# The Transition to ICD-10-CM: Challenges for Pediatric Practice

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**KEY WORDS**

ICD-9-CM, ICD-10-CM, diagnostic codes, health informatics, convolution

**ABBREVIATIONS**

CMS—Centers for Medicare and Medicaid Services
GEM—General Equivalent Mapping
ICD-9-CM—International Classification of Diseases, Ninth Revision, Clinical Modification
ICD-10-CM—International Classification of Diseases, 10th Revision, Clinical Modification

Dr Caskey helped to conceptualize and design the study, participated in determining criteria for categorization of ICD-10-CM codes, categorized the ICD-10-CM codes, and drafted the initial manuscript; Mr Zaman performed initial analyses for the accuracy of the codes and the analysis of the financial data and reviewed and revised the manuscript; Drs Nam, Chae, Williams, and Mathew participated in determining criteria for categorization of ICD-10-CM codes, categorized the ICD-10-CM codes, and reviewed and revised the manuscript; Mr Burton queried the initial database of Medicaid, assisted in the characterization of the data and the analysis of the financial data, and reviewed and revised the manuscript; Mr Li carried out the initial analyses for the accuracy of the codes and the analysis of the financial data and reviewed and revised the manuscript; Dr Lussier helped to conceptualize and design the study; Dr Boyd helped to conceptualize and design the study, identified key collaborators, had access to all of the data throughout the study, and assisted in drafting the initial manuscript; and all authors approved the final manuscript as submitted.

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**WHAT'S KNOWN ON THIS SUBJECT:** The US health care system transition to the ICD-10-CM will occur in October 2015. The logistical and financial impact of the transition for billing codes frequently used by pediatricians has not been studied.

**WHAT THIS STUDY ADDS:** The findings of this study evaluate the government-provided mappings from ICD-9-CM to ICD-10-CM for accuracy and provide the diagnostic codes used by pediatricians, which may be adversely affected by the transition to ICD-10-CM.

## abstract

**BACKGROUND AND OBJECTIVES:** Diagnostic codes are used widely within health care for billing, quality assessment, and to measure clinical outcomes. The US health care system will transition to the *International Classification of Diseases, 10th Revision, Clinical Modification* (ICD-10-CM), in October 2015. Little is known about how this transition will affect pediatric practices. The objective of this study was to examine how the transition to ICD-10-CM may result in ambiguity of clinical information and financial disruption for pediatricians.

**METHODS:** Using a statewide data set from Illinois Medicaid specified for pediatricians, 2708 International Classification of Diseases, Ninth Revision, Clinical Modification, diagnosis codes were identified. Diagnosis codes were categorized into 1 of 5 categories: identity, class-to-subclass, subclass-to-class, convoluted, and no translation. The convoluted and high-cost diagnostic codes ($n$ = 636) were analyzed for accuracy and categorized into "information loss," "overlapping categories," "inconsistent," and "consistent." Finally, reimbursement by Medicaid was calculated for each category.

**RESULTS:** Twenty-six percent of pediatric diagnosis codes are convoluted, which represents 21% of Illinois Medicaid pediatric patient encounters and 16% of reimbursement. The diagnosis codes represented by information loss (3.6%), overlapping categories (3.2%), and inconsistent (1.2%) represent 8% of Medicaid pediatric reimbursement.

**CONCLUSIONS:** The potential for financial disruption and administrative errors from 8% of reimbursement diagnosis codes necessitates special attention to these codes in preparing for the transition to ICD-10-CM for pediatric practices. *Pediatrics* 2014;134:31–36

Diagnostic codes are not only used for billing medical services but also to measure quality, predict clinical outcomes, and anticipate future needs (staffing, purchasing) by health care systems.[1–4] The Centers for Medicare and Medicaid Services (CMS) mandated the US health system transition from the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) to the *International Classification of Diseases, 10th Revision, Clinical Modification* (ICD-10-CM) by October 1, 2015.[5] The ICD-10-CM includes ~68 000 codes, compared with 14 000 codes in the ICD-9-CM, and greater detail is embedded within each ICD-10-CM code.[6] Compared with ICD-9-CM, ICD-10-CM is more flexible by accommodating advances in medicine and technology because new codes can be incorporated over time and it more accurately codes ambulatory encounters, including primary care and preventive health visits.[6] Implementation of ICD-10-CM is estimated to cost from $83 000 to >$2 million per practice, depending on size.[7] A number of previous reports have discussed the transition from different perspectives.[8–11]

