JNSD Journal for Nurses in Staff Development • Volume 27, Number 1, E1–E5 • Copyright © 2011 Wolters Kluwer Health | Lippincott Williams & Wilkins

Creative Strategies to Improve Patient Safety

CE

Allergies and Adverse Drug Reactions

Sharon Valente, PhD, RN, FAAN ❍ Lillian P. Murray, MSN, RN

Approximately 770,000 Americans are hospitalized and suffer adverse drug events (ADEs) costing billions of dollars each year. An ADE occurs when a patient is injured by an adverse drug reaction. Improved medication administration could prevent about 2.5 million ADEs (Institute of Medicine, 2004). This project provided an education for patients and nurses and a medication fact sheet. Outcomes included updating allergy records, improving medication safety knowledge, and improving nurses' adverse drug reactions and allergy reports.

The Institute of Medicine (2004) has highlighted the problem of medical safety and has emphasized the major preventable systems errors. The institute underscored medication-related adverse events as the major leading causes of injury from medications. The most recent report examined strategies to improve medication safety, including preventing administration errors. Nurses' work processes such as medication administration occur in ways that can increase the risk of a medication error (Institute of Medicine, 2004). One major outcome of this report was replacing blame for errors by conducting a system analysis to remove the causes of these errors (Institute of Medicine, 2004). This change from a punitive culture to a "no fault" error and system analysis has significantly improved medication safety. Staff members are more willing to report errors when blame is removed. This article illustrates one successful project in which nurses improved allergy and adverse drug event (ADE) reporting. An adverse drug reaction (ADR) is defined as an unintended, an undesirable, or an unexpected effect of prescribed medication or of medication errors that require a medication be discontinued or the dose modified, that require initial or prolonged hospitalization, that require treatment with a prescription, and that result in disability or have other untoward effects. An ADE indicates that a patient injury due to a medication occurred because of a reaction either to the normal dose or from a preventable event or error. Clinicians must report all ADRs; if a significant injury occurred, it is labeled as an ADE.

Since 2005, the Greater Los Angeles Veterans Administration (VA) Hospital conducted a multidisciplinary, nurse-led project that improved patients' and nurses' knowledge and documentation of medication allergies and ADR/ADE. The project emerged from observations that patients initially denied allergies or ADR but subsequently reported difficulties with drugs. A multidisciplinary team was convened by the lead caseworker to design this evidence-based project. Primary care providers, patient education, nursing education, and nursing executive leadership supported this project. This allergy or ADR project replicated a New York VA pharmacy best practice (J. A. Matusezwski, personal communication, 2006) to help patients speak up about their medications and allergies. The New York VA gave permission for revision of the patient education materials, although the project focused on improving patients' and physicians' knowledge. This project focused on improving patients' and nurses' knowledge. The allergy or ADR project used education to improve nurses' awareness of ADR/ADE and documentation. Patient education materials, including two brochures, one allergy questionnaire, and a medication safety fact sheet, were initially distributed through pharmacy, outpatient, and some inpatient units. The patient education centers now distribute material at all sites. After more than 3 years of educating nurses to accurately report allergies and ADRs, we have increased the number of properly documented allergies and ADR by nurses.

The goals of the project were (1) to increase the patients' and nurses' knowledge of medication safety, (2) to improve nurse ADR/ADE reports and patient education, and (3) to improve accuracy of computerized records of

Sharon Valente, PhD, RN, FAAN, is Acting Associate Chief Nurse, Research and Education, Veterans Affairs Greater Los Angeles Health Care System, Los Angeles, California.

Lillian P. Murray, MSN, RN, is Case Manager, Veterans Affairs Greater Los Angeles Health Care System, Los Angeles, California.

The authors have disclosed that they have no significant relationships with, or financial interest in, any commercial companies pertaining to this educational activity.

