

Medication Errors Associated with Documented Allergies

ABSTRACT

The selection of appropriate medications and dosages is dependent upon the availability and review of critical patient information. Without patient-specific clinical information, such as age, weight, allergies, diagnosis, and laboratory values, healthcare practitioners cannot develop safe and effective treatment plans. As many as 18% of serious, preventable adverse drug events stem from practitioners having insufficient information about the patient before prescribing, dispensing, and administering medications. Review of data from PA-PSRS reveals more than 3,800 reports of cases in which patients received medications to which they had documented allergies. Narcotics and antibiotics were the most common medications listed in reports. Types of breakdowns in the communication of allergy information include documentation of patients' allergies on paper but not entered into the organization's computerized order-entry systems, allergy information not consistently documented in expected locations, organizations' attempts to list every drug allergen on the wristband, and allergies arising during episodes of care but not documented in the medical record or communicated to appropriate staff. Strategies to address problems with patients' documented allergies include adding clear and visible prompts in consistent and prominent locations; listing patient allergies, as well as a description of the reaction to the allergen, on all admission order forms; eliminating the practice of writing drug allergens on allergy arm bracelets; and making the allergy reaction selection a mandatory entry in the organization's order-entry systems. (Pa Patient Saf Advis 2008 Sep;5[3]:75-80.)

Patient information helps guide the appropriate selection of medications, dosing, and routes of administration. This information includes patient-specific clinical information such as age, weight, allergies, diagnoses, comorbid conditions, and pregnancy status, as well as patient monitoring information such as laboratory values, vital signs, and other parameters that gauge the effects of medications and the patients' underlying disease processes. This information is critical because as many as 18% of serious, preventable adverse drug events (ADEs) stem from practitioners having insufficient information about the patient before prescribing, dispensing, and administering medications.¹ Lesar et al., in a systematic evaluation of every third prescribing error detected and averted by pharmacists in a 631-bed tertiary care teaching hospital, showed that more than 25% of prescribing errors alone were directly associated with inadequate patient information, most notably renal and hepatic function, allergies, and pregnancy status.² In this study,

the most common specific factors associated with prescribing errors were a decline in renal or hepatic function requiring alteration of drug therapy (13.9%) and patient history of allergy to the same medication class (12.1%). The two drug categories most frequently involved in errors related to insufficient patient information were narcotics and antimicrobials; the most serious injuries were due to prescribing these drugs for patients with documented allergies to them.

A review of data from PA-PSRS reveals more than 3,800 reports in which medications were erroneously prescribed for and given to patients who had documented allergies to them. These results are based on the review of the PA-PSRS event type "A. Medication Errors, 6. Monitoring Errors, c. Documented Allergies," as well as other medication error reports identified by PA-PSRS clinical analysts as having involved patient allergies. Of the 3,813 reports, 61 (1.6%) resulted in a Serious Event, meaning the patient was harmed. Table 1 lists the care areas most cited as the location where the error occurred. Although the most frequently cited care area was the pharmacy, clearly these problems originate when orders are written by prescribers in patient care areas. Similar to findings of the study conducted by Lesar et al.,² narcotics and antibiotics dominate the top 15 medications listed in reports submitted through PA-PSRS (see Table 2).

An analysis of the reports show that these events fall into two broad categories: breakdowns in patient information and breakdowns in drug information.

Table 1. Care Areas Most Cited in Documented Allergy Events

CARE AREA	NUMBER OF ADVERSE EVENT REPORTS (TOTAL N = 3,813)
Medical/surgical unit	490 (12.9%)
Emergency department	442 (11.6%)
Ambulatory surgery—preoperative and discharge	224 (5.9%)
Telemetry	195 (5.1%)
Operating room	124 (3.3%)
Medical/surgical intensive care unit	78 (2%)
Postanesthesia care unit	77 (2%)
Medical/surgical/oncology unit	71 (1.9%)
Medical/surgical/cardiac intermediate unit	63 (1.7%)
Pharmacy	1,042 (27.3%)
Remaining care areas	1,007 (26.4%)

Breakdowns in Patient Information

Errors associated with breakdowns in patient information, including allergies, diagnosis, comorbid conditions, current medication lists, and labs, involve breakdowns at each level of the medication-use process. These errors can occur when practitioners

- obtain information from patients, caregivers, or other healthcare facilities during the reconciliation process;
- document the information into paper-based and electronic records;
- write orders for medications or enter orders into computerized prescriber order-entry (CPOE) systems;
- enter orders into the pharmacy order-entry systems and dispense medications; and
- obtain and administer medications.