Most countries transitioned to either the World Health Organization version of ICD-10 or developed their own version of ICD-10 in the 1990s. An analysis of the Swiss experience found that the accuracy of administrative data coded with ICD-10 improved somewhat over the 5 years after implementation, but accuracy varied by condition.[12] In Canada, a comparison between ICD-9-CM and ICD-10-CA revealed similar validity of administrative data in documenting clinical conditions, and the implementation of ICD-10-CA did not improve the quality of the data.[13] Worldwide, transitioning to ICD-10 has had a variable impact on data quality and accuracy; however, the impact of the transition on billing codes frequently used by pediatricians has not been studied.[3,12] The objective of this study was to examine how the transition to ICD-10-CM may result in ambiguity of clinical information and financial disruption for pediatricians.

## METHODS

### Overview

Pediatric ICD-9-CM codes were obtained from Illinois Medicaid and were mapped to ICD-10-CM codes by using CMS General Equivalent Mappings (GEMs), a tool created by the CMS and the Centers for Disease Control and Prevention to assist with the conversion between ICD-9-CM and ICD-10-CM codes.[5,14] The mappings were examined by pediatricians for clinical accuracy, and financial analysis of the findings was conducted. The study was approved by the University of Illinois Institutional Review Board.

### Data Set

We used the statewide data set of Illinois Medicaid ICD-9-CM data for a 1-year (2010) complete billing picture for all patients identified as primary care patients of the University of Illinois system in the month of April 2011. All physician bills were labeled by medical specialty and subspecialty by Medicaid, which included the amount of money the state paid for each claim. The data set was then filtered for bills submitted by a pediatrician including general pediatricians and pediatric subspecialists. A total of 2708 diagnosis codes were used by pediatricians in a total of 174 500 patient encounters for a total payment by Medicaid of $12 298 520. The diagnosis code 999.99 was excluded from analysis because it is not an official ICD-9-CM code and has no defined clinical meaning.

### Mapping ICD-9-CM to ICD-10-CM Codes

The CMS GEMs[5] directional mapping of codes from ICD-9-CM to ICD-10-CM, and a separate file for ICD-10-CM to ICD-9-CM, was used to create the online analysis tool (version 1.0) and to map the billing codes.[14] A total of >100 000 mappings from ICD-9-CM to ICD-10-CM and ICD-10-CM to ICD-9-CM exist.

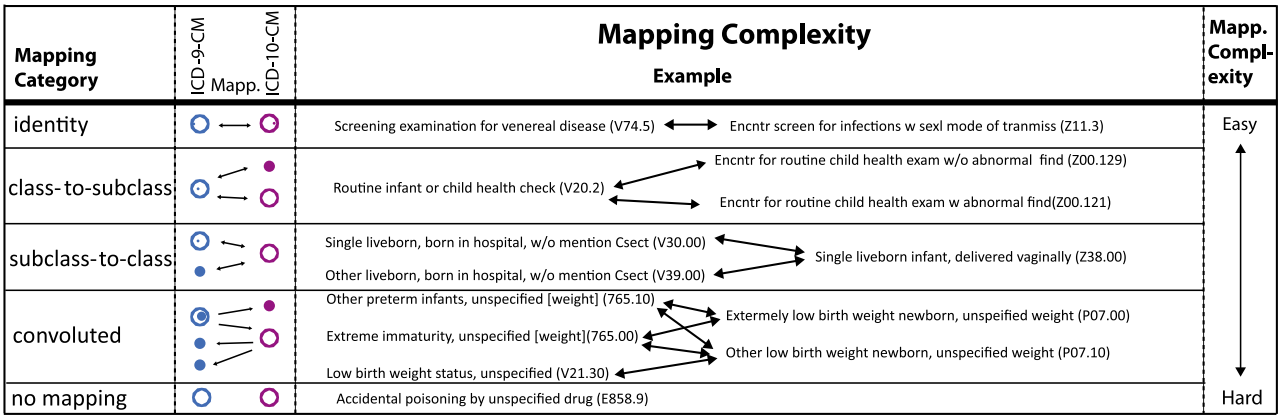
### Categorization of Complexity of Mapping

After mapping, all the ICD-9-CM codes were categorized for the complexity of transition to ICD-10-CM. Boyd et al[14] provided classification for mapping on the basis of on how codes associate with each other. The ICD-9-CM codes were categorized into 5 categories on the basis of how they map to ICD-10-CM: identity (where the codes are equivalent), class-to-subclass (1 ICD-9-CM code going to multiple ICD-10-CM codes), subclass-to-class (multiple ICD-9-CM codes to 1 ICD-10-CM code), no transition (no mapping to ICD-10-CM), and convoluted (a complex mapping of ICD-9-CM to and from ICD-10-CM; see Fig 1).[14] The first 4 categories include codes where the transition is straightforward and easy to identify; however, the convoluted codes have complex mappings making the transition difficult.

