High-Cost Patients and Preventable Spending: A Population-Based Study

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ABSTRACT

Background: Although high-cost (HC) patients make up a small proportion of patients, they account for most health system costs. However, little is known about HC patients with cancer or whether some of their care could potentially be prevented. This analysis sought to characterize HC patients with cancer and quantify the costs of preventable acute care (emergency department visits and inpatient hospitalizations). **Methods:** This analysis examined a population-based sample of all HC patients in Ontario in 2013. HC patients were defined as those above the 90th percentile of the cost distribution; all other patients were defined as non-high-cost (NHC). Patients with cancer were identified through the Ontario Cancer Registry. Sociodemographic and clinical characteristics were examined and the costs of preventable acute care for both groups by category of visit/condition were estimated using validated algorithms. **Results:** Compared with NHC patients with cancer (n=369,422), HC patients with cancer (n=187,770) were older (mean age 70 vs 65 years), more likely to live in low-income neighborhoods (19% vs 16%), sicker, and more likely to live in long-term care homes (8% vs 0%). Although most patients from both cohorts tended to be diagnosed with breast, prostate, or colorectal cancer, those with multiple myeloma or pancreatic or liver cancers were overrepresented among the HC group. Moreover, HC patients were more likely to have advanced cancer at diagnosis and be in the initial or terminal phase of treatment compared with NHC patients. Among HC patients with cancer, 9% of spending stemmed from potentially preventable/avoidable acute care, whereas for NHC patients, this spending was approximately 30%. **Conclusions:** HC patients with cancer are a unique subpopulation. Given the type of care they receive, there seems to be limited scope to prevent acute care spending among this patient group. To reduce costs, other strategies, such as making hospital care more efficient and generating less costly encounters involving chemotherapy, should be explored.

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Background

Recent publications have shown that patients with cancer incur high costs of care, particularly after diagnosis and in the last year of life.^{1–3} Given the increasing number of patients with cancer⁴ and increasing treatment costs,⁵ policymakers are continually seeking ways to bend the cost curve without sacrificing the quality of care. Focusing on high-cost (HC) patients is likely to have a large impact on health system costs, because these patients account for most healthcare spending. Many jurisdictions have implemented high-risk care management strategies to reduce costs and improve quality. However, it is not clear which costs can be reduced, especially among patients who require costly care, such as those with cancer. One potential solution to decrease costs without sacrificing care is to target preventable or avoidable acute care—that is, acute care for which good outpatient care could likely prevent the need for emergency department (ED) visits and/or hospitalization. Previous research has shown that ED visits and hospitalizations make up more than half of all costs among HC patients.⁶ Furthermore, some studies have shown that a substantial proportion of ED visits^{7,8} and hospitalizations^{9–12} may be prevented.

Little is known about HC patients with cancer and their healthcare utilization and spending patterns. Previous work has shown that individuals with cancer make up 20% of all HC patients.¹³ This is not surprising given that the population is aging, the number of patients diagnosed with cancer is increasing,⁴ and the introduction of newer and more expensive treatments has contributed to an increase in treatment costs.⁵ Wodchis et al¹⁴ examined the cost trajectories of patients with cancer over time and identified patient and system characteristics associated with high system costs after cancer treatment. The most common trajectory consisted of patients who were low-cost in the year before cancer treatment and remained low-cost after completing cancer treatment. In addition, the investigators

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found that increases in age and multimorbidity and low continuity of care were the strongest predictors of high costs after cancer treatment. Lam et al¹⁵ examined Medicare data for HC and non-high-cost (NHC) patients with and without cancer in 2014, and found that despite 15% of Medicare patients having a cancer diagnosis, the prevalence of cancer was higher among HC patients (33% vs 13%). Furthermore, the investigators found that HC patients had 3 times greater odds of having cancer and higher total annual spending (\$66,685 vs \$59,427).

