: prescription, transcription, dispensing, or administration (Stetina et al., 2005; Tang, Sheu, Yu, Wei, & Chen, 2007). None of these steps is error proof. All steps involve multiple members of the health care team, including physicians, pharmacists, pharmacy technicians, and nurses. The order in which these steps routinely occur ultimately places nurses in the position of the final check point of ensuring safe medication delivery (Maricle, Whitehead, & Rhodes, 2007; Ulanimo et al., 2007).

Most of the nursing literature focuses on consequences of the nursing shortage and does not address human errors. One of three adverse drug events related to medication errors occurs when a nurse administers the medication, yet even when the root cause of the error can be traced to the prescriber, nurses still receive the blame (Burke, 2005). A literature review by Carlton and Blegen (2006) found medication errors to occur due to

incorrect drug calculations, lack of knowledge, failure to follow protocol, time pressures, fatigue, staffing levels, inexperience, design deficiencies, and inadequate equipment. Lassetter and Warnick (2003) identified nine types of common medication errors: prescribing two or more medications with interactions known to cause side effects, prescribing a drug to which the patient has a known allergy, misreading a physician's handwriting, misinterpreting an abbreviation, experiencing confusion between two medications with similar names, using a concentrated dose instead of a dilute form of a drug, confusing medications in similar looking packages, receiving unclear prescribing directions, and committing an error of omission. This review also noted many errors result when exceptional demands are placed on a person's memory, attention, and vigilance due to complex systems in many institutions.

Although the literature points to common themes related to nurses' views of medication errors, it is also clear that some confusion exists regarding what constitutes a medication error. A pioneering study by Gladstone (1995) captured nursing's attention 5 years before the IOM report. Gladstone studied the factors underlying the occurrence and reporting of medication errors. The study revealed nurses' confusion regarding the definition of medication errors. This study has been replicated with an alarming result; disagreement still exists among nurses as to what constitutes a medication error (Mayo & Duncan, 2004; Osborne, Blais, & Hayes, 1999; Ulanimo et al., 2007).

Agreement among studies does exist, however, regarding, nurses' perceptions of the causes of medication errors (Fry & Dacey, 2007; Mayo & Duncan, 2004; Osborne et al., 1999; Pape, 2003; Rogers, Hwang, Scott, Aiken, & Dinges 2004; Stetina et al., 2005; Tang et al., 2007; Ulanimo et al., 2007). Because nurses routinely administer medications, their perceptions of the causes of errors are important to consider as health care systems implement error-prevention measures. The purpose of this integrative review is to identify evidence regarding nurses' perceptions of the cause of medication errors and discuss their implications for the nursing profession.

Search Strategies

A CINAHL search of publications 2002-2008 was performed using the key words *medication errors* and *nursing*. Study results published in this time frame were likely to experience equally the weight of the IOM publication. The search yielded 394 articles. The limits of *research article* and *peer reviewed* were added, narrowing the number of articles to 76. Adding the keyword *reporting* did not change the results of this search. Interestingly, limiting the dates of the search from 1995 to 1999 (representing the 5 years prior to the publication of *To Err is Human: Building a Safer Health System*, Kohn et al., 2000), produced only five articles. A subsequent search limited to 2000-2001 also yielded only five articles. These search findings strongly suggest the IOM's report contributed to an increase in research stemming from the national attention to safety in the health care system regarding medication errors. A Medline search also was conducted using the keyword *medication errors* and the following limits: review, English only, core critical journals, nursing journals, and the years 2002-2008. The Medline search yielded 176 articles. Articles reporting research focused on specific interventions, such as safe prescribing practices, physician computer order entry, and effectiveness of medication reconciliation, were excluded. Articles reporting research in specialized areas of practice not generalizable to all nursing practice also were excluded. In addition, studies of methods to increase the reporting of errors or research on other forms of medical errors, such as equipment failure, diagnostics errors, or drug-related problems, were rejected. Inclusion criteria allowed both qualitative and quantitative studies. Research articles reporting nurses' perceived causes of medication errors, parameters of medication errors, and the impact of nursing environ-

ments and medication errors, were included. A total of nine articles from the years 2002-2007 found during the CINAHL and Medline searches were summarized in a matrix for organized review.