## DATA ANALYSIS

After the pediatric ICD-9-CM codes were mapped to ICD-10-CM codes and labeled into the above 5 categories,[14] an initial patient visit count and cost analysis were performed for each category. To appreciate potential clinical complexity inherent in the transition to ICD-10-CM, the convoluted codes were evaluated by physicians and classified into to 1 of 4 categories: information loss, overlapping categories, inconsistent, or consistent. "Information loss" was used when the transition obscures a clinically important diagnostic distinction, resulting in a potential loss of relevant clinical detail. "Overlapping category" was used when the transition results in a distinction without a clinically relevant

A




B

| Category | % of Peds ICD-9-CM |
|---|---|
| identity | 33% |
| class-to-subclass | 29% |
| subclass-to-class | 12% |
| convoluted | 26% |
| no mapping | 0.08% |

**FIGURE 1**

Mapping complexity (A) and category (B) of diagnosis codes. Csect, C-section; Encntr, encounter; find, finding; Peds, pediatrics; Sexl, sexually; transmiss, transmission.

difference or could result in confusion for appropriate code assignment. The overlapping category included ICD-9-CM codes that mapped to ICD-10-CM codes where additional nonintuitive clinical information was needed to understand the mapping. "Inconsistent" was used when ICD-10-CM codes were clinically different than the ICD-9-CM codes to which they mapped. The "consistent" category was used when the transition resulted in a consistent and clinically intuitive ICD-10-CM code (see Fig 2). Every convoluted code was analyzed by at least 2 independent physicians (R.C., L.W., G.M., S.R.-C., H.N.), and all discrepancies in classification were rectified by the group. To calculate the total financial impact of the different categories, the percentage of cost was divided by the total cost of all pediatric bills paid by Medicaid in the state of Illinois to reflect a percentage of overall costs related to pediatricians.

Five physicians coded the mappings and were instructed to focus only on the clinical accuracy of each mapping. Physicians were selected to be a mix of practicing pediatricians and resident physicians. We included senior resident physicians to balance any bias that could exist from more seasoned physicians whose coding practices may be more likely to be unintentionally influenced by reimbursement rates or clinical experiences. None of the physicians had expertise in billing or coding outside of on-the-job experience as a practicing physician.

## RESULTS

Of the 2708 diagnosis codes, we found 26% of all pediatric ICD-9-CM codes and 21% of pediatric patient visits associated with convoluted codes (Figs 1 and 3). Only 27 ICD-9-CM codes had no ICD-10-CM mapping due to diagnosis codes being redacted or no translation (Figs 1 and 3). Code 999.99, which was not included in the analysis, had $264 181 in payments and 128 432 visits associated with it. Code classification discrepancies were found for 132 codes (21%). The team of physicians reviewed every discrepancy and came to a consensus on the classification. The majority of discrepancies (111 of 132) involved minor differences in clinical interpretation of the mapping.

Of the 636 convoluted codes analyzed by pediatricians for accuracy, nearly 40% were categorized into the following 3 categories: information loss (14%), overlapping categories (18%), or inconsistent categories (7%) (Table 1). ICD-9-CM codes related to pregnancy and postpartum complications in which the transition to ICD-10-CM required additional clinical information were included in the overlapping category. (See the Supplemental Information for a list of specific ICD-9-CM codes.)

| Category | ICD-9-CM Code | ICD-10-CM Code(s) | Description |
|---|---|---|---|
| Information Loss | 401.0 Malignant essential Hypertension | I10 Essential (primary) hypertension | ICD-10-CM loses the designation of *malignant* hypertension which is clinically distinct from nonmalignant essential hypertension |
| Overlapping Categories | 624.8 Other specified noninflammatory disorders of vulva and perineum | N90.89 Other non-inflammatory disorders of vulva and perineum; N90.7 Vulvar Cyst | The ICD-9-CM maps to 2 ICD-10-CM codes, one (N90.89) is very similar to 624.8 and one (N90.7) may not be intuitive. |
| Inconsistent | V32.00 Twin, mate stillborn, born in hospital without mention of cesarean section; V33.00 Twin, unspecified, born in hospital without mention of cesarean section; V31.00 Twin, mate liveborn, born in hospital, delivered without mention of cesarean section | Z38.30 Twin liveborn infant, delivered vaginally | Z38.30 is designated as a liveborn but V32.00 is designated as stillborn |

**FIGURE 2**
Evaluation categories**:** category examples for ICD-9-CM codes with convoluted mapping transitions to ICD-10-CM codes.

