

C L I N I C A L M A N A G E M E N T

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Changes in Classifications of Chronic Lower-Limb Wound Codes in Patients with Diabetes: *ICD-9-CM* Versus *ICD-10-CM*



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This continuing educational activity will expire for physicians on February 29, 2016.

PURPOSE:

To enhance the learner's competence with knowledge of changes in classifications of chronic lower limb wound codes from ICD-9-CM to ICD-10-CM in patients with diabetes.

TARGET AUDIENCE:

This continuing education activity is intended for physicians and nurses with an interest in skin and wound care.

OBJECTIVES:

After participating in this educational activity, the participant should be better able to:

- 1. Identify the upcoming transition date and coding differences of ICD-9-CM and ICD-10-CM coding.**
- 2. Interpret the author's study population, methods, and design.**
- 3. Summarize the author's study findings comparing ICD-9-CM coding to ICD-10-CM coding.**

ABSTRACT

OBJECTIVE: To determine the sensitivity and specificity of *International Classification of Diseases, Ninth Edition, Clinical Modification (ICD-9-CM)* and *ICD-10-CM* codes for individuals with diabetes and foot ulcers.

DESIGN AND METHODS: Wound care providers and researchers are concerned about the potential impacts when the United States transitions from *ICD-9-CM* to *ICD-10-CM*. To identify the impact on diabetic foot ulcers, health history and wound variables were prospectively assessed with criterion-standard data from a prospective study of 49 patients with 65 foot ulcer episodes representing 81 incident foot ulcers. The *ICD-9-CM* and *ICD-10-CM* code sets were mapped to correctly classify individuals with diabetes and foot ulcers.

RESULTS: Frequencies for health history variables were similar in both systems. The *ICD-9* code did not capture any data on laterality (left or right) or ulcer depth/severity. The *ICD-9* captured 69 of 81 incident ulcers (85%) and 94% of heel and midfoot ulcers, whereas the *ICD-10* code captured 78 of 81 incident ulcers (96%) and all incident heel or midfoot ulcers. Sensitivity and specificity for ulcer characteristics were consistently lower in *ICD-9* than in *ICD-10*.

CONCLUSIONS: The *ICD-9* and *ICD-10* are similar for data capture on health history variables, but wound variables are captured more accurately using *ICD-10*. The increased specificity of *ICD-10* for ulcer location and severity improves identification and tracking ulcers during an episode of care.

KEYWORDS: *ICD-9*, *ICD-10*, diabetes and foot ulcers, wound classification

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INTRODUCTION

Data collection in clinical practice occurs in 2 realms, the clinical notes and the codes. The clinical note organizes data from the history, physical examination, laboratory, and imaging studies into an assessment, diagnoses, procedures performed, and treatment plan. The coding translates the clinical note into numerical codes used for research, quality improvement, analysis of morbidity, mortality, and reimbursement. Therefore, it is important to standardize clinical data coding to ensure accuracy. Administrative data collection and accurate wound classification are problematic for chronic lower-limb wounds, including foot ulcers in people with diabetes, because of the current *International Classification of Diseases, Ninth Edition (ICD-9)* coding system for key wound variables. Reading this article will help clinicians to recognize the sensitivity and specificity of *ICD-9-CM* and *ICD-10-CM* codes for people with diabetes and foot ulcers.

Since 1995, the United States has used the *International Classification of Diseases, Ninth Edition, Clinical Modification (ICD-9-CM)* to (1) summarize clinical services, (2) compute morbidity statistics, and (3) calculate reimbursement. These diagnostic and procedural codes are periodically updated as medical technology, healthcare, and global classification efforts advance. The National Center for Health Statistics announced that *ICD-9-CM* will transition to *ICD-10-CM* by October 1, 2015, well over a decade after its European implementation.

Researchers recognize the importance of *ICD* codes, coding rules, and coding algorithms, as well as the limitations imposed by case definition criteria when using administrative data in research. Conversion to a new *ICD* system may result in data anomalies when codes in one system are not available in the other. An analysis of anticipated impact of the coding changes in lower-limb ulcers is lacking. Therefore, the purpose of this article is to describe and quantify the differences between the *ICD-9* and *ICD-10* systems for coding chronic lower-limb foot ulcers among very well-characterized study patients with diabetes.