Synthesis of Findings

Common themes have been identified regarding nurses' perceptions of the causes of medication errors. Distractions, failure to follow the five rights of medication administration, failure to follow protocol, fatigue or exhaustion, poor physician handwriting, confusion between drugs with similar names or similar packaging, confusion regarding infusion devices and miscalculations, length of shift, excessive daytime sleepiness, and events on the unit requiring higher priority were noted throughout these studies. See Table 1 for a summary of these studies that includes their purpose, method, subjects/sample, findings, limitations, and comments.

Five years before the IOM report, a groundbreaking study sought to identify common themes underlying the occurrence and reporting of drug administration errors (Gladstone, 1995). Over the course of a year, medication administration errors were studied in an acute care setting in England. A total of 102 nurses participated in this study, as well as 17 nurse managers who were likely to deal with nurses who make drug errors. During this 12-month period, 79 incident reports involving medication administration errors were reviewed. The results summary included types of drug errors, routes of administration, time of day the incident occurred, and type of monitoring or intervention required. No statistics regarding nurses' years of experience, level of education, specific practice setting, or age or gender were mentioned. Gladstone used a questionnaire to allow nurses to rank causes of drug errors according to their perceived frequency of occurrence and offer comments at the end of the questionnaire. In addition, nurses reviewed four case scenarios in which they indicated if what occurred constituted a medication

Table 1.
Matrix of Studies Reviewed

Reference	Purpose of Study	Methodology	Subjects and Sample	Findings Related to Causes of Medication Errors	Limitations
Pape, 2003.	To measure the effect of two targeted interventions to decrease nurses' distractions during medication administration. Study was based on protocols used in the airline industry.	Compared three groups of nurses during eight cycles of medication administration. Independent variable was group identity of first the control and then the two interventions, to prevent distractions during medication administration. Dependent variable was the number of distractions each group experienced during medication administration.	Convenience sample 24 nurses (LVNs, RNs with both ADN & BSN preparation), 1-26 years of experience. Members of sample routinely administered medications on a medical-surgical unit in an acute care hospital in the southwestern U.S.	Distractions Failure to follow the five rights of medication administration or protocol Lack of focus Poor communication	Observer influence may have affected behavior. Only one nurse observed at a time. Hospital did not have a medication room on the unit. Nurses not observed while in patient's room. Poor communication and lack of focus not defined.
Rogers, Hwang, Scott, Aiken, & Dinges, 2004.	Examine the work patterns of hospital staff nurses to identify a possible relationship between hours worked and frequency of errors.	Random sample of members of the American Nurses Association invited to keep a logbook of hours and shift worked, overtime, and sleep/wake patterns for 2 weeks.	RNs only 92% female 79% Caucasian 17.2 ± 10.0 years of experience 4,320 members invited to participate 1,725 expressed interest 891 eligible (unit-based hospital staff nurses working full time) 362 returned logbooks Response rate ~ 40%	Work duration Overtime Number of hours worked per week. Likelihood of making an error was three times higher when nurses worked 12.5 hours or more in a shift. More than half of errors and near errors involved medication administration.	Data derived from self-reports may not be representative of work schedules and practices of all U.S. hospitals. Study participants responded to 17-40 items daily for 28 days – more effort than most surveys. No definition of "error" in survey instrument possibly limiting responses of errors considered to be minor or harmless.
Mayo & Duncan, 2004.	To identify nurses' perceptions of medication errors and reporting the errors.	Self-report survey method by randomly selected nurses in multiple settings. Descriptive study.	Sample from 16 southern California acute care hospitals RNs. Ages 23-74 95% female 1-45 years experience 62.7% worked full-time 49% Caucasian 34% Pacific Islander 8% Hispanic 4% African-American 4% other Educational preparation: 11% diploma 40% ADN 44% BSN 3% graduate 3% other Units represented: Medical-Surgical ICU Maternal/Child All shifts represented. Random sample 5,000 RNs from United Nurse's Association of California/Union of Health Care Professionals 983 responded 20% response rate	Distractions Failure to follow five rights of medication administration (failure to check name band) Being tired and exhausted Poor physician handwriting Confusion over similar medication packaging Confusion over drugs with similar names Miscalculations by nurses Confusion over correct programming of infusion device Miscalculation by MD	Sample for study from a health care union and may not be representative of nonunion nurses. Survey completion was voluntary and may reflect reporting bias.