Illinois Medicaid reimbursements associated with ICD-9-CM codes categorized as the information loss category during translation to ICD-10-CM totaled $455 320 (3.6% of total cost), the overlapping category totaled $399 302 (3.2% of total cost), and the inconsistent category totaled $156 637 (1.2% of total cost).

## DISCUSSION

Coding data are used broadly within health care for billing, surveillance (infections, mortality, etc), quality assessment, and administrative decisions (staffing needs, supply needs, etc). Although the quality of ICD-9-CM data has been called into question,[15] the US health care system relies on diagnostic coding data. We found the 26% of pediatric ICD-9-CM codes were convoluted (ie, complex mapping). A similar analysis revealed that 18% of adult oncology codes, 31% of emergency department codes, and 55% of hospital procedure codes are convoluted, showing variability in potential coding challenges by type of practice and the importance of understanding potential issues associated with codes commonly used by each specialty (A.D.B., unpublished data).[14,16] To assist with analysis of data that span the transition time frame (2015–2016), the American Medical Association suggests mapping in the direction with the most data (initially map ICD-10-CM back to ICD-9-CM; then, as more ICD-10-CM codes are used, map ICD-9-CM to ICD-10-CM).[17] However, using the GEMs files for simple transitions will miss a large number of codes: for example, if mapping from ICD-9-CM to ICD-10-CM using GEMs you map to only 24% of ICD-10-CM codes. Alternately, if mapping from ICD-10-CM to ICD-9-CM using GEMs you map to only 70% of ICD-9-CM codes.[18] Thus, it is important to note that simple mapping without examining the codes in detail could result in underutilization of a substantial number of codes.

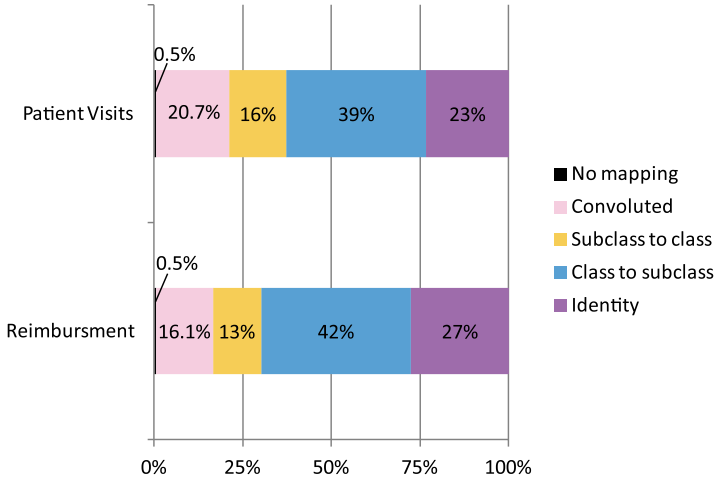



**FIGURE 3**
Percentage of patient visits and reimbursement associated with the coding categories.

The convoluted codes categorized as information loss, overlapping categories, or inconsistent have the potential to cause inaccuracies during the transition to ICD-10-CM, which may lead to adverse consequences, including financial loss from billing errors, errors in surveillance, and inaccurate administrative data. The overlapping category accounted for transitions in which nonintuitive details are needed to understand which ICD-10-CM code is accurate. For example, ICD-9-

**TABLE 1** Analyzed Pediatric ICD-9-CM Codes of All Pediatric ICD-9-CM Codes in Illinois Medicaid

| | Number of Analyzed Codes[a] ($N$ = 636) | Codes Analyzed, % | Total Illinois Medicaid Diagnosis Codes, % | Reimbursement (% of Total Reimbursement) |
|---|---|---|---|---|
| Information loss | 88 | 14 | 2.5 | $455 320.84 (3.6) |
| Overlapping categories | 115 | 18 | 3.2 | $399 302.13 (3.2) |
| Inconsistent | 42 | 7 | 1 | $156 637 (1.2) |
| Consistent | 385 | 61 | 10 | $1 970 000 (15.7) |
| Unanalyzed transition | — | — | 83.3 | $9 300 000 (75) |

The last row represents the percentage of codes and cost that were not analyzed by the pediatricians. Overlapping categories at 3.2% of codes and 3.2% of overall cost is the largest contributor to clinically incorrect concepts.