ADDRESS FOR CORRESPONDENCE: Sharon Valente, 346 N. Bowling Green Way, Los Angeles, CA 90049-2818 (e-mail: sharonvalente725@hotmail.com).

DOI: 10.1097/NND.0b013e31819b5f0b

patients' medication allergies. Ensuring that patients know what to report and nurses know proper documentation of ADR/ADE could reduce medication errors and need for emergency care. These practices help improve patient safety and are cost-effective.

LITERATURE REVIEW

Preventing medication errors is a blueprint for change in medication safety by identifying opportunities to improve systems and practices to provide patient safety. Technologies, such as computerized order entry, bar coding, smart pumps, and computerized ADR monitoring, play a key role. The Institute of Medicine (2004) recommended projects to improve medication administration and documentation and to provide formal education for healthcare providers.

As the numbers of drugs being administered increases, nurses face a growing challenge to know drug actions, side effects, and correct dosage. One way to lessen ADEs is to ensure that medication allergies are accurately documented in the computer and that ADR/ADE are promptly reported. Yet the nurse's lack of knowledge about medication is a persistent problem and a cause of not reporting ADRs (Leape et al., 1995). A system analysis of ADEs occurring in 21 medical and surgical units in two tertiary care hospitals more than 6 months found that lack of knowledge about the drug was the most common cause of ADEs among both physicians and nurses. Other causes of ADEs include inefficient processes and stress in the environment, including interruptions and fatigue (Institute of Medicine, 2004).

A meta-analysis that compared several research studies showed that ADEs are among the top causes of death for people receiving health care (Institute of Medicine, 2004; Lazarou, Pomerantz, & Corey, 1998). The nurse safeguards patient safety and reduces ADRs by preventing medication errors, reporting ADRs, documenting patients' allergies, and notifying the prescribing clinician of problems (Institute of Medicine, 2004). The cost of these medication errors to the patients, the practitioners, and the healthcare system is significant (Fry & Dacy, 2007). If the patient's allergy to codeine is incorrectly documented in the electronic medical record, the prescribing clinician will not avoid prescribing this drug. Medications can have various side effects that range in duration, seriousness, and preventability. For instance, a gastric reflux medication may inadvertently cause intolerable stomach cramps and diarrhea. When the untoward effect is promptly reported, the medication will be stopped or replaced.

The negative consequences of an ADE can include illness, hospitalization, increased cost, and possible fatality. The Institute of Medicine (2004) estimated that in 2006, 2.5 million of these ADEs in the United States could be prevented by improving the medication administration systems and procedures. Computerized medication systems have effectively enhanced safety by improving steps in the order and the administration of medications and have reduced errors from illegible handwritten prescriptions. Computerized systems can verify that the right drug is given to the right patient correctly and at the right times. To improve reporting of medication allergies and ADRs, both the nurse and the patient require training to know what to report and how to report side effects (Copping, 2005).

Nurses are responsible for surveillance, prevention, treatment, and documentation of ADRs and medication allergies (Pape et al., 2005). Other activities involve dose/time, side effects, work arounds (e.g., shortcuts that do not follow procedure), and drug administration. Prompt recognition of an ADR and an action may be lifesaving. Researchers reported that most preventable ADRs in hospitals related to nurses' knowledge and administration of medications (Copping, 2005). When nurses administer medications, their thinking expands beyond rules and procedures because they consider the patient's condition and use their professional knowledge (Eisenhauer, Hurley, & Dolan, 2007). The growing number of medications, interactions, and medications that sound alike complicate the problem. Nurses must remain alert to elderly patients with more chronic illnesses and medications that can increase the risk of an ADR (Baker, 2003; Oermann & Templin, 2000). Nurses have a unique opportunity to observe and to detect ADRs as they are the final point of medication administration. Their around-the-clock observation of hospitalized patients allows them to identify early signs of a problem.