When critical patient information, which may or may not be available to the prescriber, is not available in a clear way to pharmacists or nurses at the time of dispensing or administering, opportunities for critical double-checks are bypassed. Thus, errors in prescribing may not be detected.³

Obtaining accurate information from patients can be difficult. One case reported through PA-PSRS exemplifies this issue.

A patient interviewed during [the preoperative period] stated that she had no allergies, but the nursing admission assessment, the anesthesia record, the history and physical, the emergency room record, and the medication [record] indicated that the patient had an allergy to penicillin. The patient had an Ancef®

irrigation of her operative site done. Following this procedure, the nurse noted the penicillin allergy documented by anesthesia.

However, a review of admission notes over a three-month period that evaluated the completeness and accuracy of drug allergy documentation by medical residents, medical students, and primary care nurses showed that approximately 20% of the healthcare professionals failed to document drug allergies in their admission notes. The authors noted that although the majority of patients could recall the dosage form of the offending drug, the time that had elapsed between administration of the drug and appearance of symptoms, and how long ago the reaction had occurred, none of this information was recorded by the practitioners. Therefore, they concluded that incomplete documentation of the drug allergy status of patients did not appear to be related to patients' inability to provide accurate information.⁴ The majority of events submitted through PA-PSRS predominately describe situations in which patient allergies have been obtained and documented, yet the patients still received a medication to which they were allergic.

Documenting allergies, but not including the specific reaction the patient experienced to the medication, does not provide all the information necessary to making therapeutic decisions. Most organizations obtain a list of medication allergies from patients upon admission. Yet the most important information, the actual reaction that occurred from the medication that prompted the documented allergy, is rarely included. Knowledge of a patient's reaction to penicillin, ranging from an "upset stomach" to an anaphylactic reaction, would have a profound effect on practitioners if this information was available.

A second breakdown in the communication of allergy information occurs when a patient's allergies are documented on paper but are not entered into the organization's CPOE and pharmacy order-entry systems. Prescribers and pharmacists rely on the availability of important patient information, including allergies, when entering and screening orders for appropriateness and safety. If this information is unavailable in the organization's computer order-entry systems, a critical checking mechanism is bypassed, which increases the risk that medications will be dispensed to the patient who is allergic to them. In a report submitted through PA-PSRS, this type of breakdown occurred twice with the same patient.

Patient admitted through the [emergency department (ED)] with allergies listed on ED sheet as "VANCO, AVELOX, KEFLEX." The order was written for "Levaquin 500 mg IV q24H." The patient's allergies were not put into computer by anyone. The ED administered the drug although Levaquin® has allergy considerations, considering the patient's allergy to Avelox®. Later, the patient was ordered "vancomycin 1 gm IV Q24h." The order was processed despite allergy to vancomycin, and the patient developed a

Table 2. Top 15 Medications Involved in Documented Allergy Events

MEDICATION	NUMBER OF ADVERSE EVENT REPORTS
morphine	303
cefazolin (Ancef®, Kefzol®)	213
oxycodone and acetaminophen	186
hydromorphone	177
aspirin	176
furosemide	106
levofloxacin	98
ceftriaxone	81
ampicillin and sulbactam (Unasyn®)	78
ampicillin	73
ketorolac (Toradol®)	70
acetaminophen	66
hydrocodone	63
tazobactam and piperacillin (Zosyn®)	53
promethazine	48

rash as a result. [During the reconciliation process] it is not known [if one] medication caused the rash, or both.

When allergy information is not consistently documented in the expected locations, confusion and problems can arise. It is critical for healthcare practitioners to be able to find important information about a patient at the time of prescribing, dispensing, and administering medications. However, allergy documentation may be inconsistent and/or appear in nonstandard locations in the patients' chart and other documentation.

Patient was prescribed and received Bactrim® following shoulder surgery and subsequently had an allergic reaction, which required intubation and transfer to critical care. The ED record from the previous day identified an allergy to penicillin and sulfa drugs. The inpatient record and pharmacy records had only penicillin. The patient's mother reported only penicillin at the time admission data was collected.