However, it is not clear which costs, if any, can be reduced for this patient population. Joynt et al¹⁶ examined preventable and nonpreventable acute care spending among HC Medicare patients using validated algorithms and found that only a small percentage of costs resulted from preventable acute care. Graven et al¹⁷ replicated that analysis, using Oregon's All Payer All Claims database and Medicaid data from the Oregon Health Authority, and found that preventable acute care spending for HC patients accounted for <6% of their total spending. Using data from Canada, Ronksley et al¹⁸ examined preventable acute care spending among hospitalized HC patients (at the Ottawa Hospital) using an ambulatory care-sensitive conditions algorithm. They found that among the HC inpatient population, most costs were due to a single nonpreventable acute care episode. Despite this work, none of these studies specifically examined HC subgroups, such as patients with cancer.

The objectives of this analysis were to provide an in-depth characterization of HC patients diagnosed with cancer, while comparing them to NHC patients with cancer, and to quantify the costs of potentially preventable/avoidable acute care (ie, ED visits and inpatient hospitalizations).

Methods

Data

We used administrative healthcare data available through ICES (Institute for Clinical Evaluative Sciences) in Toronto, Ontario, which includes individual-level linkable data on most publicly funded healthcare services for all legal residents of Ontario, Canada's most populous province.¹⁹ Data on inpatient care are captured in the Discharge Abstract Database, the Ontario Mental Health Reporting System, the Continuing Care Reporting System, and the National Rehabilitation Reporting System, whereas data on ambulatory care are recorded in the National Ambulatory Care Reporting System. The Ontario Health Insurance Plan claims database captures data on physician visits, including fee-for-service visits and shadow-billed services, and laboratory claims. The Ontario Drug Benefit program database

includes information on all outpatient prescription drugs dispensed to individuals eligible for public drug coverage (ie, individuals on social assistance and those aged ≥ 65 years). The Home Care Database records all unique visits by home care providers. The Ontario Cancer Registry provides data on all patients diagnosed with a malignant neoplasm in Ontario. The ICES data repository also includes other databases, which provide useful sociodemographic data on patients. The Registered Persons Database, a population-based registry, provides basic demographic data (such as age and sex) on all legal residents of Ontario. The Immigration, Refugees, and Citizenship Canada database provides information on all legal immigrants and refugees in Canada. Census data, obtained through Statistics Canada, contain information on neighborhood-level data, such as income and rurality. All databases were linked using unique encoded identifiers and analyzed at ICES, in compliance with Ontario's privacy legislation. A full description of the databases can be found in supplemental eTable 1, available with this article at JNCCN.org.

Patient Cohorts

We selected all adult patients (aged ≥ 18 years) eligible for public healthcare insurance and residing in Ontario in 2013. All individuals who did not contact the Ontario healthcare system in 2013 and those who died during 2013 (but not those in their last year of life) were excluded, in line with previous research,¹⁶ because assessing the preventability of end-of-life care costs was beyond the scope of this analysis.

HC patients were defined as those above the 90th percentile of the cost distribution (ie, the top decile) in 2013, in line with previous work.²⁰ All other patients were defined as NHC patients. This threshold provided a larger cohort of patients compared with other thresholds. Within each group, we identified those ever diagnosed with cancer (before or during 2013) through use of the Ontario Cancer Registry. To estimate healthcare costs and thus determine patients with costs above the 90th percentile, we used a cost estimation algorithm, available at ICES.¹⁹ Healthcare costs included all costs borne by the public third-party payer (ie, the Ontario Ministry of Health and Long-Term Care)¹⁹: inpatient hospitalizations (both psychiatric and acute), other institution-based care (inpatient rehabilitation, complex continuing care, long-term care), ED visits and other ambulatory care, outpatient clinic visits, physician visits and outpatient care, outpatient prescription drugs (for individuals covered under the public provincial drug plan), and home care. Costs captured by the algorithm accounted for >90% of all government-paid healthcare costs.²¹