RESEARCH DESIGN AND METHODS

Setting and Patients

The authors conducted a cohort study enrolling individuals with diabetes and foot ulcers to determine if organized wound care was acceptable, feasible, and safe in a rural environment. Rural residents reported an increased time and transportation burden when seeking healthcare. Veterans in rural areas have limited access to care, diminished health-related quality of life, and poorer physical and mental health than do veterans in urban areas.¹ Inclusion criteria were veterans older than 20 years, a diabetes diagnosis, and 1 or more ulcer episodes below the malleoli during the period from October 1, 2006, to September 30, 2007. An ulcer episode was defined as the interval from the baseline visit for an incident (new onset) ulcer to 30 days following confirmed reepithelialization.²

The subject's foot ulcer data were uniformly collected using a medical records template embedded in the electronic medical record.³ The template included information on health history characteristics and ulcer-specific characteristics. This was augmented with wound photographs. These 3 combined data sources were considered the "criterion standard" for comparison. A certified wound care specialist and medical coder (J.R.L.) reviewed the medical record for the baseline and incident ulcer visits for the study population. The medical coder then selected *ICD-9* and *ICD-10* codes based on specific health history, diagnoses, and ulcer-specific clinical data. A multidisciplinary panel consisting of a dermatologist, physician's assistant, and certified wound

care nurse reviewed and classified the diabetic foot ulcers by consensus. The authors' Veterans Affairs Health Services Research and Development-funded project (IBA 09 061) received Human Subjects Approval from Veterans Affairs Puget Sound (IRB no. 00253).

Considerations for Using ICD-9 and ICD-10

The authors recognize *ICD-9* and *ICD-10* have fundamentally different structures and are organized using different classification axes as shown in Table 1.⁴ The main axis for *ICD-9* is the nature of the health condition, and the main axis for *ICD-10* is the body region of the health condition, with the diagnostic code containing the highest degree of specificity always assigned in classification.

The *ICD-9-CM* has 3 to 5 numeric characters plus V (factors influencing health status) and E (external causes of injury and poisoning) codes, containing 14,000 alphanumeric diagnosis codes and 4000 5-character numeric procedure codes. In contrast, the *ICD-10* contains 68,000 alphanumeric diagnosis codes that include the supplementary classifications V and E of *ICD-9-CM* as combination diagnosis/symptom codes. The inpatient procedural classification code for *ICD-10 (ICD-10-PCS)* contains an additional 73,000 3- to 7-character alphanumeric codes as illustrated in Table 1, which specify etiology, severity, and encounter type.⁵

Although both coding systems share organizational conventions and common formatting, codes that exist in *ICD-10* may not correspond directly to codes in *ICD-9*, and vice versa. A consortium of government and professional organizations, including the National Center for Health Statistics and the Centers

for Medicare & Medicaid Services, created tools to link data between the 2 code sets called General Equivalence Mappings (GEMs) in the absence of one-to-one matches between codes in *ICD-9* and *ICD-10*.^{6,7} These GEMs assist health information data users translate codes forward and backward between *ICD-9-CM* and *ICD-10-CM* and logically organize the 2 code sets.

The 3 possibilities in translating codes between the 2 classification systems are (1) one-to-one mapping where a single code in 1 system links to a single code in the other; (2) GEM type single-entry codes, a one-to-many mapping, and (3) GEM type combination codes. With single-entry codes, unlike one-to-one mapping, codes in 1 system may be used multiple times in the other system, each time linked to different codes. For example, a pressure ulcer of the heel is coded as 707.07 in *ICD-9*, whereas there are more than 15 unique codes in *ICD-10*, given the separate codes for left, right, or unspecified heel combined with depth of injury to the skin, fat layer, muscle, or bone. The GEM type combination codes involve diagnoses and describe both the underlying etiology of the wound and its manifestation. Both codes are required to be valid. Diabetic foot ulcers are an excellent example of this coding convention in both coding systems. Table 2 illustrates *ICD-10*'s additional sensitivity according to type of diabetes, type of complication, laterality of wound location, and depth of wound. Study definitions are found in Table 3.

Data Collection

A coding algorithm for lower-limb wounds in individuals with diabetes was created by translating the *ICD-9* codes to *ICD-10*

Table 1.
DIFFERENCES BETWEEN *ICD-9* AND *ICD-10*¹

	<i>ICD-9-CM</i>	<i>ICD-10-CM</i>
Characters	3–5 Numeric (plus V and E codes)	3–7 Alphanumeric
Diagnostic codes	~14 000	~68 000
Procedure codes	~4000	~73 000
Chapters	17	21
Main axis	Nature of health condition	Body region of health condition
Format		

Table 2.

