



Prevalence of diabetes, diabetic foot ulcer, and lower extremity amputation among Medicare beneficiaries, 2006 to 2008

Diabetic Foot Ulcers

Data Points #1

More than 16 million people in the United States (U.S.) have diabetes mellitus. The prevalence of diabetes among those over 65 years of age was last estimated by the Centers for Disease Control and Prevention (CDC) using 2008 data from the National Health Interview Survey. It is about 19.9 percent among those ages 65 to 74 and 17.1 percent among those more than 75 years of age. These estimates are based on self-reports and are thought to underestimate the true prevalence by one-third (www.cdc.gov/diabetes/statistics/prev/national/figbyage.htm). Those with diabetes are expected to suffer from several associated medical complications, such as renal disease, cardiac disease, and retinopathy. In addition, between 10 and 15 percent of those with diabetes can expect to develop a foot ulcer at some point in their lives.^{1,2} Lower extremity amputation (LEA) is a less common complication associated with diabetes and foot ulcer. Both foot ulcer and amputation vary by geographic location.³

Diabetic foot ulceration can develop because of acute or chronic cutaneous compromise of the skin, arterial insufficiency, peripheral neuropathy, or a combination of these factors.⁴ In fact, approximately 20 percent of diabetic patients with foot ulcers will primarily display inadequate peripheral arterial supply (also called peripheral arterial disease, PAD), about 50 percent will primarily display peripheral neuropathy, and about 30 percent will display a combination of both conditions (i.e., neuroischemia).^{1,4} The prevalence of PAD among those with foot ulcers has recently been shown to be increasing and now the majority likely has PAD or neuroischemia.⁵

In 2003, CDC, based on the National Hospital Discharge Survey, reported a rate of 8 (ages 65-74) to 11 (age 75 and greater) hospital discharges with a diagnosis of foot ulcer per 1,000 individuals with diabetes. This report was limited because it did not include outpatient care or chronic care facilities, may have counted individuals with venous leg ulcers, and may have counted individuals more than once if they were hospitalized more than once. Using the same dataset, CDC estimated in 2005 that the rate of LEA was 5.3 to 5.6 hospital discharges per 1,000 individuals with diabetes.



The prevalence of diabetes in the Medicare population may be one-third higher than previously estimated.

Overall, approximately 8% of diabetic Medicare beneficiaries have a foot ulcer and 1.8% have an amputation. These prevalence rates are further elevated for the subset of beneficiaries with lower extremity peripheral artery disease.

The prevalence rates for foot ulcer and lower extremity amputation among diabetic Medicare beneficiaries vary dramatically by geographic region.



These rates have been shown to vary by age, gender, race/ethnicity, and health care region.

Improving the quality and effectiveness of management of diabetes mellitus and, in particular, lower extremity wounds in diabetic patients may diminish the incidence of unnecessary or inadequate LEAs. It also may improve success in the treatment of lower extremity wounds. The goal of this *Data Points* brief is to explore the prevalence of diabetes, foot ulcer, and LEA in Medicare beneficiaries. Please refer to companion briefs for separate discussions of the incidence of diabetes, foot ulcer, LEA, and reamputation; the rate of death among Medicare beneficiaries with foot ulcer or amputation; the rate of other diabetes-related complications with respect to diagnosis of foot ulcer and LEA; and medical utilization and costs associated with foot ulcers and amputation.