On nursing assessment, an allergy to penicillin was noted. An allergy sticker was not placed on chart per procedure. Ancef® was ordered and administered. The patient developed an itchy, red rash on arms.

As was noted in the December 2005 supplementary Patient Safety Advisory, nearly four out of five (78%) survey respondents' facilities use patient wristbands to communicate clinical information, including allergies.⁵ However, a number of errors have been associated with the methods used to identify allergies with wristbands. One problem is that admission staff and/or healthcare practitioners forget to apply the wristband. Another contributing factor is an organization's policy to list every drug allergen on the wristband, which is a risky procedure because not every drug to which a patient is allergic can always be listed, as illustrated in PA-PSRS reports.

A dressing change was performed on the patient's peripherally inserted central catheter line. Nurse performing dressing change utilized Betadine to clean site. The patient's chart states that the patient is allergic to Betadine, but the patient's allergy bracelet did not include Betadine as known allergy. The patient [experienced] warmth and flushing of the face and right arm, which required treatment with Benadryl® 50 mg.

Patient was status post hip surgery. Morphine was administered as ordered for complaints of pain. The patient questioned what pain medication was being administered. The patient then stated that she gets "chest pain" from morphine. Allergy band in place did not list morphine; however, anesthesiology did list morphine as an allergy.

New allergic reactions that develop during the current hospitalization are as important to capture and document as the patient's preexisting allergies. However, reports submitted through PA-PSRS illustrate that new allergies are not always documented in the

medical record or communicated to appropriate staff. As the following case describes, breakdowns in the communication or documentation of new allergies can lead to additional allergic reactions during the patient's stay.

Preoperatively, the patient had documented no known drug allergies. Intraoperatively, the patient was administered Unasyn® (ampicillin/sulbactam) 1.5 gm IV and developed hives on her abdomen and chest. Benadryl (diphenhydramine) 50 mg IV and Decadron® (dexamethasone) 10 mg IV were administered. The patient was admitted to [intensive care unit (ICU)] and remained intubated. [Later], the patient was administered Unasyn 1.5 gm IV. Halfway through the infusion, the patient developed stridor and wheezing.

There are other breakdowns in the medication use system that can lead to errors. The Institute for Safe Medication Practices (ISMP) identified another error scenario involving inadequate communication of a patient's allergies.⁶ A pharmacist could not read the list of patient allergies that a nurse had faxed on a new admission, so he accessed the patient's profile from a recent, previous admission and entered the allergies as they appeared on the prior profile. However, the allergies listed there were incomplete. Since her prior hospital admission, the patient developed an allergy to cefazolin. A consulting physician, also unaware of the patient's recent allergic response, telephoned an order for cefazolin. The pharmacy processed the order without detecting the allergy. The cefazolin allergy also was not listed on the medication administration record (MAR) since it was generated from the pharmacy computer system. Thus, the nurse administering the drug did not detect the allergy. The patient became hypotensive and unresponsive. The patient's nurse noticed the adverse reaction, and the patient was treated with a dose of diphenhydramine, recovered, and was discharged the next day. Because patients may develop new allergies at any time, medical records from previous admissions can be used as a reference for allergy history but should be verified with a current list.

As noted in an article about verbal orders from the June 2006 issue of the *Advisory*, verbal medication orders can result in errors, especially when prescribers do not ask about or are not asked to communicate the patient's allergies and the corresponding reaction.⁷

Automated dispensing cabinets (ADC) offer the ability for patient profiling. Pharmacists can enter and screen drug orders against allergies listed in the patient's profile before the medication is removed from an ADC and administered. Furthermore, allergy alerts can be programmed to display when a medication to which a patient has a documented allergy is selected for retrieval. However, many organizations still use non-profiled ADCs. In facilities with nonprofiled ADCs, nurses must manually check the medical record or MAR for allergies when retrieving medications from

a nonprofiled ADC or unit stock. Based on reports submitted through PA-PSRS, this manual check of the medical record does not always occur.

Physician ordered Neurontin® for a patient with a listed drug allergy on patient chart and [MAR]. After pharmacy hours, the nurse transcribed/verified order and pulled med from night cabinet without any pharmacist check of order. Nurse admits to not checking for drug allergy and not clarifying with physician. Neurontin dose was given without any ill effects to patient.