EXAMPLE OF COMBINATION CODES TRANSLATED FROM ICD-9 TO ICD-10 AND ICD-10 TO ICD-9

Clinical Scenario	ICD-9-CM	ICD-10-CM
Patient with type 2 diabetes has developed a right heel wound that extends through the subcutaneous tissue	250.80 Diabetes with other specified manifestations and 707.14 Ulcer of heel and midfoot (ulcer of lower limbs, except decubitus)	E11.69 Type 2 diabetes mellitus with other specified complication and L97.409 Non-pressure chronic ulcer of unspecified heel and midfoot with unspecified severity
	ICD-10-CM E11.621 Type 2 diabetes mellitus with foot ulcer and L97.412 Non-pressure chronic ulcer of right heel and midfoot with fat layer exposed	ICD-9-CM 250.80 Diabetes with other specified manifestations and 707.14 Ulcer of heel and midfoot (ulcer of lower limbs, except decubitus)

and vice versa by individually cross-referencing each diagnosis backward and forward in each system. The algorithm was tested on the study patients with diabetes and foot ulcers, and foot ulcers in the study were coded for both systems. Codes in both systems were examined for their ability to capture select patient health history and wound care variables as shown in Table 4. Ulcer etiology was determined based on clinical testing and/or specialist assessment. In addition, most veterans in this study had multiple documented comorbidities.

Data Analysis

The authors compared *ICD-9* and *ICD-10* with the criterion-standard medical/research record data by first computing frequencies for health history and ulcer variables. Sensitivity, specificity, positive predictive value, and negative predictive value were calculated for each ulcer characteristic variable in the *ICD-9-CM* data, and then the *ICD-10-CM* data. *Kappa* was used to assess agreement between each code's data and the medical/research record data.

Data were analyzed descriptively using Statistical Package for Social Sciences 17.0 software (SPSS, Inc, Chicago, Illinois). Frequencies were calculated for each variable for each *ICD* system. The unit of analysis for the patient characteristics was the episode of care. The unit of analysis for the ulcer characteristics was the incident ulcer. Mappings were created for each ulcer, and a coding algorithm for diabetic foot ulcers was developed (Table 4). For each ulcer characteristic variable identified in the medical/research record data, estimates of sensitivity and specificity of *ICD-9-CM* and *ICD-10-CM* were calculated (Table 5).

RESULTS

There were 49 veterans meeting the study criteria with 65 episodes of care and 81 incident ulcers. The average age for the cohort of

49 veterans was 66 (SD, 11) years. Average body mass index was 34 (SD, 7.4) kg/m². The cohort was 100% male, and all members had type 2 diabetes. In 32% of patients, HbA_{1c} levels greater than 8% were present, and prior amputations had occurred in 10 patients (20%) (data not shown).

Table 4 illustrates the mapping algorithm between *ICD-9* and *ICD-10*. One-to-one mapping was applied to a limited number of health history and ulcer characteristics, such as corns and callosities. Single-entry mapping (one-to-many) pertained to most of the ulcer characteristics codes because of the limited number of descriptive codes in *ICD-9* compared with the multiple codes in *ICD-10* to specify ulcer location, laterality, and depth/severity. Combination code mapping was required for many of the health history characteristics, including neuropathy, angiopathy, arthropathy, and atherosclerosis, because 2 codes were required in *ICD-9* to describe many of these conditions, whereas a single code described the condition in *ICD-10*. In *ICD-10*, the specific combination code for type 2 diabetes mellitus with foot ulcer is E11.621. It is important to note that the location of the ulcer must also be coded in both coding systems, but the descriptive capability of *ICD-10* is much greater than *ICD-9*.

Table 5 reviews health history and wound variable data, showing the sensitivity for each variable coded by system. Both *ICD-9* and *ICD-10* systems had similar frequencies for health history variables. The *ICD-9* captured only 69 of incident foot ulcers (85%) compared with *ICD-10*, which recorded 78 of the 81 incident ulcers (96%). For ulcers located on the heel or midfoot, 94% of ulcers were identified in *ICD-9*, and all were captured in *ICD-10*. For ulcers on other parts of foot (ie, toe or dorsal foot), the *ICD-9* identified 82%, and the *ICD-10*, 95%.

