Validation of Rash and Nonspecific Eruption Diagnoses Using ICD-9 and ICD-10 Codes

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Abstract

Despite being common cutaneous findings in the hospital setting, cutaneous drug eruptions have not been thoroughly validated for administrative claims data. The purpose of this study was to validate primary discharge diagnoses for the ICD code rash or other nonspecific eruptions by finding the positive predictive value (PPV) and to determine how often it was used to indicate an eruption that was eventually determined to be a drug eruption. Two dermatologists independently examined each of 39 hospital patient encounters to assess the validity of the ICD code used by stating whether the code used was appropriate or inappropriate, per table 1 criteria. Since in most patients, a drug eruption was suspected, the Naranjo Adverse Drug Reaction Probability Scale was utilized to externally validate our findings. Our results yielded a PPV for nonspecific rashes of 94.87% (83.11-98.58%) for appropriateness of use. The mean Naranjo score for appropriately versus inappropriately coded cases was 5.7 versus 2.5, respectively, with a mean difference of 3.17568 (0.18833-6.16302), (pooled P-value = 0.0378). Out of the cases analyzed, 29/39 or 74% were confirmed to be drug-related. Our high PPV supports the validity of non-specific eruptions found in national patient databases and the high Naranjo criteria suggest that often, these eruptions are drug related, yet not confirmed at the point of discharge.

Keywords: Validation, ICD9, ICD10, morbilliform rash, exanthema, exanthem, health services research

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INTRODUCTION

Despite being common cutaneous findings in the hospital setting, cutaneous drug eruptions have not been thoroughly validated for administrative claims data.[1,2] Numerous questions on the impact, associations, and etiologies of these drug eruptions have been raised from single center designs such as differentiating acute kidney injury of drug reaction with eosinophilia and systemic symptoms (DRESS) from vancomycin induced nephrotoxicity. Yet it is critical to corroborate these findings in larger databases, a challenge that is difficult without better drug eruption classifications and ICD coding.[3,4]

The purpose of this study was to validate primary discharge diagnoses for the ICD code rash or other nonspecific eruptions by finding the positive predictive value (PPV), and to determine how often it was used to indicate an eruption that was eventually determined to be a drug eruption. We investigated adult hospitalizations at The Ohio State University Wexner Medical Center (OSUWMC) between 2012 and 2018 for a primary discharge diagnosis of nonspecific rash/eruption, including ICD-9-CM 782.1 and/or ICD-10-CM R21.

The OSUWMC is a large public institution in Columbus, Ohio that receives 1.87 million outpatient visits and 62,000 inpatient visits annually. The above search resulted in 39 discharges of interest. Subsequently, two dermatologists (JCT, NMN) independently examined each patient encounter to assess the validity of the ICD code used by stating whether the code used was appropriate or inappropriate, per Table 1 criteria (Table 1). In cases of disagreement, a third dermatologist (BHK) was the tie-breaking arbiter. Since a drug eruption was suspected in most patients, the Naranjo Adverse Drug Reaction Probability Scale was utilized to externally validate our findings.

Likelihood Categories[a]	**Hospitalizations (n = 39)**	**95%-CI**	**Mean Naranjo Score[b]**	***P*-value[c]**	**PPV**
Appropriate	37 (94.87%)	(83.11-98.58%)	5.67568	*P* = 0.0378	94.87% (83.11-98.58%)
Inappropriate	2 (5.13%)	(1.42-16.89%)	2.50000		

Final Dermatologic Diagnosis		Total N = 39
Drug-Related Rashes (N = 29)	DRESS	N = 6
	AGEP	N = 6
	Medication Hypersensitivity Reaction	N = 5
	Low-Risk Morbilliform Drug Eruption	N = 4
	Fixed Drug Eruption	N = 2
	Medication Induced Vasculitis	N = 2
	Toxic Erythema of Chemotherapy	N = 1
	Infusion Reaction	N = 1
	Serum Sickness	N = 1
	Palmoplantar Erythrodysesthesia	N = 1
Non-Drug-Related Rashes (N = 10)	Viral Exanthem	N = 3
	Acute Immunologic Disorder	N = 1
	Pityriasis Rubra Pilaris	N = 1
	Id Reaction	N = 1
	Purpuric Dermatosis	N = 1
	Pemphigus Vulgaris	N = 1
	Sweet's Syndrome	N = 1
	Dermatomyositis	N = 1

[a] Likelihood categories describe the accuracy of ICD coded inpatient diagnoses based on examinations by 2 board-certified dermatologists. Appropriate codes are defined as: agreed by second dermatologist by review and documented medication history, pending workup studies; supporting documentation including image review; lack of better diagnosis after workup or with minimal work up; or diagnosis by board-certified dermatologist without clear supporting documentation or by non-dermatologist with some features of above support. Inappropriate codes are defined as: ICD Diagnosis on Discharge without documentation; no documentation of diagnosis; or different skin disease diagnosis rendered. SNOMED, or Systematized Nomenclature of Medicine, is a comprehensive machine-readable clinical terminology that standardizes how clinical terms are reported, thus limiting confusion that can arise from using colloquial terms.

[b] Mean Naranjo scores were calculated based on the least square means estimates; the mean difference between groups is 3.17568 (0.18833-6.16302) as calculated by the Dunnet's Test. Naranjo scores are interpreted as: doubtful adverse drug reaction (<2), possible (2-4), probable (5-8), and definite (≥9).

[c] *P*-value represents pooled T test assuming equal variances between the likelihood categories and associated Naranjo scores. *P*-values are statistically significant at a threshold of 5%.

Table 1. *Accuracy of ICD coded inpatient diagnoses based on examinations by 2 board-certified dermatologists*

CONCLUSIONS

Our results yielded a PPV for nonspecific rashes of 94.87% (83.11-98.58%) for appropriateness of use. The mean Naranjo score for appropriately versus inappropriately coded cases was 5.7 versus 2.5, respectively, with a mean difference of 3.17568 (0.18833-6.16302), (pooled *P*-value = 0.0378, Table 1). Out of the cases analyzed, 29/39 or 74% were confirmed to be drug-related (Table 1).

Our high PPV supports the validity of non-specific eruptions found in national patient databases, and the high Naranjo criteria suggest that often, these eruptions are drug related, yet not confirmed at the point of discharge.

This field of research is not without challenges. First, the number of admissions with a primary diagnostic code for nonspecific drug reactions is substantially lower than the number coded as a secondary diagnosis.[5] Further, given that this code is non-specific, its use likely differs between hospitals with and without access to dermatology. Lastly, another challenge of this code is that while usually linked to 'rash and nonspecific eruption,' there are multiple SNOMED terms that map to these diagnostic codes. Particularly, dermatologists may use the descriptor morbilliform eruption as a diagnosis for viral eruptions, morbilliform drug eruptions, or early graft-versus-host disease, intending its use as a final diagnosis as opposed to a non-specific eruption. Nevertheless, our results suggest that nonspecific eruptions are appropriately coded and are most likely secondary to drug eruptions, with an ongoing evaluation at the time of discharge.

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Conflicts of Interest: The authors declare no conflicts of interest.

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