Table 1. (continued)
Matrix of Studies Reviewed

Reference	Purpose of Study	Methodology	Subjects and Sample	Findings Related to Causes of Medication Errors	Limitations
Suzuki, Ohida, Kanieta, Yokoyama, & Uchiyama, 2005.	To determine the prevalence of EDS and sleep habits among nurses; analyze associations between EDS and different types of medication errors; provide data to allow informed discussions about measures to prevent accidents among hospital nurses.	A cross-sectional study targeting 4,407 nurses in large Japanese hospitals. Anonymous self-administered questionnaire.	Convenience sample of nurses from eight general hospitals in Japan 4,407 nurses responded to questionnaire (4,279 female)	EDS is prevalent among nurses. A significant relationship between EDS and occurrence of occupational accidents including the following: Drug administration errors Shift work and age (with ages 20-29 as a reference, an association was observed in ages 30-39 and age 50 or older) Incorrect operation of medical equipment Needlestick injuries and age Findings suggest shift work, work-related stress, and short sleep duration are associated with EDS among nurses as compared to non-nurses.	Self-administered questionnaire may include reporting bias. May not be generalizable to other cultures.
Stetina, Groves, & Pafford, 2005.	To explore the management of medication errors by examining ways nurses define and make decisions regarding the reporting of medication errors; how medication errors affect nurses' daily practice	A Heideggerian phenomenologic method of interviewing nurses.	Clinical nurses in south/southeast Texas with 6 months-34 years experience Settings: Labor and Delivery Medical-surgical ER Faculty and school nurses Six nurses interviewed	Nurses did not believe "right time" was as crucial as the other five rights, especially if higher priority events were occurring on the unit. Respondents believed timing was part of nursing judgment. Over-reliance noted when nurses believed medication administration records and automated medication dispensing machines were reliable and assisted in preventing errors.	Response bias may occur with interviews.
Ulanimo, O'Leary-Kelley, & Connolly, 2007.	To describe: • Medical-surgical nurses' perceptions of frequent causes of medication errors • What nurses believe constitutes a medication error • The barriers and empowerments to reporting medication errors	Descriptive study with convenience sample used modified Gladstone questionnaire. Part 1 - rank a list of 10 possible causes of medication errors Part 2 - identify percent of medication errors that are reported Part 3 - six patient care scenarios Part 4 - views on medication errors Part 5 - demographic information	Subjects from inpatient Veterans Administration facility in California Medical-surgical units included: Telemetry/medical Oncology and hematology Surgical 92% female 72% Asian 52% ages 40-49 68% BSN 40% >20 years experience 84% worked full time 40% day shift 40% evening shift 20% night shift Convenience sample of 61 RNs and LVNs 27 questionnaires returned 44% response rate	Nurses' failure to check name band (5 Rights) Tired and exhausted MD wrote wrong dose Nurse dose miscalculation Confusion between two drugs with similar names Poor handwriting Distractions Confusion of infusion devices Confusion over medication labels/packaging Incorrect setup/ adjustment of infusion device	Results from inpatient VA facility using physician order entry; barcode medication administration with computerized medical record may not be generalizable to hospitals that do not use these IT systems. Small convenience sample, PI was previously a nurse manager on one of the units. Questionnaire not did include percent of errors. Verbally reported.