Unsafe practices with the use of electronic systems (e.g., computer order-entry systems, ADCs, point-of-care bar-coding systems) include the use of overrides and workarounds. The use of overrides results in circumventing potentially critical alerts in order to enter and process orders more quickly or to obtain and administer medications before delivery by the pharmacy. For example, a Pennsylvania facility reported the following:

Patient had a listed allergy to oxycodone. Order for Percocet® was prescribed “as needed” for the patient. The nurse used the override feature of the medication dispensing system to obtain the medication, therefore disabling the safety feature to alert for allergies. The patient developed a rash, which resolved without further injury to patient.

Administering medications to patients without asking the patient for possible past reactions to medications is another breakdown reported through PA-PSRS.

[Before noon] the patient’s left knee was noted to be oozing. A dime-sized [application of] Betadine® was applied to the uppermost part of wound. The patient stated, “I am allergic to Betadine.” The area was promptly washed with soap and water.

Breakdowns in Drug Information

Breakdowns with critical drug information, lack of available information on prescribing medications, lack of knowledge of possible drug-drug contraindications as well as the lack of effective screening for drug-allergy interactions by order-entry systems have led to patient harm. One example reported through PA-PSRS discusses a patient who had a documented penicillin allergy, and a prescriber wrote an order for a medication that had a possible cross allergy to the medication listed in the patient’s chart. Cross allergies most commonly reported through PA-PSRS include ketorolac with aspirin or nonsteroidal anti-inflammatory medications (e.g., ibuprofen), as well as penicillin-derivative antibiotics with Zosyn®, Unasyn, or cephalosporins (e.g., cefazolin, ceftriaxone).

A second example of errors associated with drug information concerns combination products that contain two or more active ingredients. When medications are prescribed using their brand or trade name (e.g., Zosyn, Unasyn), that name does not communicate the multiple, active ingredients contained in that product (e.g., piperacillin/tazobactam, ampicillin/sulbactam). Therefore practitioners as well as electronic systems

may not identify a product that contains a potential allergen. When this occurs, a patient may experience an allergic reaction that requires initial treatment or higher levels of medical care, as illustrated in the report below from PA-PSRS.

The patient had a known allergy to penicillin and was prescribed Augmentin® (amoxicillin/clavulanic acid). The patient presented to the ED due to swelling of her lip and tongue. She was intubated and admitted to the ICU with the diagnosis of angioedema.

Once patient information is correctly entered into electronic databases, it is possible to screen for any drug-allergy interactions. But the electronic screening process may not detect potentially significant interactions, as discussed in a May 2007 supplementary Advisory article.⁸ One study, in which chart reviews were performed on a stratified random subset of all allergy alerts, showed that overrides of drug-allergy alerts were common and about 1 in 20 result in ADEs, but all of the overrides resulting in ADEs that were included in the study appeared clinically justifiable. The authors stated that the high rate of alert overrides was attributable to frequent nonexact match alerts (in which the drug and allergy had structural similarities or were in the same family but were not identical) and infrequent updating of allergy lists in their organization.⁹

Risk Reduction Strategies

Healthcare facilities should take steps to ensure that current and complete allergy information is accurately and clearly collected and readily available to all practitioners at the point of care when they are prescribing, dispensing, and administering medications. Based on the review of reports in PA-PSRS as well as observations at ISMP, some suggestions include the following:

- Review all paper and online data collection forms to determine the current location in which practitioners will document and retrieve complete allergy information, including descriptions of the reaction(s) (e.g., front of medical record, on the top of order forms, designated MAR locations, computer screens, resident assessment forms). This location should be standardized and should be used by all locations in your organization, including the ED, operating room, imaging services, and general medical/surgical care areas. Alert staff to always refer to these areas for reliable information. Develop a process to make sure updates occur in all these areas if the patient’s allergies change.
- Consider adding prompts in consistent locations to document allergy information and include clearly visible and prominently placed allergy prompts on the top of every page of all prescriber order forms (including blank, preprinted, and verbal order forms).

