

Disparity in Patients' Self-Reported and Charted Medication Allergy Information

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Objectives: The objective of this study was to compare current adverse drug/allergy reaction reporting in patient electronic medical records/charts against information gathered during patient interviews in the emergency department. Our hypothesis was that current methods for allergy reporting results in significant discrepancy between what is documented and the actual allergy history upon interviewing the patient.

Methods: The study was conducted between December 2011 and April 2012 in an academic emergency department. This was a convenience sample study comparing a prospective patient interview with previously documented allergy histories. Demographics for sex, age, and race were recorded. Patients to be interviewed were adults with at least one documented allergy in their chart. Descriptive statistics and percentages were used for demographic and prevalence data. Agreement between interviews and charts was assessed for both the reaction type and the reaction descriptor.

Results: There were 101 patients interviewed during this 4-month period, and a total of 235 adverse drug reactions were recorded. There were 66 women and 35 men included in this study. The mean age was 51 ± 17 years. The median number of allergy instances for women was 2 (interquartile range 1–3) and for men the median number of allergy instances was 1 (interquartile range 1–2). The percentage of agreements for overall allergies was 85% and 50% for the type of reaction. Total profile agreement occurred in nine patients.

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The study was funded in part by the Valente Foundation.

The study was presented in part at the 2011 American Society of Health-System Pharmacist Midyear Clinical Meeting and at the Society for Academic Emergency Medicine 2013, Atlanta, Georgia.

The authors have no financial relationships to disclose and no conflicts of interest to report.

Accepted October 13, 2014.

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0038-4348/0-2000/108-332

DOI: 10.14423/SMJ.0000000000000301

Conclusions: The percentage of agreement between interviews and charting for reaction type was 50%. Even with the use of electronic medical records, better methods are needed to properly record allergies to ensure patient safety and care.

Key Words: adverse drug reaction, agreement, allergy, electronic medical records

Each year in the United States, 114 million people are admitted to emergency departments (ED). Adverse drug/allergic reactions are experienced by 7% of patients within the hospital setting, with true medication allergies being responsible for 15% of all allergies.^{1–3} Proper documentation of medication allergies plays a critical role in the care of patients, especially upon admission to an ED, given that inaccurate information may affect clinical decision making and result in suboptimal therapy. Healthcare providers in the ED have an especially important job of detailing whether a patient's medication allergy is a true, immune-mediated allergy or an adverse effect.

Our university-affiliated hospital ED uses an electronic medical record (EMR, hereby referred to as *chart*; Cerner Millennium, FirstNet, Kansas City, MO) to document allergy information. The purpose of this descriptive study was to compare current allergy reporting in patient charts with information gathered during ED patient interviews using the hypothesis that there are significant discrepancies between what is documented and the allergy history/patient interview.

Key Points

- Proper documentation of medication allergies plays a critical role in the care of patients; inaccurate information may affect clinical decision making and result in suboptimal therapy, as well as potential adverse effects.
- Even with the use of electronic medical records (EMRs), the percentage of agreement between interviews and EMRs was low.
- Better methods for properly documenting adverse drug reactions are required, even in the age of EMRs.

Methods

Study Design

This study was a convenience sampling prospective cohort of patients with previous adverse drug/allergic reactions recorded in charts. Samplings were taken when the study investigators were available. Most of the patients present in the evening hours (11 AM to 11 PM) and the data mostly were collected during these times; however, there was no regularity to sampling times. The term *allergy* is used here in the same way it is recorded in the EMR, which uses *allergies* as the section heading. Patients were recruited during a 4-month period between December 2011 and April 2012. The study was performed in a 68-bed academic ED with an average daily census of 250 patients. EMRs have been in use for >2 years.

English- or Spanish-speaking patients 18 years or older registered in the ED with at least one allergy previously documented in the chart were included in this study. Patients were excluded if they stated they had previously participated in the present study on a different recent ED visit.

Measurement

ED patient charts were reviewed for inclusion criteria. For patients eligible for an interview, one of three trained interviewers completed a standardized questionnaire with the patient. The interviewers were a doctor of pharmacy resident on an emergency medicine rotation, a doctor of pharmacy pharmacist who worked in the ED on a regular basis, and a third-year emergency medicine resident. Training included a review of data entry forms created by experienced emergency medicine researchers and meetings about the study in two sessions. The interviewers were not blinded to the purpose of the study. Previously documented allergies from patient charts were recorded on the questionnaire before the interview. The standardized forms were then completed during the patient interview. All of the data collected from each of the three interviewers were reviewed by the same person and transcribed into electronic databases. Human research review committee approval was obtained before the initiation of the study.