Table 1. (continued)
Matrix of Studies Reviewed

Reference	Purpose of Study	Methodology	Subjects and Sample	Findings Related to Causes of Medication Errors	Limitations
Madegowda, Hill, & Anderson, 2007.	Compares and contrasts three nursing shifts in a small rural Midwestern hospital with regard to number of reported errors, type and severity of errors, and units on which errors occurred.	Retrospective, non-experimental descriptive design.	Reviewed 133 medical errors reported over a 12-month period Used 120 of the reports No pediatric or incomplete reports were included Research conducted at a 100-bed rural hospital where RNs routinely have 15-20 patients on 2nd shift	Highest percent on Fridays, during the month of January, on a general med-surg unit, with IV medications. Errors involved either omission or wrong dose. Fridays have a high rate of absenteeism at the hospital.	Findings from the small rural hospital are not generalizable. Unknown if more errors occurred but were not reported.
Fry & Dacey, 2007.	To identify nurses' views on the factors potentially contributing to medication errors and consequences of error reporting.	Cross-sectional survey using a structured questionnaire.	Volunteer RNs from seven different types of wards 0-16 or more years of experience 57% trained in the U.K. 240 questionnaires distributed 139 returned completed 58% response rate	Distractions Training/education Confusion over packaging/labels Illegible medication charts	Study in U.K. (London). Participation voluntary and may reflect reporting bias. No clear definition of 'medication chart.' Significant difference in nurses trained in the U.K. regarding preparation in pharmacology.
Tang, Sheu, Yu, Wei, & Chen, 2007.	Investigate nurses' views on factors contributing to medication errors in the hope of improving the medication administration process	A three-part semi-structured questionnaire with narrative description of error, nurses' background, and contributing factors snowball sample.	Female nurses in Taiwan 90 nurses invited to participate 72 responded 80% response rate	Personal neglect (5 Rights) Distractions Heavy workload New staff Need to solve other problems while administering drugs Advanced medication preparation without rechecking before administration Being a new graduate Medical wards and ICUs were most common sites for medication error occurrence.	Study conducted in Taiwan; authors stated they are reluctant to release incident reports and to participate in surveys regarding medication errors. Respondents based answers on recall. Snowball sampling and small sample size may cause sampling bias.

error, and subsequently if the physician and nurse manager should be notified.

Results revealed two major areas of concern (Gladstone, 1995). First, confusion existed among nurses regarding the definition of medication errors, when such errors should be reported to the physician, and when they should be reported to the nurse manager. Second, fear of disciplinary action upon reporting medication errors was identified. The four case scenarios included common occurrences on a medical-surgical unit. Scenario #1, in which a patient missed a scheduled antibiotic because he was off the unit for 3 hours, showed less than 20% of nurses considered this an error. Scenario #2 stated four patients received their intravenous antibiotics 45-60 minutes late on a busy surgical unit. Again, less than 20% of nurses considered this a medication error. A patient receiving total parental nutrition at 200 ml/hour instead of the ordered 125 ml/hour was the subject of scenario #3, and greater than 80% of nurses said this constituted an error. Scenario #4 in which a nurse omitted a 2:00 a.m. dose of Ventolin® (albuterol) for a patient who was asleep, was considered a drug error by just over 20% of nurses. Results also demonstrated nurses would tend not to report all errors to the nurse manager, and showed disagreement as to whether the error should be reported to the doctor. Other survey questions revealed 63% of participants were not sure what constitutes a medication error, and 74% believed some errors were not reported due to nurses' fear of the

reaction of nurse managers. A total of 14 nurses who made medication errors also were interviewed. One of the common themes that emerged from these interviews revealed fear of management's reaction to nurses who make drug errors.

Subsequent studies replicated Gladstone's work (Mayo & Duncan, 2004; Osborne, Blais, & Hayes, 1999; Ulanimo et al., 2007). Their results demonstrated continuing confusion among nurses about what constitutes a medication error. This confusion is relevant to note because nurses must agree on the definition of a medication error and an appropriate reporting process in order to develop effective strategies for a safer health system.