- Upon admission to a facility, list patient allergies, as well as a description of the reaction to the allergen, and, if possible, the date that the reaction took place, on all admission order forms. Have appropriate staff consistently transfer this information obtained on admission to subsequent order forms and place the completed forms into the charts so that they are readily accessible. This process can help visually remind physicians and nurses about the patient's allergies when prescribing medications and/or transcribing a verbal order for a medication.
- If the organization obtains archived allergy information, establish processes to verify and update this information upon each readmission or patient encounter. Errors have occurred when archived listings are assumed to be complete and correct (i.e., new allergy information has become available since the prior data was entered into the computer system).
- Establish a forcing function error reduction strategy to make the allergy "reaction" selection a mandatory entry in the organization's order-entry systems for prescribers and pharmacists.
- Eliminate the practice of writing drug allergens on allergy wristbands. Errors may occur with this practice if drug names are missed or when small wristbands are used. Confusion may also occur when drug names are abbreviated, misspelled, or smeared, leading to further risk. In addition, if a patient has many allergies, multiple bracelets may be used, increasing the chance that a practitioner may only view one bracelet and not realize there are more bracelets to check. Instead, have the single red allergy bracelet act as an "alert" to the practitioner, identifying at the point of care that the patient *has an allergy*, requiring further investigation of the patient, medical record, and MAR.
- When communicating verbal or telephone medication orders, prescribers should always ask for the patient's allergies and reactions. The receiver of the order should always present this information during this process.
- Provide prescribers, nurses, and pharmacists with education on medication allergies. Educational efforts need to focus on screening patients for the potential of a reaction, recognition of an allergic reaction, and the treatment of serious allergic reactions.¹⁰ These efforts should include organization-specific procedures such as the locations to document/find patient allergy information, as well as to access important drug information that includes common allergies, cross allergies, and combination drug products that may have implications with common drug allergies.

- Use information reported through PA-PSRS to identify problem areas, processes, or medications to determine the types of events that occur within an individual organization. In addition, measure the use of trigger drugs used to treat allergic reactions (e.g., diphenhydramine, methylprednisolone, epinephrine) to increase detection of possible preventable ADEs and determine whether there are other instances of patients erroneously receiving medications with documented allergies. Collection of trigger data could be incorporated into the order-screening processes, captured by clinical pharmacists during rounds, or accomplished by those who routinely review patient records, such as quality managers or case managers.

Notes

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Self-Assessment Questions

The following questions about this article may be useful for internal education and assessment. You may use the following examples or come up with your own.

1. Based on reports submitted to PA-PSRS, during which phase of the medication-use process do errors involving breakdowns in communication of patient allergy information originate?
 - a. Dispensing
 - b. Prescribing
 - c. Administering
 - d. Transcribing
2. Events in which patients were prescribed and given medications to which they had documented allergies fall primarily into two categories. One occurs with breakdowns in drug information. The other is
 - a. breakdowns in staff education.
 - b. breakdowns in quality control.
 - c. breakdowns in patient information.
 - d. breakdowns in drug labeling.
3. Errors associated with breakdowns in patient allergy information may occur during each of the following activities EXCEPT?
 - a. Documenting patient allergy information into paper-based and electronic records
 - b. Obtaining information from patients, caregivers, or other healthcare facilities
 - c. Entering orders into the computerized prescriber order-entry systems and pharmacy order-entry systems
 - d. Selecting a medication to add to the organization's formulary
4. All of the following represent breakdowns or at-risk behaviors in the communication of patient allergy information EXCEPT?
 - a. Failing to document the specific reaction the patient experienced to the medication
 - b. Obtaining a medication by means of an override function from an automated dispensing cabinet before pharmacy review of the order
 - c. Verifying patient allergies and reactions when communicating verbal and/or telephone orders
 - d. Prescribing medications with insufficient critical patient information (e.g., age, weight, allergies, diagnoses, laboratory values)
 - e. All of the above
5. Which of the following risk reduction strategies could reduce the occurrence of adverse drug events related to allergy information?
 - a. Communicating allergy information by documenting drug allergens on patient allergy wristbands
 - b. Removing prompts in prescriber order forms that would document allergy information
 - c. Establishing processes to verify and update archived patient allergy information upon each readmission or patient encounter
 - d. Programming forcing functions into the organization's computer order-entry systems that would not allow for the documentation of "reactions" to allergies

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