Identifying Preventable Acute Care

To identify preventable ED visits, we used an updated version of a validated algorithm created at NYU Wagner²² by John Billings and colleagues and used in prior research examining HC Medicare patients.¹⁶ The NYU algorithm uses specified diagnosis codes to determine the following type of ED visits: nonemergent, emergent but primary care treatable, emergent ED care needed but preventable, and emergent ED care needed and not preventable. The updated version of the algorithm includes additional categories for injury, mental health, alcohol use, and drug use.²³ Based on these classifications, Billings et al²⁴ compiled a set of probabilistic weights that were applied to ED discharge data using the primary discharge ICD-10 diagnosis codes to determine the percentage of ED use attributable to each category. ED visits with diagnosis codes not mapped to any of the 8 categories were assigned to the “unclassified” category. Preventable ED visits were defined as nonemergent, emergent/primary care treatable, and emergent/ED care needed but preventable, in line with prior work.¹⁶

To identify potentially preventable hospitalizations, we used a validated algorithm, Quality Prevention Quality Indicators, developed by the Agency for Healthcare Research and Quality²⁵ and used elsewhere.^{26–28} This algorithm defines potentially preventable hospitalizations as

those related to conditions, such as heart failure, diabetes, hypertension, and asthma, for which good outpatient care can likely prevent the need for hospitalization. In addition, we used the respective prevention quality indicators for common nonpreventable clinical diagnosis groups to identify nonpreventable hospitalizations (see supplemental eAppendix 1 for codes).

Analysis

Patient Descriptives

HC and NHC patients with cancer were characterized and compared in terms of sociodemographic (sex, age, migrant status, neighborhood-level income quintile, urban/rural residence) and clinical characteristics (chronic conditions, frailty, residence in a long-term care home). We used the existing ICES-derived cohorts/registries to ascertain chronic conditions among patients^{29–40} and the Johns Hopkins Adjusted Clinical Groups Case-Mix System⁴¹ to obtain data on patient frailty. Residence in a long-term care facility was determined through the Continuing Care Reporting System. Using information included in the Ontario Cancer Registry, we also characterized patient groups by cancer type (solid vs hematologic) and site, cancer stage at diagnosis (where available), treatment phase (initial, continuing, terminal),^{1,2} and days since first diagnosis (patients with multiple cancers were assigned

Table 1. Sociodemographic Characteristics of Patient Cohorts

	High-Cost Patients n (%)	Non-High-Cost Patients n (%)	P Value	All Patients n (%)
Total, N	187,770	369,422		557,192
Sex				
Female	98,001 (52.2)	202,213 (54.7)		300,214 (53.9)
Male	89,769 (47.8)	167,209 (45.3)		256,978 (46.1)
Age, mean (SD), y	69.9 (14.2)	64.5 (14.2)	<.001	66.4 (14.4)
Migrant status				
Nonimmigrant	173,622 (92.5)	337,369 (91.3)	<.001	510,991 (91.7)
Immigrant	11,969 (6.4)	27,492 (7.4)	<.001	39,461 (7.1)
Refugee	2,179 (1.2)	4,561 (1.2)	.017	6,740 (1.2)
Neighborhood income quintile				
Missing	714 (0.4)	1,113 (0.3)	<.001	1,827 (0.3)
1st, low	35,704 (19.0)	57,620 (15.6)	<.001	93,324 (16.7)
2nd, medium-low	37,301 (19.9)	70,207 (19.0)	<.001	107,508 (19.3)
3rd, medium	36,834 (19.6)	72,885 (19.7)	.316	109,719 (19.7)
4th, medium-high	38,539 (20.5)	80,614 (21.8)	<.001	119,153 (21.4)
5th, high	38,678 (20.6)	86,983 (23.5)	<.001	125,661 (22.6)
Rural residence			.281	
No	162,412 (86.5)	319,146 (86.4)		481,558 (86.4)
Yes	25,358 (13.5)	50,276 (13.6)		75,634 (13.6)

to the first cancer diagnosed; see supplemental eTable 2 for ICD-O codes). Patient characteristics between HC and NHC individuals with cancer were compared using a chi-square test for differences.