Data Collection and Processing

Demographic data (age, sex, ethnicity) was collected for all patients. Previously documented allergy information recorded on the data form included specific drug or drug class, reaction type (immune-mediated allergy or adverse effect), and reaction descriptor (eg, rash, anaphylaxis). Reaction descriptors are prompted, but not required, in our charting, so many may not be recorded. The system reaction type was subdivided into categories and recorded to determine agreement. The setting in which the reaction took place (inpatient or outpatient) and the estimated onset of the reaction also were obtained.

For the interview, there was a separate area on the questionnaire for each allergy and included information concerning the causative class, causative agent, date of reaction, and various checkboxes with reaction descriptors. The information gathered

was reviewed by a designated investigator whereby the reaction type was determined based on the reaction descriptor documented on the questionnaire.

Adverse Drug Reactions: Definitions and Classifications

The term *adverse drug reaction* is used to encompass any undesirable pharmacologic effect at a usual dose. Any immune-mediated reaction including, type I through IV hypersensitivities, as defined by the Gell and Coombs Hypersensitivity Classification, was regarded as an allergy.⁴ Non-immune-mediated undesirable pharmacologic effects at a usual dose also were listed in the chart as allergies, so for the purposes of the study both immune and non-immune-mediated reactions were considered allergies. Comparisons were made between the patient report of allergies gathered by one of the interviewer principal investigators and that which was stated in the EMR previously entered by medical personnel. Which is correct is uncertain. The study aimed to find discrepancies in agreement. Reported allergies to medications that were inconsistent with the patient's prescribed medications (eg, allergy to acetaminophen but prescribed and taking hydrocodone with acetaminophen) were not considered allergies in reality. Reported allergies to more than one medication in a class (eg, both penicillin and amoxicillin) were considered one allergy. We did not specifically compare written or verbal allergies with those medications received in the ED visit during the interview. Any discrepancies believed to have potential to harm patient care were reported to the treating physicians and nursing personnel.

Data Analysis and Outcome Measures

The primary outcome was the agreement between allergy information previously recorded in the charts and information obtained through interviewing the patients. Other outcomes included total discrepancies and the most common medication classes contributing to allergies.

For demographics and prevalence, descriptive statistics and percentages were used. We measured agreement between previously documented information and information gathered during the prospective interviews. $P < 0.05$ was considered statistically significant. SPSS version 19 (IBM SPSS Statistics, Armonk, NY) was used for all of the statistical analyses.

Results

A total of 101 patients were interviewed during the 4-month period and there were 235 drug allergies. Each allergy either was recorded in the chart or stated during the interview. To be included in the study, each patient had to have at least one allergy recorded in his or her chart. Demographic characteristics are described in Table 1. The population was predominantly white women with a mean age of 51 years.

The median number of allergies per patient was two for women (interquartile range 1–3) and 1 for males (interquartile range 1–2). The most common class of medication that was

Table 1. Baseline characteristics

Characteristic	N = 101
Sex (%)	
Male	35 (34.7)
Female	66 (65.3)
Age (mean ± SD)	51.3±16.8
Age, range	20–90
Race/ethnicity (%)	
White	59 (58.2)
Hispanic	27 (26.7)
Other	15 (14.9)
Total documented allergies	235
Medication classes associated with allergies (%)	
Penicillins	35 (14.9)
Sulfonamides	21 (8.9)
Other antibiotics	24 (10.2)
Opioid	61 (26.0)
NSAID	20 (8.5)
Antiemetic	17 (7.2)
Other	57 (24.3)

NSAID, nonsteroidal anti-inflammatory drug; SD, standard deviation.

responsible for allergies was antibiotics. A total of 80 (34%) medications consisted of penicillins (35, 14.9%), sulfas (21, 8.9%), and all other aggregated antibiotics (24, 10.2%). The next highest offending class was opiate analgesics (61, 26%). Each of the 101 patients had at least one allergy to a drug noted in the chart, and more may have been discovered during the interview. Some charts documented the allergy but not the type of reaction. The 235 listed allergies represent the drugs for which the chart and/or interviewer found an allergy to that drug. The comparison between the chart and the interview regarding allergies is shown in Table 2. Table 3 shows the results of a subgroup analysis broken down by the type of allergic reaction documented in the chart or obtained during the interview.