Osborne and colleagues (1999), Mayo and Duncan (2004), and Ulanimo and co-authors (2007) each used a modified version of the Gladstone survey to determine nurses' perceptions of what constitutes a medication error, identify the main causes of medication errors, and understand barriers to reporting errors. Osborne and colleagues administered a modified version of Gladstone's survey to registered nurses in a community hospital in south Florida. With permission from Gladstone, these researchers omitted the items that addressed nurses' education related to administering medication and the need for continuing education about medications, as this was specific to nursing in England. Items included in their survey included statements requiring the ranking of perceived causes of medication errors, participants' views about reporting medication errors, and the same scenarios in which the respondents indicated whether the incident constituted a medication error, if the doctor should be notified, and if the nurse manager should be notified. This survey included an extra scenario describing a nurse who gave a patient one oxycodone (Percocet®) for pain when she had the option of giving one or two pills for pain every 4 hours. One and a half hours later, the patient requested the second pain pill and the nurse admin-

istered it. The survey participants were to state if that constituted a medication error, and if it should be reported. Results revealed when nurses discovered what they thought to be medication errors, they were not necessarily likely to report the error. No statistical differences related to age, years of experience, or level of education were found in these nurses' perceptions of medication errors. These participants ranked their perception of the causes of medication errors as failure to identify the patient properly, followed by fatigue and exhaustion of the nurse. Distractions were ranked as the fourth major cause of medication errors in this study.

Using a larger sample, Mayo and Duncan (2004) replicated the study by Osborne and colleagues. They used the modified Gladstone instrument to survey 983 registered nurses from multiple settings. They also included yet one more scenario in which the nurse is preparing to administer a patient's daily dose of digoxin (Lanoxin®). The nurse was aware that the previous day's serum digoxin level was 1.8 ng/ml, slightly over the normal value, and the current day's digoxin level was not yet available. Therefore, the nurse held the morning dose of the medication. Respondents were to identify if that is a drug error, and if it needs to be reported.

The top three ranked perceived causes of medication errors in this study were hard-to-read or illegible physician handwriting, distractions, and tired/exhausted nurses (Mayo & Duncan, 2004). Responses varied as to what constituted a medication error, yet 92.6% of nurses stated they were sure of what composed an error. Results also revealed most nurses did not report errors because of fear of manager reactions. Few significant relationships were found between nurse characteristics and medication errors, including type of unit and perceived reporting of errors.

Ulanimo and co-authors (2007) not only reviewed nurses' perceptions of medication errors using a modified Gladstone questionnaire, but also considered possible inter-

ventions, such as computerized physician order entry and bar coding. They also found that failure of the nurse to check the name band and the nurse being tired and exhausted were the highest perceived causes of medication errors.

All three studies found disagreement among nurses as to what constituted a medication error. These studies also identified common themes among nurses' perceived causes of errors. They included distractions, failure to follow the five rights of medication administration, nurses being tired and exhausted, and poor physician handwriting (Mayo & Duncan, 2004; Osborne et al., 1999; Ulanimo et al., 2007). In addition, Mayo and Duncan, and Ulanimo and colleagues found common perceived causes of errors to involve medications with similar names, miscalculations by nurses, similar drug packaging, and confusion or improper use of infusion devices.

Fry and Dacey (2007) sought to establish nurses' views on contributing factors to medication errors and error reporting. The researchers based their questionnaire on issues discussed in studies by Gladstone (1995), Mayo and Duncan (2004), and Osborne and colleagues (1999). The Fry and Dacey questionnaire used open, closed, and Likert-scale questions asking for level of agreement to predetermined statements. Results showed distractions, poor physician handwriting, and similar drug packaging as perceived causes of medication errors among nurses. Another study by Tang and co-authors (2007) revealed personal neglect, heavy workload, new staff, and the need to solve other problems on the unit as contributing factors to the causes of medication errors.

Stetina and colleagues (2005) used a Heideggerian method of interviewing nurses regarding the phenomenon of medication errors. They explored management of medication errors by examining how nurses define error and make decisions regarding error reporting, and how errors affect their daily practice. They found nurses did not believe administering medications at the right time was as

crucial as the remaining five rights of medication administration. For this group of nurses, not administering medications on time was considered part of nursing judgment, particularly if timeliness was affected by higher priority events on the unit.