FINDINGS

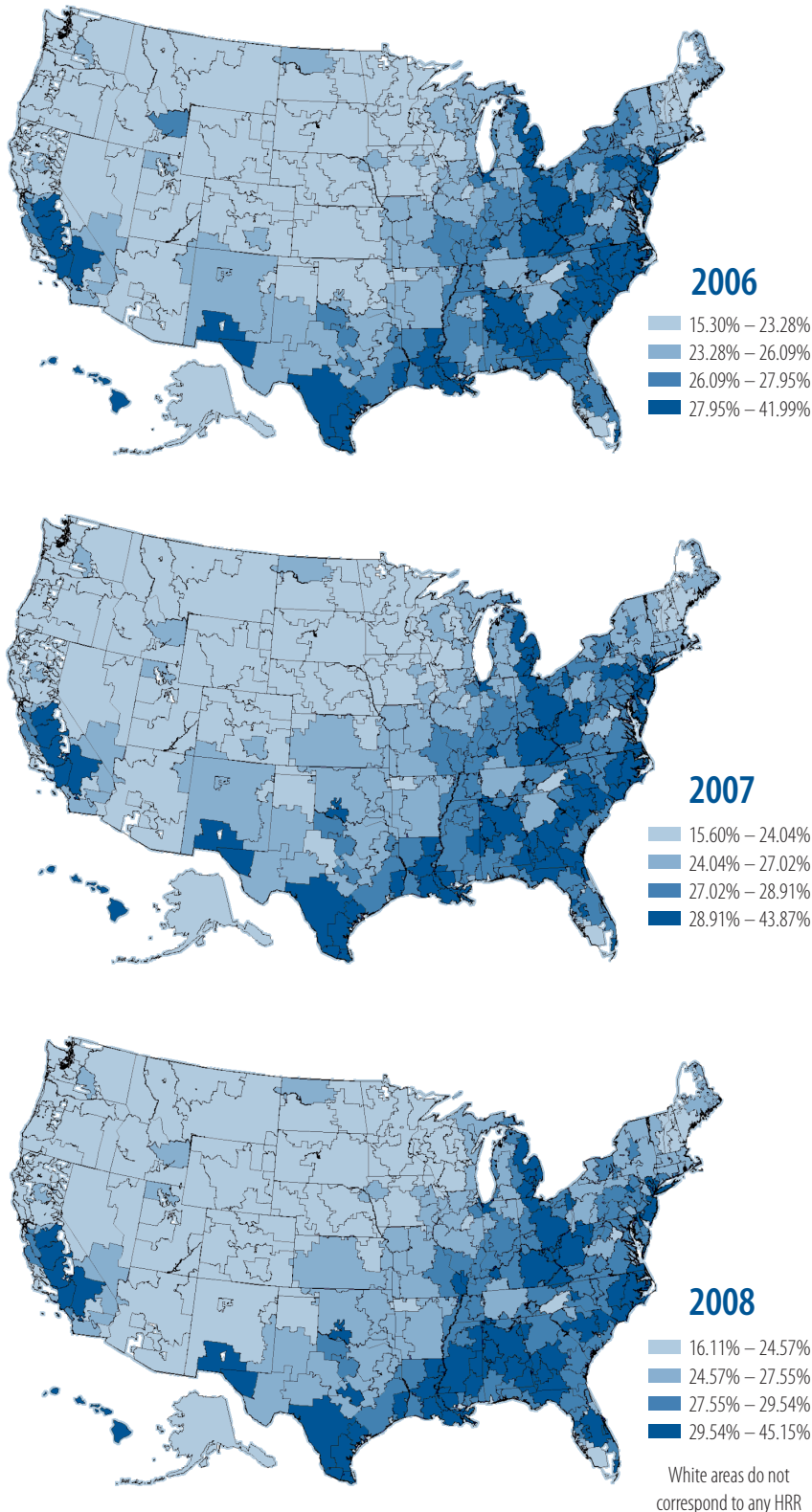
Prevalence of Diabetes

In the population of beneficiaries with at least 12 months of continuous enrollment in Medicare Parts A and B Fee-for-Service (FFS) plans (see Data Source section), the prevalence of diabetes was 26.4 percent in 2006, 27.3 percent in 2007, and 27.9 percent in 2008 (Table 1). As expected, this is about one-third higher than previous CDC prevalence estimates. Approximately 8.7, 8.8, and 8.9 million participants had diabetes mellitus in 2006, 2007, and 2008, respectively. More specifically, for beneficiaries age 65 years and over, the prevalence was 26.5 percent in 2006, 27.4 percent in 2007, and 28.0 percent in 2008. These rates varied by age, gender, race/ethnicity, and geographic location. For example, in 2008, the prevalence of diabetes mellitus was 29.1 percent for males and 26.9 percent for females. The prevalence of diabetes by race was 26.2 percent for white, 38.2 percent for African American, 36.8 percent for Asian, 39.8 percent for Hispanic, 37.9 percent for American Indian/Alaska Native, and 33.4 percent for other. Geographic distribution of diabetes mellitus prevalence varied widely based on Dartmouth Atlas of Health Care Hospital Referral Regions (HRRs) (www.dartmouthatlas.org/) but varied little by year, as presented in Figure 1.