[a] Six codes had no mapping and were excluded from analysis.

CM code 528.9 (other and unspecified disease of the oral soft tissue) maps to 4 ICD-10-CM codes: E08.638 (diabetes due to underlying condition with other oral complication), E09.638 (drug- or chemical-induced diabetes with other oral complication), K13.70 (unspecified lesions of oral mucosa), and K13.79 (other lesions of oral mucosa). All 4 of the ICD-10-CM codes could encompass "other diseases of oral soft tissues"; thus, it may not be intuitive when to select K13.70 versus K13.79, especially if nonclinical individuals conduct the coding. The information loss category accounted for 14% of pediatric ICD-9-CM codes, which could result in a loss of clinically relevant information. For example, ICD-9-CM code 385.83 (retained foreign body of middle ear) maps to ICD-10-CM code H74.8X9 (other disorder of middle ear and mastoid). A "retained foreign body in the middle ear" elicits a fairly straightforward clinical scenario, whereas "other disorder of middle ear and mastoid" could be any number of clinical issues and levels of acuity.

Coding inaccuracies could result in financial loss. The purpose of a diagnostic code is to determine medical necessity of a specific treatment or intervention. Theoretically, a clinician could select what he or she believes is a clinically correct code, but the insurance company uses a mapping to a different ICD-10-CM code, which could result in financial disruption due to billing errors. Such errors will likely occur harmlessly due to the complex nature of the transition to the new coding system. However, some errors may occur intentionally because a provider or insurance company could try to maximize gains by selectively mapping to certain ICD-10-CM codes. Furthermore, the misallocation of scarce resources (personnel, supplies, etc) due to inaccurate projections if coding data are incorrect could have financial and logistical implications for practices and health care systems.

More than 40% of visits were coded 999.99 and were excluded from our analysis because we could not categorize on the basis of the clinical definition of the code. The general nature of this diagnosis code limited our ability to evaluate the impact for pediatricians. We do not know what clinical encounters typically prompt the use of ICD-9-CM code 999.99, especially because the reimbursement appears to be quite low (~$2).

Despite the potential for financial disruption, the transition to ICD-10-CM is likely to provide important benefits over time. The increased level of clinical detail embedded in each ICD-10-CM code, if coded appropriately, should improve the overall quality of billing data, leading to improvements in how we measure quality of care, reimburse providers, and use resources. Because there is less clinical ambiguity in ICD-10-CM codes, compared with ICD-9-CM, it should be easier to compare clinical documents with the codes billed for service and identify inconsistencies between a diagnosis and the care provided (procedures, studies, etc), decreasing opportunities for health care fraud.[19] As pediatric providers and practices prepare for the transition to ICD-10-CM, awareness of the complexity of the transition process, as well as specific codes with potential pitfalls, will be important to maximize clinical accuracy of coding data and to minimize financial disruptions and administrative burdens.

We acknowledge that our categories will not be clinically relevant to all providers. The potential errors for each practice and pediatrician will depend on the types of codes frequently used for billing and for other administrative purposes (staffing, ordering supplies, quality assurance). The Illinois Medicaid database is not representative of all patient populations across the country or coding variations regionally. The data involved in the study reflect the requirements for Illinois Medicaid in the year 2010. Patient data sets from private insurers or other government data set could result in different diagnosis codes being used more frequently. The payment by Medicaid tends to be less than other insurers, so the total monetary impact may be more than estimated by this article. Finally, we acknowledge that our interpretation of the mappings could be influenced by personal and clinical experiences. Because of the vast number of health care providers, payers, technology vendors, and commercial mapping tools in the United States, there will be a lack of consensus regarding how to map the codes and how to interpret the mappings for years to come.

## CONCLUSIONS

The potential for financial disruption and administrative errors from 39% of pediatric diagnosis codes (8% of Medicaid reimbursement) necessitates special attention to these codes in preparing for the transition to ICD-10-CM for pediatric

practices. Many pediatric practices function on a thin financial margin in which 3% to 5% of codes resulting in billing errors could have a significant financial impact. Sufficient planning to mitigate this challenge and prepare is necessary.

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