Pape (2003) compared three groups of nurses during the administration of medications. One group followed the usual protocol for medication administration, the second group used a focused protocol, and the third group used a Medsafe protocol. With distractions cited most often as a perceived reason for medication errors, addressing distractions on nursing units should be of high priority for nursing leaders in their quest to decrease errors. Pape addressed distractions in the work environment and adopted a protocol similar to the airline industry. Pilots follow standard operating procedures, use checklists during critical points of a flight, and are not allowed to engage in conversation while the plane is below 10,000 feet. Pape used protocols and checklists, and nurses in one group wore a red vest that read, "Medsafe Nurse, Do Not Disturb," while administering medications. Nurses in the other group used standard protocols. Two intervention groups were utilized, one in which staff members were asked not to disturb a nurse who was administering medications, and another group in which a checklist and vest were used. Significant differences were found regarding distractions among the three groups, with the number of distractions decreasing incrementally from the control group to the Medsafe group.

Pape and colleagues (2005) also studied the use of symbols or signage and standard protocols as a way to decrease distractions during medication errors. The signs served as a reminder not to disturb the nurse during medication administration. While the results were mixed for nurses who were following the protocol checklist, the placement of signs saying, "Do Not Disturb During Medication Administration," resulted in a significant decrease in the number of distractions.

Attention to noise levels and distractions should be a priority among nurse managers. Pape and co-authors (2005) described two inexpensive, straightforward, timely interventions of the use of "Do Not Disturb During Medication Administration" signs and a vest worn by the nurse administering medications that states "Medsafe Nurse. Do Not Disturb" as ways to address one of the most frequently cited perceived reasons for medication errors. Interventions to decrease distractions likely would lead to an increased focus on patient care, more time for nurses to complete their work, a decrease in job-related stress, and an increase in job satisfaction. The study found distractions, poor communication, and failure to follow standard protocols, or deviation from the five rights, as commonly perceived causes of medication errors.

The perception that medication errors result when nurses are tired or experiencing heavy workloads was noted in four studies (Mayo & Duncan, 2004; Osborne et al., 1999; Tang et al. 2007; Ulanimo et al., 2007). These findings are in agreement with a study by Rogers and colleagues (2004), who examined work patterns of staff nurses in hospitals to determine if a relationship existed between the number of hours worked and the frequency of errors. Their findings revealed not only the number of hours worked per week had a significant effect on errors, but also the likelihood of making an error was three times higher when nurses worked 12.5 hours or more in a shift. More than half the errors and near errors involved medication administration.

Shift work has long been recognized as a contributing factor to workers being tired and exhausted. Excessive daytime sleepiness (EDS) was noted to have a significant relationship to occupational errors, including medication administration errors (Suzuki, Ohida, Kanieta, Yokoyama, & Uchiyama, 2005). This study suggested shift work, work-related stress, and short sleep duration are associated with EDS among nurses.

A retrospective study by Madegowda and co-authors (2007) compared the number of reported errors, types and severity of errors, and units on which errors occurred during three nursing shifts in one hospital. Errors were most likely to occur on a medical-surgical unit, on Friday, during second shift, in the month of January, and to involve administration of an intravenous medication. Significant information relevant to this study included the following: the highest percentage of absenteeism was on Friday, second shift typically had lower staffing, and staffing was based on census rather than acuity. Decreased staffing puts higher demands on available staff, which in turn may lead to increased workload; increased workload may lead subsequently to increased fatigue. Both increased workload and fatigue affect nurses' ability to focus on tasks such as medication administration.

Implications to Nursing

Interventions to decrease medication errors are implemented continuously in health care settings. Efforts also should ensure new procedures do not put a further burden on nurses who are already distracted, tired, exhausted from working long shifts, and experiencing EDS. When nurses are rushed and tired, constantly interrupted, or adjusting to a different shift, the chances of deviating from the standard medication administration protocol are likely to increase (Mayo & Duncan, 2004; Osborne et al., 1999; Tang et al., 2007; Ulanimo et al., 2007).

The second most frequently cited perceived reason for medication errors by nurses is failure to follow the five rights, or failure to follow protocol (Mayo & Duncan, 2004; Pape, 2003; Tang et al., 2007; Ulamino et al., 2007). The question nursing leaders should ask is, "Why are nurses not following the five rights?" Distractions may explain in part why the five rights are not being followed, but nurses must determine if other factors contribute to the failure to follow this basic practice. Do nurses value this fundamental charge?