The agreement between the medical/research record data and the coded data for ulcer characteristics was evaluated. A sensitivity analysis was used to determine whether the ulcer characteristics were depicted in the coded data when they were

Table 3.
GLOSSARY

Ulcer episode: the interval from baseline visit for an incident ulcer to 30 d following confirmed reepithelialization

Incident ulcer: new-onset ulcer during period of study

Reference standard: a reference technique that is considered accurate and generally accepted to indicate the presence (or absence) of that disease

Study ID number: number assigned to intervention study patient

Age: age in years at time of first ulcer start date

Ulcer start date: date patient first seen at outpatient clinic for ulcer

Ulcer end date: date ulcer resolved (ie, healed, amputated, patient death)

Diabetes type: type 1 or type 2 as indicated by provider in clinic note

Controlled diabetes: HgA_{1c} <8 at time of first ulcer start date. If not stated, assume controlled

History of prior diabetic foot ulcer: patient has history of prior diabetic foot ulcer, as indicated in provider documentation or from self-report in patient survey

History of amputation: patient has history of prior amputation, as indicated in provider documentation or from self-report in patient survey

Amputation laterality: limb on which prior amputation occurred (left, right, or bilateral)

Amputation level: level of prior amputation. If >1 amputation, choose highest level

Multiple ulcers: patient has >1 qualifying diabetic foot ulcer during intervention study period

Ulcer location: location of ulcer on foot/ankle/toe

Toe number: if ulcer on toe, number of toes affected (ie, 1–5)

Laterality: limb on which ulcer occurred (left, right)

Ulcer depth: degree of tissue destruction (skin, fat, muscle, bone) as indicated by documentation or image

Foot deformity: presence of foot deformity that may contribute to ulcer development as indicated by documentation, image, and/or patient self-report in patient survey

Type of foot deformity: hammer/claw toe or Charcot deformity as indicated by documentation, image, and/or self-report on patient survey

Neuropathy: documentation of previous diagnosis of peripheral neuropathy, loss of sensation as noted by monofilament test, and/or patient self-report of same in patient survey

Angiopathy: documentation of previous diagnosis of angiopathy/peripheral vascular disease, ankle-brachial index <0.9, absence of pulses, or history of lower-extremity vascular surgery, and/or patient self-report of same in patient survey

Atherosclerosis: documentation of previous diagnosis of coronary artery disease, congestive heart failure, or myocardial infarction, and/or patient self-report of same in patient survey

Venous hypertension: documentation of previous diagnosis of lower-limb venous hypertension and/or venous ulcers

Postphlebotic syndrome: documentation of previous diagnosis of postphlebotic syndrome

Infection: documentation of current infection due to diabetic foot ulcer

Type of infection: documentation of type of infection according to tissue affected. If multiple tissue types affected, report deepest tissue infection (ie, osteomyelitis vs cellulitis)

Organism: type of organism responsible for infection

Gangrene: documentation of presence of gangrene at, or distal to, ulcer site

Renal disease: documentation of previous diagnosis of renal disease or self-report of same, or presence of creatinine levels >2 at time of first ulcer occurrence

Retinopathy: documentation of previous diagnosis of retinopathy or self-report of same on patient survey

Corns/callus: documentation of presence of corns or calluses that may impact ulcer formation or healing

present in the medical/research record data. Ulcer location had lower sensitivity in ICD-9, 82.5% to 94.4% compared with 95.2% to 100% in ICD-10. Positive predictive value, the probability that

the data actually represent the underlying condition, was 75% or greater for 6 ulcer characteristics in ICD-9 and 13 ulcer characteristics in ICD-10. Specificity was calculated to measure

Table 4.