Table 1: Yearly prevalence of diabetes mellitus in Medicare beneficiaries (Parts A and B FFS) in 2006, 2007, and 2008

Variable		Prevalence of Diabetes (%)		
		2006	2007	2008
Overall		26.4	27.3	27.9
Age	Under 45	14.3	15.0	15.4
	45 to 54	24.6	25.5	26.0
	55 to 64	34.7	35.4	35.8
	65 to 74	26.4	27.2	27.7
	75 to 84	28.0	29.0	29.8
	85 to 94	24.1	25.1	25.9
	95 and over	16.7	17.5	18.1
Gender	Male	27.5	28.5	29.1
	Female	25.6	26.4	26.9
Race or Ethnicity	White	24.8	25.6	26.2
	African American	36.5	37.5	38.2
	Asian	33.9	35.5	36.8
	Hispanic	38.1	39.1	39.8
	American Indian/Alaska Native	36.0	37.3	37.9

Figure 1: Annual prevalence of diabetes (nonadjusted) among Medicare beneficiaries by HRR



Prevalence of Foot Ulcer

We used the population of beneficiaries who were continuously enrolled for at least 12 months in Medicare Parts A and B FFS plans, as defined in the Data Source section, and also continuously enrolled in the calendar year, hereafter referred to as the Medicare FFS population. The yearly prevalence of foot ulcer in the subpopulation of Medicare FFS beneficiaries with diabetes was 8.1 percent in 2006, 8.1 percent in 2007, and 8.0 percent in 2008 (Table 2). The prevalence of foot ulcer in the subpopulation of Medicare FFS beneficiaries with diabetes and PAD was about twice as high, with yearly prevalence rates of 19.2 percent in 2006, 18.9 percent in 2007, and 18.6 percent in 2008. These rates varied by age, gender, race/ethnicity, and geographic location. For example, in 2008, the prevalence of foot ulcer among the subpopulation of Medicare FFS beneficiaries with diabetes was 8.2 percent for males and 7.8 percent for females. The prevalence of foot ulcer among those in the subpopulation of Medicare FFS beneficiaries with diabetes by race in 2008 was 8.0 percent for white, 8.7 percent for African American, 4.2 percent for Asian, 8.6 percent for Hispanic, 9.6 percent for American Indian/Alaska Native, and 5.5 percent for other. These overall yearly prevalence rates varied little from 2006 to 2008. Geographic distribution of prevalent foot ulcer among those with diabetes mellitus varied widely (and slightly by year) based on Dartmouth Atlas of Health Care HRRs.

Prevalence of Lower Extremity Amputation

We used the Medicare FFS population (beneficiaries continuously enrolled for at least 12 months in Medicare Parts A and B FFS, as defined in the Data Source section, and also continuously enrolled in the calendar year). The yearly prevalence of LEA (all or part of a leg or foot) in the subpopulation of Medicare FFS beneficiaries with diabetes was 1.8 percent in 2006, 2007, and 2008 (Table 2). The prevalence of LEA in the subpopulation of Medicare FFS beneficiaries with diabetes and PAD was about three times as high, with yearly prevalence rates of 6.5 percent in 2006, 6.1 percent in 2007, and 5.9 percent in 2008. The prevalence of LEA in nonelderly diabetics with PAD (many of whom likely have end-stage renal disease, since they are receiving Medicare benefits before age 65) was nearly seven times as high as the prevalence in the Medicare FFS population with diabetes. Yearly prevalence rates were 14.7 percent in 2006, 14.0 percent in 2007, and 13.9 percent in 2008 (Table 2). These rates varied by age, gender, race/ethnicity, and geographic location. For example, in 2008, the prevalence of LEA was 2.3 percent for male diabetics and 1.3 percent for female diabetics. By race/ethnicity, the prevalence of LEA among those with diabetes was 1.5 percent for white, 3.3 percent for African American, 0.7 percent for Asian, 2.6 percent for Hispanic, 3.8 percent for American Indian/Alaska Native, and 1.5 percent for other. Geographic distribution of prevalent LEA among those with diabetes mellitus varied widely based on Dartmouth Atlas of Health Care HRRs (Figure 2). Finally, the prevalence of major amputation in 2008 was 1.3 percent and minor amputation was 0.46 percent. The yearly prevalence rates varied little from 2006 to 2008.

