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Implications of electronic health record transition on drug allergy labels

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To the Editor:

Drug allergy labels impact up to 35% of the population and their accuracy is crucial to patient safety.¹ Drug allergy lists or labels in electronic health records (EHRs) generally contain all adverse drug reactions and contraindications, with the minority being true immune mediated drug reactions. Current evidence supports the negative impact of clinically irrelevant penicillin allergy labels including use of less effective, more toxic antimicrobials, development of resistant organisms, higher healthcare costs, and overall higher morbidity and mortality.² Therefore, both accurate documentation of confirmed immune mediated drug allergies and removal of allergy labels after negative evaluation are key elements to maintain patient safety. Drug allergy labels are known to pose problems in EHRs ranging from inaccuracies when transcribing from paper records,³ differences in data entry and storage forms, and inappropriate warning prompts, all of which can lead to patient harm.⁴

In 2017, Vanderbilt University Medical Center (VUMC) underwent system-wide simultaneous inpatient and outpatient transition from a home-grown legacy EHR to Epic (Verona, Wisconsin). A technical developing team without clinical training and consulting clinical informaticians wrote the data transfer and mapping of allergens. Over 3 million allergy labels required transfer to the new EHR which was accomplished directly through health level 7 (HL7) messages either automatically or after manual mapping (e.g. “Bactrim” was mapped to code for “sulfamethoxazole-trimethoprim”). Approximately 226,000 allergy

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labels were not codable and required manual reconciliation as outside information by clinical staff. If reconciliation was needed, the user was notified and prompted to select from suggested allergen labels, search for a coded allergen label, or enter the allergen as “other” with a free-text description.

After transition to the new EHR, we conducted a retrospective chart review of 511 randomly selected patients seen between March 5, 2014 and November 1, 2017 in an outpatient clinic at VUMC that exclusively sees patients referred for assessment of drug allergy to evaluate the impact the EHR transition had on the accuracy of their drug allergy labels. This specific patient population is ideal to see legitimate drug label alterations because all patients seen in this dedicated drug allergy clinic had at least one drug allergy label modified after formal evaluation for immune mediated drug allergy. Modifications included label(s) removed or “de-labeled”, details added in the description to clarify the reaction, and recommendations for safe alternatives or additional drug avoidances. The chart review compared drug allergy labels between the two EHR systems to identify labels that were 1) reacquired, 2) lost or 3) lacked vital information. If any inconsistencies were noted, further chart review was completed for potential reasons (e.g. new reaction, patient tolerated drug) or technological causes. All errors were corrected at the time of identification.

There were 79/511 (15%) patients with differences in drug allergy labels between the two EHRs, totaling 114 specific labels. Alarming, 28/511 (5%) patients had 40 drug allergy label differences for confirmed severe reactions, such as Stevens-Johnson syndrome/toxic epidermal necrolysis (SJS/TEN), drug reaction with eosinophilia and systemic symptoms (DRESS), or anaphylaxis. Furthermore, 8/28 (29%) of those patients with severe reaction discrepancies had an encounter in the new EHR in the 10 months following the transition, meaning an allergy review with the patient had taken place and these discrepancies had not been corrected by the reviewer (Table 1). Post transition, 15/114 (13%) labels were reacquired because they had been removed from the legacy EHR between the initial data transfer and go-live and the allergen was not deleted in the post go-live update. Upon further investigation, we discovered that the post go-live update only included patients new to VUMC since the initial transfer, not patients already assigned a medical record number. Other label discrepancies included 69/114 (61%) labels lost and 30/114 (26%) labels altered with misrepresented reaction information, safe alternatives, and specific avoidances as a result of an incomplete or incorrect reconciliation. A secondary observation, not specifically related to data transfer, found an additional 27 patients had 33 previously removed drug allergy labels reappear in allergy lists without documentation of a new reaction. Interestingly, 17 labels reappeared in the 10 months after EHR transition while 14 labels reappeared in the 44 months prior to EHR transition. No known adverse events have resulted from drug allergy label discrepancies at our institution.