MAPPING ALGORITHM BETWEEN ICD-9 AND ICD-10 FOR LOWER-LIMB WOUNDS IN PEOPLE WITH DIABETES

Description	ICD-9		ICD-10
	Health History		
Type 2 diabetes with foot ulcer	250.80 or 250.82 and 707.14 or 707.15		E11.621
Controlled	250.80		No code
Uncontrolled	250.82		No code
Neuropathy	250.60 or 250.62 and 337.1		E11.4-
Angiopathy	250.70 or 250.72 and 443.81		E11.5-
Arthropathy	250.80 or 250.82 and		
Charcot	713.5		E11.610
Hammer toe	755.66		Q66.8
Atherosclerosis			
With ulcer	440.23 and 707.14 or 707.15		I70.234, I70.235, I70.244, I70.245
With gangrene	440.24 and 707.14 or 707.15		I70.261, I70.262, I70.263
Retinopathy	250.50 or 250.52		E11.31
Nephropathy	250.40 or 250.42		E11.2-
History of amputation	V49.7, V49.71, V49.72, V49.73, V49.74 V49.75, V49.76, V49.77		Z89.411, Z89.412, Z89.421, Z89.422, Z89.431, Z89.432, Z89.441, Z89.442, Z89.511, Z89.512, Z89.611, Z89.612, Z89.621, Z89.622
Corns and callosities	700		L84
Multiple current ulcers	No code		No code
History of diabetic foot ulcer	No code		Z86.31
Ulcer Characteristics			
Ulcer location			
Heel and midfoot	707.14		L97.40-, L97.41-, L97.42-
Other part of foot	707.15		L97.50-, L97.51-, L97.52-
Laterality	No code		
Left			L97.42-, L97.52-
Right			L97.41-, L97.51-
Depth/severity	No code		
Limited to breakdown of skin			L97.411, L97.511, L97.421, L97.521
With fat layer exposed			L97.412, L97.422, L97.512, L97.522
With necrosis of muscle			L97.413, L97.423, L97.513, L97.523
With necrosis of bone			L97.414, L97.424, L97.514, L97.524
Unspecified			L97.419, L97.429, L97.519, L97.529
Gangrene	785.4		E11.52
Infection			
Paronychia	681.11		Same code for cellulitis of toe
Cellulitis	681.10, 681.7, 681.9, 682.6, 682.7		L03.03-, L03.04-, L03.115, L03.116
Abscess	Same codes for cellulitis		L02.41-, L02.61-, L03.03-
Osteomyelitis	730.0-, 730.1-		M86.1-, M86.2-, M86.3-, M86.4-, M86.6-
Unspecified osteomyelitis	730.2-		M86.8-, M86.9

Cohort of 49 veterans with diabetes and 81 foot ulcers (65 episodes of care).

Table 5.**PATIENT AND WOUND VARIABLES CAPTURED BY MEDICAL/RESEARCH RECORD AND CODING SYSTEM BY EPISODE OF CARE FOR 49 PATIENTS WITH DIABETES, 81 FOOT ULCERS, AND 65 EPISODES OF CARE**

Description	ICD-9 n (% of Criterion Standard)	ICD-10 n (% of Criterion Standard)	Medical/Research Record (Criterion Standard)
Health history characteristics			
Multiple current ulcers	0 ^a	0	37
History of diabetic foot ulcer	0	55 (100)	55
Type 2 diabetes	65 (100)	65 (100)	65
Controlled	46 (100)	0	46
Uncontrolled	19 (100)	0	19
Neuropathy	60 (100)	60 (100)	60
Angiopathy	48 (100)	48 (100)	48
Ulcer characteristics			
Ulcer location (n=81)	69 (85.2)	78 (96.3)	81
Heel and midfoot	17 (94.4)	18 (100)	18
Other part of foot	52 (82.5)	60 (95.2)	63
Laterality	0	78 (96.3)	81
Left	0	41 (95.3)	43
Right	0	37 (97.4)	38
Depth/severity	0	47 (96.0)	81
Limited to breakdown of skin	0	17 (100)	49
With fat layer exposed	0	6 (100)	17
With necrosis of muscle	0	4 (80.0)	6
With necrosis of bone	0	4 (100)	5
Unspecified	0	78 (96.3)	4
Gangrene	4 (100)	4 (100)	4
Infection	27 (93.1)	28 (96.6)	29
Paronychia	2 (100)	Same code for cellulitis	2
Cellulitis	22 (100)	24 (109)	22
Abscess	Same code for cellulitis	1 (100)	1
Osteomyelitis	3 (75.0)	3 (75.0)	4

Cohort of 49 veterans with diabetes and 81 foot ulcers in 65 episodes of care.

^a0 Indicates a lack of code available in system to capture characteristic

the absence of the ulcer characteristics in the coded data when they were also absent in the medical/research record data. Negative predictive value, probability that data absent from the coded data were also absent from the medical/research record, is 62.1% for 6 characteristics (ulcer location, gangrene, paronychia, cellulitis, abscess, and osteomyelitis) in *ICD-9* compared with 85.7% or greater for all 13 measured ulcer characteristics in *ICD-10*. Measures of sensitivity and specificity for ulcer characteristics were consistently higher in *ICD-10* versus *ICD-9*, ranging from 75.0% to 100%.

The score indicating agreement between the medical/research records and coded data was higher in *ICD-10* for 10 ulcer characteristics (0.737–1.0) than in *ICD-9*. These characteristics included ulcer location (heel and midfoot/other part of foot), laterality (left/right), depth/severity (limited to breakdown of skin/with fat layer exposed/with necrosis of muscle/with necrosis of bone/unspecified), and infection (abscess). Two ulcer characteristics for infection, paronychia and cellulitis, had higher values in *ICD-9*. The values for the 2 sets of code data were equivalent for gangrene and osteomyelitis.