Upon interviewing the patients, 18 (7.7%) allergies were discovered that were not in the chart. In addition, a different 18 (7.7%) allergies documented in the chart were denied by patients upon interview. Some of reaction descriptors were omitted in the patients' charts, and approximately 32% of the allergies had no reaction descriptor specified. The percentage of agreement for reaction descriptors between previously documented allergies and patient interviews was 50%. Total profile agreement for allergy information occurred in only nine patients. When checking for general agreement on an allergy, the two sources (chart vs interviews) were in agreement 85% of the time (Table 2). When we tried to determine the type of reaction, the agreement between the chart and the interview dropped to 50%, however (Table 3).

Discussion

Correct and complete allergy documentation is paramount to providing optimal patient care. This study has demonstrated that

significant discrepancies exist in the documentation of allergy information in the chart. Unlike the former paper charting, EMRs contain prompts that encourage listing allergies to medications. The assumption is that this would improve the charting of allergies; however, this assumption is unsubstantiated. It is possible that an actual allergy may not be recorded in the EMR or that a false allergy is documented in the EMR and may be carried over in subsequent patient encounters.

The literature examining allergy documentation is sparse and has primarily examined paper records. One study evaluating reported allergies to beta-lactam antibiotics, sulfonamides, and/or opioid narcotics found that after interviewing the patients, 43%, 52%, and 0% had true allergies, respectively.¹ Furthermore, the most common contributing factor to medication errors in this study was that the provider was unaware of the allergy (76%).¹ Several other studies have shown discrepancies between medical records and patient accounts of the reactions in both ambulatory care and surgical patients.^{2,5,6}

The reasons for disparities in allergy documentation are likely multifactorial. First, patients' knowledge regarding their drug allergies often is incomplete. A study by Wyatt reported that 38 of the 242 patients interviewed about their claimed drug allergies to medications could not remember the name of the medication.⁷ Furthermore, 57 patients could not recall what their allergic reaction was. Better awareness of the importance of taking a medication allergy history also is needed. Previous studies have shown that education programs focusing on the importance of taking allergy histories can improve the pharmacist's recording and reporting of allergies on medication charts.⁸ Other studies show that there are still significant discrepancies in allergy reporting among healthcare providers.⁹ One study found a disparity between pharmacists and physicians taking medication and allergy histories in the ED.¹⁰ Pharmacists entered a descriptor for an allergy in 53% of the patient profiles, whereas physicians entered a description for only 2%. The addition of a reaction descriptor in a patient's allergy history allows providers to identify clinically significant reactions and thus limit unnecessary treatment modifications based on incomplete information.

Our unsubstantiated assumption that charts may limit inconsistencies within charting of allergies may be inaccurate. The present study found low agreement in allergy reporting in charts,

Table 2. Allergy agreement (in 85% of cases)

Chart/EMR	Interview		Total (chart/EMR)
	Allergy to a drug	Denied allergy	
Allergy to a drug	199	18	217
No recorded allergy	18	0	18
Total allergies (interview)	217	18	235

Bold type indicates statistical significance. EMR, electronic medical record.

Table 3. Type of reaction (agreement in 50% of cases)

EMR/chart (n)	Interview							
	Anaphylaxis	N/V/D	Hives	Rash	Other allergy symptoms	Allergy but cannot recall type	Denied allergy in interview	Total (EMR)
Anaphylaxis	15	0	0	2	1	0	0	18
N/V/D	1	23	0	0	1	0	2	27
Hives	7	0	12	3	0	0	1	23
Rash	2	0	3	28	1	1	4	39
Other allergy symptom	0	3	0	1	29	1	1	35
Allergy, but type undocumented in chart	10	13	19	11	20	10	10	75
No recorded allergy in chart	2	3	2	4	7	0	0	18
Total (interview)	35	39	34	45	52	12	18	235

Bold type indicates statistical significance. EMR, electronic medical record; N/V/D, nausea, vomiting, diarrhea.

which is consistent with what has been reported using paper charting. This study has identified pitfalls specifically within our electronic charting system. For example, our system defaults the documentation of an allergy to label it as a true immune-mediated allergy. The system also does not obligate the provider to input a reaction descriptor. This leads to overreporting of the reaction type being an allergy and underreporting of reaction descriptors. The results are to be presented to the university's medication safety committee in the hopes of instituting parameters to ensure more accurate allergy reporting.