Does it lose its importance after they are no longer being observed by a nursing instructor? Or have heavy workloads, long shifts, and fatigue so affected nurses' ability to focus and concentrate that the importance of the five rights is no longer appreciated as part of routine, safe medication administration?

Miscalculations and incorrectly set infusion devices also could contribute to medication errors (Mayo & Duncan, 2004; Suzuki et al., 2005; Ulanimo et al. 2007). A distracted, stressed, or tired nurse could make a mistake while setting an infusion rate or performing a basic calculation.

Barriers to reporting medications errors and the emotional impact of medication errors also are discussed frequently in the literature (Fry & Dacey, 2007; Gladstone, 1995; Mayo & Duncan, 2004; McBride-Henry & Foureur 2006; Osborne et al., 1999; Rassin, Kanti, & Silner 2005; Stetina et al., 2005; Ulanimo et al., 2007). Maricle and colleagues (2007) noted a discrepancy in the number of medication errors observed and the number of medication errors reported that is consistent with other studies related to underreporting of medication errors.

Medication errors also affect nurses emotionally. Studies indicate nurses often feel incompetent, guilty, scared, worried, and afraid of co-workers' reactions after making a medication error (Fry & Dacey, 2007; Mayo & Duncan, 2004; Tang et al., 2007). In their study, Osborne and co-authors (1999) reported nurses' loss of self-esteem and decreased confidence in their clinical abilities after making an error. In a notable study on the long-term effects of medication errors, Rassin and colleagues (2005) discussed the feelings of shame and guilt as well as insomnia experienced by nurses involved in an error. While considering what method to use in working with a nurse who has committed a medication error, nursing leaders thus also must consider how the error itself may have affected the nurse and plan supportive strategies.

__W__hile a method for dealing with unsafe or careless practice is imperative in health care, punitive measures may cause many errors to go unreported.

Conclusion

The second half of the saying by Alexander Pope is familiar to many: "To err is human, to forgive, divine" (Pope, n.d.). While some may suggest authentic forgiveness requires divine intervention, nurses can take a first step in that direction by seeking to understand the root causes of medication errors to ensure their peers are not afraid to report errors. If nurses fear managers' reactions to medication errors, or if they are afraid of what their co-workers will say, they will be less likely to come forward if such events occur (Fry & Dacey, 2007; Gladstone, 1995; Mayo & Duncan, 2004; McBride-Henry & Foureur, 2006; Osborne et al., 1999; Rassin et al., 2005; Stetina et al., 2005; Ulanimo et al., 2007). While a method for dealing with unsafe or careless practice is imperative in health care, punitive measures may cause many errors to go unreported. Errors must be reported in order to identify system failures and individual causes leading to the errors (Mayo & Duncan, 2004; McBride-Henry & Foureur, 2006; Osborne et al., 1999). Multiple studies discussed nurses' fear of repercussion, damage to their reputations, or loss of employment if reporting medication errors (Gladstone, 1995; Mayo & Duncan, 2004; McBride-Henry & Foureur, 2006; Osborne et al., 1999; Stetina et al., 2005; Ulanimo et al., 2007). The existence of unreported errors may be linked closely to the disagreement regarding exactly what constitutes a medication error (Gladstone, 1995; Mayo & Duncan 2004; McBride-Henry & Foureur 2006; Osborne et al., 1999; Ulanimo et al., 2007).

The nurses' role is only a small part of the process of medication administration. Medication delivery is a complex, multidisciplinary process. To increase the safety of medication administration, all aspects of the process must be scrutinized carefully and thoughtfully to ensure system issues, environmental issues, and human error factors are addressed in a nonpunitive manner that encourages health care leaders to collaborate in creating a safer setting for patient care (Gladstone 1995; Mayo & Duncan, 2004; McBride-Henry & Foureur, 2006; Osborne et al., 1999; Ulanimo et al., 2007). ∎

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