CONCLUSIONS

The authors analyzed *ICD-9* and *ICD-10* codes using a criterion-standard data set of prospectively collected data, photographic wound images, and the medical records. The authors found when mapping diabetic foot ulcers using *ICD-9* and *ICD-10* that there was improved classification of chronic lower-limb wounds in study participants using *ICD-10*. Other conditions may have fewer or more differences in coding details than the diabetic foot ulcer example.

Other strengths of *ICD-10* include capturing data for a prior history of foot ulcers, a strong risk factor for further ulcerations or lower-limb amputation,^{8,9} and inclusion of ulcer location (laterality) and severity, which will improve capture of multiple ulcers in *ICD-10*. In the authors' study, the added precision of *ICD-10* allowed more incident ulcers (criterion standard) to be identified than were identified using *ICD-9*. The authors' study shows *ICD-10* will improve coding sensitivity and specificity for patients with diabetes and foot ulcers; however, care and attention to documentation in the patient's record are still needed.

There are limitations in classifying chronic lower-limb wound data using *ICD* codes. Coding systems are only as good as the documentation provided. If a provider fails to adequately document an encounter for a chronic lower-limb wound, medical coders will not code it, and researchers will be unable to collect data on that wound.

The *ICD-9* codes do not capture multiple ulcers for the same patient if they occur on the same body part. For pressure ulcers, *ICD-9* allows for the assignment of only 1 code for a patient with multiple ulcers on the same body part.^{10,11} Severity of ulcer is captured only for pressure ulcers and does not apply to other chronic wounds, thereby further limiting data capture for diabetic foot ulcers. Multiple ulcers and history of ulcers are not captured by coded data because each unique *ICD-9-CM* diagnosis code may be reported only once per patient encounter. Studies intending to capture these data would be limited to prospective research extracting data directly from the medical records.

Some studies¹²⁻¹⁵ in countries that have already adopted *ICD-10* find very few data loss in the transition from *ICD-9*; however, other studies¹⁶ show that while both systems captured major procedures relatively well, neither system properly coded less invasive or minimal procedures. Quan et al¹³ found little difference in validity between the *ICD-9-CM* and *ICD-10* systems for capturing chronic clinical conditions in a Canadian study; however, the authors also attributed this apparent lack of difference to coders' unfamiliarity with the new coding system and predicted that validity of *ICD-10* would improve as coders gained experience with the system. A study from Australia, where *ICD-10* has been routinely used since 1998, supports the supposition that data coding quality improves the longer the system has been

used. Henderson et al¹² audited hospital discharge data and found agreement between diagnostic codes in 1998 to 1999 at 85% and at 87% from 2000 to 2001,¹² suggesting a slight learning curve during the transition period for the new coding systems. However, the development of clinically validated coding algorithms will facilitate the transition.

Recommendations

Improving data capture with *ICD-10-CM* will enhance chronic wound databases. To take full advantage of the features of *ICD-10*, training and support for clinicians and medical coders are needed.

Merging or comparing data from different time periods by mapping between coding systems can facilitate longitudinal research on patients with diabetic foot ulcers. Mappings and algorithms for all types of chronic lower-limb wounds need to be tested to improve data capture in administrative databases.

Future Research

Risk factors for foot ulcers in patients with diabetes are well established, yet interventions to prevent and treat them have been limited in part because of the difficulty collecting accurate foot ulcer data. For chronic lower-limb wounds, including diabetic foot ulcers, data collection, and correct wound classification have been restricted by the *ICD-9* lack of specificity. The *ICD-10* removes much of this barrier and offers new benefits of classification for studies on improving outcomes for patients with diabetes.

PRACTICE PEARLS

- Risk factors for foot ulcers in patients with diabetes are well-established, yet interventions and treatment have been limited by difficulty in collecting accurate data.
- Data collection and correct wound classification in the United States have been restricted by the lack of specificity of *ICD-9*.
- *ICD-10* will improve coding sensitivity and specificity for patients with diabetes and foot ulcers; however, accurate and detailed documentation in the patient record is required.
- Implementation of *ICD-10* on October 1, 2015 in the United States will offer new benefits of classification for studies on improving outcomes for patients with wounds and diabetes.
- Training and support for clinical documentation and medical coding is needed to facilitate full advantage of the new coding system.

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