Figure 2: Annual prevalence of lower extremity amputation (nonadjusted) among Medicare beneficiaries with diabetes by HRR

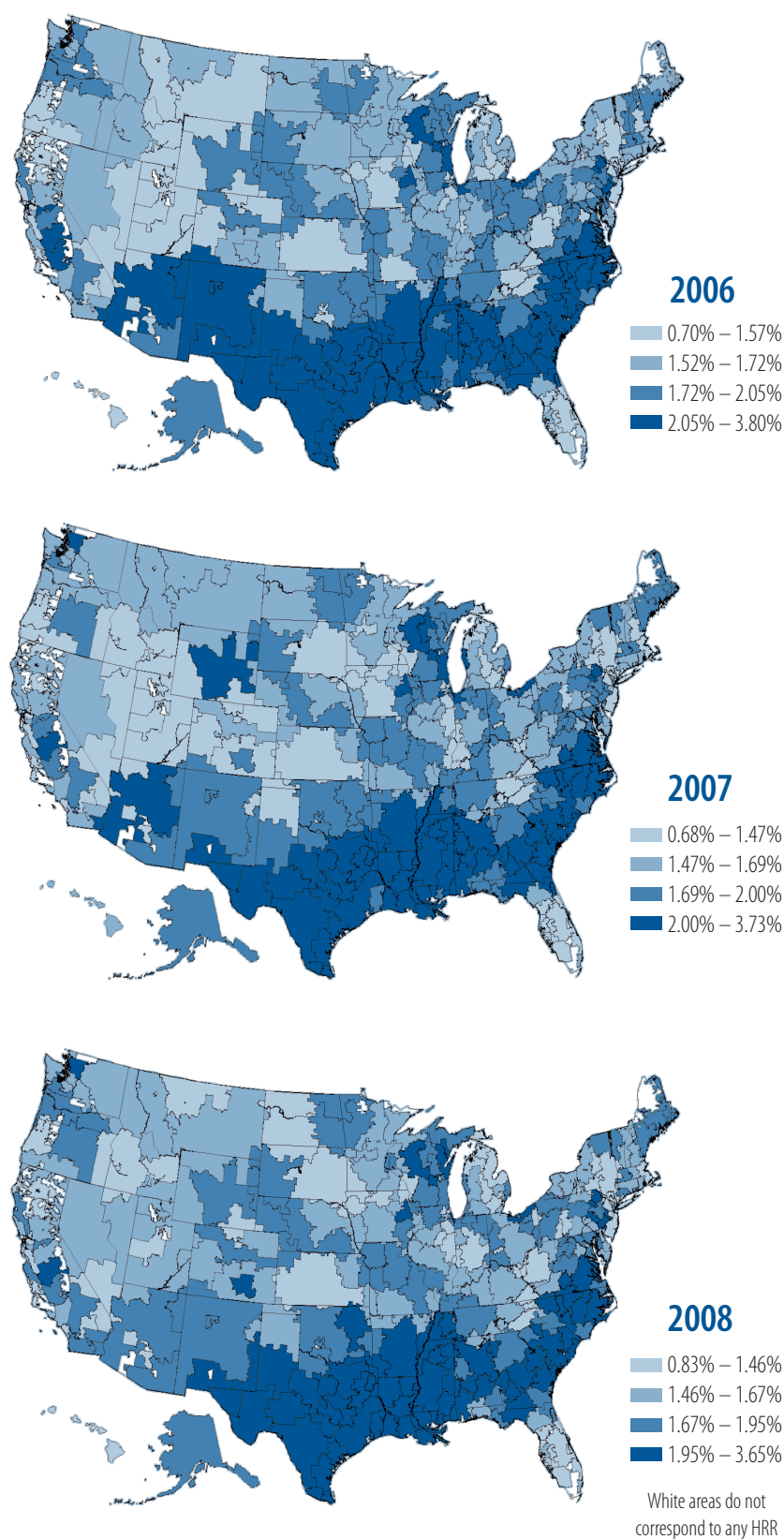


Table 2: Yearly prevalence for foot ulcer and lower extremity amputation in Medicare beneficiaries among diabetic population (Parts A and B FFS) in 2006, 2007, and 2008

Variable		Year	Foot Ulcer Prevalence (%)	Lower Extremity Amputation Prevalence (%)
Overall		2006	8.1	1.8
		2007	8.1	1.8
		2008	8.0	1.8
Age	Under 45	2006	9.0	2.6
		2007	9.1	2.6
		2008	9.1	2.6
	45 to 54	2006	10.3	3.7
		2007	10.2	3.5
		2008	10.1	3.6
	55 to 64	2006	10.0	3.8
		2007	10.1	3.7
		2008	9.9	3.6
	65 to 74	2006	6.1	1.5
		2007	6.1	1.4
		2008	6.1	1.4
	75 to 84	2006	8.0	1.5
		2007	8.0	1.4
		2008	7.9	1.4
	85 to 94	2006	11.5	1.6
		2007	11.5	1.6
		2008	11.3	1.5
95 and over	2006	15.3	1.9	
	2007	15.2	1.7	
	2008	15.0	1.6	
Gender	Male	2006	8.2	2.4
		2007	8.2	2.3
		2008	8.2	2.3
	Female	2006	7.9	1.4
		2007	7.9	1.3
		2008	7.8	1.3
Race or Ethnicity	White	2006	8.0	1.5
		2007	8.0	1.5
		2008	8.0	1.5
	African American	2006	8.9	3.5
		2007	8.9	3.4
		2008	8.7	3.3
	Asian	2006	4.4	0.7
		2007	4.3	0.7
		2008	4.2	0.7
	Hispanic	2006	8.7	2.6
		2007	8.6	2.6
		2008	8.6	2.6
	American Indian/ Alaska Native	2006	9.7	4.1
		2007	9.7	4.0
		2008	9.6	3.8

ADDITIONAL FINDINGS AVAILABLE ONLINE

The following additional materials are available online at: <http://www.effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/?pageaction=displayproduct&productid=508>.

TABLES

Prevalence of Diabetes in Medicare Parts A and B Fee-for-Service (FFS) Cohort Population (Millions), 2007