Nurses also improve medication safety through patient education. Research shows that patients do not receive the necessary information about medications for their illness or treatment (Baker, 2003; Oermann & Templin, 2000). Hence, the patient may not know when to report a symptom related to the medication, may hesitate to bother the clinician, or may forget to report a problem. These knowledge deficits can be corrected with education that improves the patient's knowledge, thereby enhancing the patient's awareness of what to report and medication safety (Oermann & Templin, 2000). Teaching methods need to be individualized and accompanied by written material. Patients appreciate the opportunity to learn about their illness and medications.

Krahenbuhl-Melcher et al. (2007) reviewed 46 studies and reported that adverse events affected 6.2 patients per 200 hospitalized patients. These researchers documented high variability among the 46 studies that could reflect different methods of assessment of the frequency of ADEs or reactions or the different wards on

which the studies were performed. Important risk factors that influenced the patient's ADRs included polypharmacy, female gender, drugs with a narrow therapeutic range, renal elimination of drugs, age older than 65 years, and use of anticoagulants or diuretics.

Because medication errors are strong risk factors for preventable ADEs, nurses need prevention strategies. Such strategies include ensuring that all persons involved in the medication process (e.g., nurses, pharmacists, and physicians) have pharmacological knowledge and use computerized medication systems. Education for staff and patients is recommended.

METHODOLOGY

Baseline Data

The team collected baseline data at the Greater Los Angeles VA Hospital as described below on (1) the scope of the problem, (2) the percentage of staff nurses who reported ADRs, (3) the nurses' knowledge about ADRs, and (4) the accuracy of the nurses' medication allergy reports. The team also searched the literature for the research, evidence base, best practices, and strategies to reduce the problem and to sustain the improvement.

The scope of the problem was reflected by agency performance data for reported ADRs from 2004 to 2006. Performance data showed an average of 600 to 900 ADRs each month as reported by discipline: physicians (35%), pharmacists (37%), and physician's assistants and nurse practitioners (27%). Staff nurses reported less than 1% of these reactions, although the nurses were the first to detect and to recognize the ADR. However, they mentioned it to the physician or pharmacist but did not document it in the computerized medical record that informed providers and yielded the performance statistics.

Baseline data also included a survey of nurses' knowledge of ADEs. A convenience sample of nurses (n = 30) working on hospital units of a large healthcare center were surveyed. The nurses selected a medication they administered frequently and described an ADE associated with that medication. They indicated how they reported the ADE. Less than 1% of those nurses defined an ADE or reported it in the computer. Nurses knew the medication and its side effects, but they did not define ADEs. One nurse identified a drug with side effects but could not define an ADE. The nurses' average score on the knowledge questions was 40%. Nurses reported that in their formative educational programs, they learned about side effects but not ADEs. Many nurses had worked at the agency for more than 20 years and studied pharmacology many years ago.

Accuracy of computerized reports was measured by a retrospective chart review using a random selection of charts from different inpatient units and outpatient clinics. To estimate accuracy of patient medication allergies, the team compared the patient's report of allergies with the computerized medical record. Approximately 20% to 50% of patient allergies were not correctly recorded. Chart errors included misspelled drug names and unrecorded medication allergies and ADEs.

Educational Interventions

Distribution of patient information

To enhance the patients' knowledge about medication safety, medication allergies, and ADEs, we revised educational materials (e.g., brochures) that had been published best practices. These educational materials included a speak-up campaign that encouraged patients to ask questions about medications and to report allergies and ADEs and a medication safety fact sheet. Patients also completed a one-page Allergy Update Questionnaire and an evaluation of these educational materials.

Initially, we distributed the educational materials (e.g., brochures on medication safety, medication fact sheet, and allergy questionnaire) in primary care. Expanded distribution of the materials to outpatient pharmacy, inpatient rehabilitation, and one community-based outpatient clinic and the patient education resource centers yielded more complete allergy questionnaires. We entered the completed allergy questionnaires and updated allergy documentation in the computer.