This study reaffirms that EHR transitions pose a significant risk for EHR-related errors which can be compounded by human error and impacted by EHR data interoperability and usability.⁵⁻⁷ Identified contributing factors for drug allergy label discrepancies include: 1) post go-live data update included only new patients to VUMC, 2) extensive free-text utilization in the legacy EHR system leading to incompatible data storage forms and

mapping challenges, and 3) a paucity of clinical and non-clinical staff education on drug allergy labels, appropriate documentation, and reconciliation in the EHR.

Several steps have been taken to correct these EHR-related errors. All drug allergy label discrepancies identified were corrected. Quality assurance testing was performed to multiple data transfer scenarios to evaluate the impact of data load update gaps on broader patient populations. Clinical informaticians used the search function to identify high-risk drug allergies to manually review and correct errors not previously identified. Pharmacists are notified, review, update and clarify any free-text “other” allergy labels; however, they are commonly not able to review directly with the patient when they are alerted. All users are encouraged to utilize standardized data input when available rather than free-text. Lack of consistent drug allergy documentation is a significant problem with negative implications on patient health.^{8,9} Drug allergy experts are working on a consensus to standardize drug allergy documentation in the medical record. Our institution has updated policies, procedures and specific training on drug allergy review and documentation.

Going forward, education is essential because the majority of persons entering allergies (such as intake staff) may have little to no training related to adverse drug reactions and in particular drug allergies. Healthcare teams need to regularly interact with the patient regarding their drug allergy list, with the awareness that drug allergies are dynamic; therefore, accurate and appropriate documentation is critical to future prescribing and medical care decisions. This will improve the accuracy of labels and prevent the re-labeling of inappropriate labels. Preparation for EHR transition should include proactive strategies and training to reduce the impact of technological gaps. Virtually all clinicians are involved in the care of patients who either have drug allergy labels or have had those labels modified by a specialist. The importance of an accurate drug allergy label needs to be reinforced by education for patients and providers alike. This includes education regarding de-labeling after negative evaluation. Our findings, that were exposed because of an EHR transition, are of generalizable concern and should prompt increased focus on 1) standardization of drug allergy documentation and terminology for critical data (e.g. anaphylaxis), 2) improvement of EHR usability and interoperability, and 3) broad education regarding drug allergy.

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Clinical Implications:

Electronic health record transitions are prone to errors and compounded by human error. Education initiatives regarding drug allergy documentation and the importance of label accuracy for patients and the medical community is greatly needed.

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Figure 1.

Process and pitfalls of data transfer between the two EHR systems. *Rectangles represent processes that were standard for all drug allergen information. The octagons represent gaps in data conversion and opportunities for human error that resulted in drug allergy discrepancies.*

EHR – electronic health record

HL7 – health language 7

Table 1.

Examples of severe allergy discrepancies

Drug name	Former EHR description	New EHR description	Background of most recent drug allergy reviewer
allopurinol	Stevens-Johnson syndrome/toxic epidermal necrolysis (SJS/TEN)	Gastrointestinal intolerance	Unknown title *
minocycline	Stevens-Johnson syndrome (SJS) Avoid doxycycline (listed as a separate allergy) Avoid tetracycline (listed as a separate allergy)	High severity rash Changed to dicyclomine No longer listed	Unknown title
ceftriaxone	Stevens-Johnson syndrome/toxic epidermal necrolysis (SJS/TEN) Recommend avoidance of cefepime and cefotaxime	No cephalosporins listed as an allergy	Pharmacist
amoxicillin	Drug reaction with eosinophilia and systemic symptoms (DRESS)	Gastrointestinal intolerance	Unknown title
ondansetron	Anaphylaxis and skin prick test positive	“per pt”	Registered Nurse
ceftriaxone	Anaphylaxis and skin prick test positive	ceftriaxone no longer listed Description was listed under the drug name “other” along with 2 additional reaction descriptions	Physician

* - unknown title includes user roles defined as medical assistants, technicians, or no information. Responsible for 37% of all the drug allergy labels entered in the new electronic health record (EHR).