Prevalence of Diabetes in Medicare Parts A and B FFS Cohort Population (Millions), 2006-2008

Annual Prevalence of Foot Ulcer Among Diabetic Medicare Parts A and B FFS Beneficiaries, 2006-2008

Annual Prevalence of LEA Among Diabetic Medicare Parts A and B FFS Beneficiaries, 2006-2008

Annual Prevalence of Foot Ulcer Among Nondiabetic Medicare Parts A and B FFS Beneficiaries, 2006-2008

Annual Prevalence of LEA Among Nondiabetic Medicare Parts A and B FFS Beneficiaries, 2006-2008

Annual Prevalence of Major and Minor LEA Among Diabetic Medicare Parts A and B FFS Beneficiaries, 2006-2008

Annual Prevalence of Osteomyelitis Among Diabetic Medicare Parts A and B FFS Beneficiaries With Foot Ulcer, 2006-2008

Annual Prevalence of Micro- and Macrovascular Complications Among Diabetic Medicare Parts A and B FFS Beneficiaries With and Without Foot Ulcer, 2006-2008

Annual Prevalence of Micro- and Macrovascular Complications Among Diabetic Medicare Parts A and B FFS Beneficiaries With and Without LEA, 2006-2008

DATA SOURCE

Unless otherwise specified, the prevalences in this *Data Points* brief were derived from the Medicare Parts A and B FFS population. Prevalence was determined separately for 2006, 2007, and 2008. A beneficiary was included in the enrollment population for a given year if he or she had at least a 12-month period of continuous Parts A and B FFS enrollment centering on any one of the months in a given year. Enrollment was determined using the Medicare Enrollment Database (EDB).