Education for nurses

To enhance the nurses' knowledge and reporting of ADEs, educational presentations were conducted for nursing staff using in-class and on-line education. Myths, misperceptions, and procedures about reporting allergies and ADEs were clarified, and principles of safe medication administration were explained. To highlight research about medication, nurses received a research-based fact sheet about reporting ADR/ADE. It included definitions of ADE and ADR, procedures for reporting these events in the computer, strategies for improving medication safety, and criteria for identifying ADEs. A brief pretest and posttest of knowledge about medication safety and ADR/ADE evaluate learning. This education was included in nursing orientation and annual review.

Results

Medication allergies

We distributed 500 copies of educational materials; 340 patient allergy forms were returned and entered in the computer. In this group, 30% of patients reported medication allergies. The most common allergies reported were to codeine, morphine, penicillin, and other antibiotics. More than 90% of the patients rated the educational

materials highly satisfactory. The computer record was updated to reflect these medication allergies.

Patients reported both side effects and ADRs associated with antidepressants such as Elavil or amitriptyline. The side effects included central nervous system (e.g., drowsiness, dizziness, sedation, excitation, and tremors) and cardiovascular (e.g., orthostatic hypotension, tachycardia, arrhythmias, stroke, and palpitations) symptoms.

On one inpatient unit, the case manager initially believed that documentation was excellent and was surprised to find that a high percentage of medication and other allergies were not correctly documented. This individual became a strong advocate for this project and also identified and corrected a system problem with the computerized program for reporting allergies.

Posteducation result

This project improved patient safety as the number of nurses' ADE reports increased significantly in the first 8 months. Although the overall total of ADEs remained the same, nurses reported a larger percentage of them. This trend of nurses reporting an ADE has continued during the subsequent 2 years. The nurses' knowledge increased from a pretest of 10–40% to an average of 80% or above on the posttest. Patient safety was improved by the increase in reports of patients' medication allergies in the computerized medical record and by the correction of errors in medication allergy reports.

To sustain the improvements, we disseminated the educational materials throughout the agency and its community-based clinics. We placed an average of 400 patient educational materials monthly at the patient education centers. We provided education on ADR/ADE as a regular part of nursing staff orientation. Since 2005, we have trained from 230 to 278 new nurses yearly during orientation. We tracked the educational materials distributed. We distributed a computerized patient record system reminder to encourage nurses to report medication allergies or ADEs.

DISCUSSION

The gaps in the system for reporting and documenting allergies and ADR/ADE and the nurses' knowledge of ADR/ADE were surprising. Nurses who attended the educational sessions concurred that detecting and reporting ADR and documenting patient allergies are high-priority activities that influence patient safety. Many researchers who examine ADR have used different methods that make comparing findings across the studies difficult. Patients have approximately a 3.6% chance of experiencing one or more ADRs; however, a patient who has one ADE has approximately a 27% chance of experiencing another (Lazarou et al., 1998; Osterberg & Blaschke, 2006). This often occurs because the patient is prescribed a medication that is withdrawn because of an ADE, so another medication of the same type may be prescribed. According to Tang, Sheu, Yu, Wei, and Chen (2007), nurses perceived multiple factors contribute to medication errors including personal neglect (86.2%), heavy workload (37.5%), and new staff (37.5%). Other factors included disruptions, new graduate nurses, advanced drug preparation without rechecking, and solving problems while administering medications. Medical and intensive care units were the most error-prone places. However, further analysis showed that system factors, patients' conditions, and physicians' prescriptions also contributed.

Implications

This project has several educational aspects. The successful patient education materials helped patients improve their safety by reporting medication allergies and by asking questions about their medications. Patients reported that these education materials were very helpful and reminded them of what to discuss with the clinician. Patients who received written education information and completed a medication allergy questionnaire were more likely to have fewer medication errors.