At our institution the allergy screening process is part of the emergency triage process; however, results from our study indicate that this process often is incomplete or not wholly accurate. Since the completion of the study, changes have been made to the medication reconciliation process to help improve it. These changes include the addition of ED pharmacy technicians to complete medication lists and obtain in-depth allergy histories for ED patients and the hiring of a care transitions pharmacist who is developing a hospital-wide process to improve medication reconciliation for all patients.

Of note, in 30% of cases, the patients believed they had an allergy to a drug but were unable to identify the type of reaction that they had experienced. In our interviews, there were only 12 drug allergies for which the patient could not identify the type of reaction. This is most likely because we spent more time trying to define the actual reaction during these face-to-face interviews.

This study shows the importance of an onsite pharmacist in the ED. In our previous study we demonstrated that our onsite pharmacists reduced errors substantially compared with instances in which pharmacists were not onsite.¹¹ The onsite pharmacist aids with medication use and can avert use of medications to which patients are allergic. In our previous study, when pharmacists were not present, errors involving allergies occurred 14 times during the 12-week period compared with none when pharmacists were present.¹¹

This study is not without limitations. The data may not be applicable to other institutions for which their EMRs require the provider to input a reaction descriptor before saving the allergy information. The system at our institution defaults the reaction type to "allergy" and does not require the healthcare provider to enter the reaction description.

Another limitation to this study is that it is a convenience sample. Randomizing the study may reduce selection bias. In the interest of patient safety, the interviewers needed to know the allergy history to obtain the most accurate information. In the real world, a pharmacist in the ED would already have knowledge of reported allergies before interviewing the patient as well. In the interest of patient safety, new knowledge was passed to the appropriate providers when obtained. Patients' recollections of the reaction also may have changed over time if the reaction occurred long ago.

Study interviewers were not blinded to the purpose of the study. This may have created bias in searching for additional allergies not stated in the records. Another bias is the fact that the search of the EMR was conducted before approaching a patient. This led to knowledge of at least one allergy before starting the interview with the potential for uncovering additional allergies. It would have been better to have another investigator determine who should be interviewed or to approach the patient before reviewing the medical record; however, this was not done and serves as a limitation.

Another potential for bias is the cueing of the patient regarding the purpose of the study. This may refresh the recall of the patient if approached with the knowledge that they do have at least one allergy to medications. This could have led to more discrepancies in the direction of adding a forgotten or overlooked drug reaction or allergy with a disavowed allergy in a smaller number of cases.

We do not know an overall number of patients who had documented allergies or how many people passed through the ED during the 4-month study period. These were convenience

samples when the study authors were available. The realization that many of our patients are too ill, too young, or have cognitive issues, and that an appropriate patient to interview must be identified must be considered in the sampling process with the admission that this is far from ideal.

There was no schedule for the sampling because this was a convenience sampling. Because the busiest hours are during the evening and the pharmacists are in the ED, most of the interviews took place between 3 PM and 1 AM. The schedule depended solely on the availability of a researcher to interview patients. A convenience sampling is not ideal, this is not the best format and a study of all consecutive patients would be desirable.

We did not document whether allergies were believed to be manipulative on the part of the patient (eg, reporting an allergy to nonsteroidal anti-inflammatory drugs to receive narcotic medications). If a patient reports these allergies, however, it would be difficult to give a similar medication considering the potential dire consequences of allergic reactions.

We did not interview patients with no recorded allergy in the chart. This would have shown important undiscovered/uncharted allergies in some of these patients. Future study could elicit whether there are discrepancies in those without previous documentation of allergies and prospective interviews.

Conclusions

Discrepancies between medication allergies recorded in the electronic ED charts and those elicited in interviews are common. Better methods for properly documenting adverse drug reactions are required, even in the age of EMRs. Onsite

pharmacists in the ED may be helpful in averting medication errors, especially those involving serious allergies.

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