DEFINITIONS AND METHODOLOGY

Definition and Prevalence of Diabetes

Four algorithms were initially explored.

Algorithm 1: An individual was determined to have diabetes if he or she had one or more claims with International Classification of Diseases, 9th Revision, (ICD-9) codes consistent with diabetes (250.00-03, 250.10-13, 250.20-23, 250.30-33, 250.40-43, 250.50-53, 250.60-63, 250.70-73, 250.80-83, 250.90-93) in the 12-month period of continuous enrollment.

Algorithm 2: An individual was determined to have diabetes if he or she had two or more ICD-9 codes consistent with diabetes in the 12-month period of continuous enrollment.

Algorithm 3: An individual was determined to have diabetes if he or she had two or more claims with ICD-9 codes consistent with diabetes or at least one inpatient claim with ICD-9 codes consistent with diabetes in the 12-month period of continuous enrollment.

Algorithm 4: An individual was determined to have diabetes if he or she had two or more claims with ICD-9 codes consistent with diabetes or at least one inpatient claim with ICD-9 codes consistent with diabetes or evidence of a prescription for a medication used to treat hyperglycemia (in Part D) or other relevant codes for treatment of diabetes (in Part A or B) during the 12-month period of continuous enrollment. (For Algorithm 4, the 12-month period required continuous enrollment in Part D as well as Parts A and B.)

Based on our initial observations, algorithm 3, which is consistent with the definition of diabetes in many previous studies, was selected for analysis. This algorithm is used to determine the denominator for diabetic foot ulcer and LEA prevalence measurements. Prevalence of diabetes overall was calculated by dividing the number of beneficiaries noted with diabetes by the number of beneficiaries in the Medicare FFS population (as described in the data source section) for a given year (i.e., 2006, 2007, and 2008). Gender, race/ethnicity, and age were all extracted from the EDB.

Definition and Prevalence of Foot Ulcer

Beneficiaries with diabetes, as defined above, were defined as having a prevalent foot ulcer if they had a primary or secondary (i.e., nonprimary) diagnosis of foot ulcer during the given calendar year (based on the following ICD-9 codes: 681.9, 682.7, 707.10, 707.13, 707.14, 707.15, 707.8, 707.9, 730.06-730.09, 730.16, 730.19, 730.26-.29, 891.0, 891.1, 891.2, 892.0, 892.1, 892.2). Any beneficiary with diabetes as defined above and a venous leg ulcer code, another common chronic wound of the lower extremity, (454.0, 454.1, 454.2, 454.9) in the given calendar year was not defined as having a foot ulcer and was excluded. For these prevalence measurements, prevalence was calculated by dividing the number of beneficiaries noted with diabetes and a foot ulcer in the given year by the number of beneficiaries in the Medicare FFS population who were also continuously enrolled in Parts A and B throughout the given year and identified with diabetes for that year. PAD was ascertained based on the following ICD-9 codes: 250.70, 440.20-24, 443.9.

Definition and Prevalence of Lower Extremity Amputation

Beneficiaries with diabetes, as defined above, were defined as having an LEA if they had a primary or secondary (i.e., nonprimary) diagnosis of LEA during the given calendar year (based on the following Current Procedural Terminology codes: 27590, 27591, 27592, 27594, 27596, 27598, 27880, 27881, 27882, 27884, 27886, 27888, 27889, 28800, 28805, 28810, 28820, and 28825; and ICD-9 codes; 895.0, 895.1, 896.0-3, 897.0-7, V49.70-6, 84.10-84.17, 84.3). For these prevalence measurements, prevalence was calculated by dividing the number of beneficiaries noted with diabetes and an LEA in the given year by the number of beneficiaries in the Medicare FFS population who were also continuously enrolled in Parts A and B throughout the given year and identified with diabetes for that year. PAD was ascertained based on the following ICD-9 codes: 250.70, 440.20-24, 443.9.

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