The education enhanced the nurses' formal reports of medication allergies and ADEs in the computer. The educational program for the nurses can be adapted online in an e-learning format and can be expanded to other healthcare providers. The collaboration of pharmacy, informatics, and nursing to improve safety provided an effective team approach to reduce medication errors. Encountering and tracking ADR/ADE is a process that requires input and involvement of all healthcare providers. Involvement of pharmacists, nurses, and other healthcare practitioners is essential to ensure patients' safety. Once nurses realized they were empowered to actually enter the ADR/ADE in the computer, the numbers and the percentage of reporting increased tenfold in the first year of the project and have continued to increase.

A future step may be to provide patients with a wallet-size card to record their medication allergies. This card has several advantages: It informs clinicians of medication allergies; it can provide information in an emergency; and it helps patients track current medications, allergies, and medical information.

CONCLUSIONS

ADRs are a frequent and serious problem in hospitalized patients. Nurses have an important role in monitoring, preventing, and treating ADR/ADE. This study reported the experience of a nurse-led multidisciplinary team (e.g., nursing, informatics, and pharmacy) that conducted an ADR/ADE surveillance study in an urban

healthcare setting with extensive computerized medical records. Patients rated the educational materials as highly satisfactory, and approximately 30% new medication allergies were reported. After the educational presentation, 10 times more nurses reported ADE/R. The prevention of adverse effects linked to drug errors requires a commitment to record all problems, to analyze them in depth, and to enforce safe working practices. The number of nurses reporting ADR increased significantly, and ongoing education of nurses, patients, and other healthcare professionals will help sustain the improvement.

REFERENCES

Baker, K. R. (2003). Risk management from a collaborative perspective. *Journal of the American Pharmacists Association*, *43*(Suppl. 2), S54.

Copping, D. (2005). Preventing and reporting drug administration errors. *Nursing Times*, *202*(33), 32–24.

Eisenhauer, L. A., Hurley, A. C., & Dolan, N. (2007). Nurses' reported thinking during medication administration. *Journal of Nursing Scholarship*, *39*(1), 82–87.

Fry, M. M., & Dacy, C. (2007). Factors contributing to incidents in medicine administration. *British Journal of Nursing*, *26*(9), 556–558.

Institute of Medicine. (2004). Keeping patients safe: Transforming the work environment of nurses. Washington, DC: National Academies Press.

Krahenbuhl-Melcher, A., Schlienger, R., Lamper, M., Haschke, M., Drewe, J., & Krahenbuhl, S. (2007). Drug related problems in hospitals: A review of the recent literature. *Drug Safety*, *30*(5), 379–407.

Lazarou, J., Pomerantz, B. H., & Corey, P. N. (1998). Incidence of adverse drug reactions in hospitalized patients: A meta analysis of prospective studies. *Journal of the American Medical Association*, *279*, 2200–2205.

Leape, L., Bates, D., Cullen, D., Cooper, J., Demonaco, H., Gallivan, T., (1995). Systems analysis of adverse drug events. *Journal of the American Medical Association*, *274*(1), 35–43.

Oermann, M. H., & Templin, T. (2000). Important attributes of quality health care: Consumer perspectives. *Journal of Nursing Scholarship*, *32*(2), 267–272.

Osterberg, L., & Blaschke, T. (2006). Medication compliance and avoiding adverse drug reactions. *Medscape Today*. Retrieved December 12, 2008, from www.medscape.com/viewprogram/5912

Pape, T. M., Guerra, D. M., Muzquiz, M., Bryant, J. B., Ingram, M., Schranner, B., (2005). Innovative approaches to reducing nurses' distractions during medication administration. *Journal of Continuing Education in Nursing*, *36*(3), 108–116.

Tang, F. I., Sheu, S. J., Yu, S., Wei, K. L., & Chen, C. H. (2007). Nurses rate the contributing factors involved in medication errors. *Clinical Journal of Nursing*, *16*(3), 447–457.

For more than 15 additional continuing education articles related to safety in nursing, go to NursingCenter.com\CE.