Costs of Preventable Acute Care Among HC Patients

We estimated the total costs of preventable and non-preventable acute care by category of visit (for ED visits) and condition (for inpatient hospitalizations) for HC and NHC patients with cancer. All costs were reported in 2016 constant Canadian dollars using the Statistics Canada Consumer Price Index for healthcare.⁴²

All analyses were performed using SAS Enterprise Guide 7.1 (SAS Institute Inc). The study was approved by the research ethics board of Sunnybrook Health Sciences Centre.

Results

Patient Characteristics

In 2013, 10,031,865 individuals contacted the Ontario healthcare system; 1,003,187 were defined as HC patients, and the remainder were defined as NHC (n=9,028,678). After excluding all patients who died during 2013 (n=90,555), we were left with 929,726 HC and 9,011,584 NHC patients. Across both groups, 557,192 patients had cancer; 187,770 were HC and 369,422 were NHC.

HC patients with cancer were older (mean age, 69.9 vs 64.5 years) and slightly more represented in the lower

neighborhood income quintile (19.0% vs 15.6%) compared with NHC patients, but the 2 groups were roughly the same for all other sociodemographic characteristics (Table 1). HC patients with cancer had a higher proportion of all chronic conditions examined, particularly HIV, chronic heart failure, and dementia. HC patients with cancer also had a higher degree of frailty and were more likely to be living in long-term care facilities (Table 2). Among all patients, most were diagnosed with breast, prostate, and colorectal cancers (Table 3). However, multiple myeloma and pancreatic and liver cancers were overrepresented among HC patients, whereas testicular, thyroid, and cervical cancers and melanoma were overrepresented among NHC patients. Moreover, although most patients had missing data on cancer stage, a higher proportion of patients with stages III and IV was seen in the HC group. There was also a higher proportion of patients in the initial and terminal phases of treatment among the HC group (note that the terminal phase did not include patients who died but rather those in the last year of life, for whom death likely occurred in 2014). HC patients with cancer also had a shorter length of time since first diagnosis (2,917.9 vs 3,844.6 days).

Costs of Preventable and Nonpreventable Acute Care

ED Visits

Within the HC cohort, 30.8% of the ED costs were classified as preventable (Table 4). Patterns were somewhat

Table 2. Clinical Characteristics of Patient Cohorts

	High-Cost Patients n (%)	Non-High-Cost Patients n (%)	P Value	All Patients n (%)
Total, N	187,770	369,422		557,192
Chronic conditions				
Arthritis	5,862 (3.1)	5,807 (1.6)	<.001	11,669 (2.1)
Asthma	30,945 (16.5)	45,438 (12.3)	<.001	76,383 (13.7)
COPD	53,878 (28.7)	58,047 (15.7)	<.001	111,925 (20.1)
Diabetes	62,963 (33.5)	78,738 (21.3)	<.001	141,701 (25.4)
HIV	869 (0.5)	396 (0.1)	<.001	1,265 (0.2)
Hypertension	131,178 (69.9)	201,941 (54.7)	<.001	333,119 (59.8)
Chronic heart failure	30,310 (16.1)	16,657 (4.5)	<.001	46,967 (8.4)
Crohn's disease/colitis	2,505 (1.3)	3,227 (0.9)	<.001	5,732 (1.0)
Chronic kidney disease	586 (0.3)	163 (0.0)	<.001	749 (0.1)
Myocardial infarction	13,121 (7.0)	11,209 (3.0)	<.001	24,330 (4.4)
Psychosis	5,443 (2.9)	3,380 (0.9)	<.001	8,823 (1.6)
Dementia	23,223 (12.4)	8,566 (2.3)	<.001	31,789 (5.7)
Comorbidity				
Frailty	28,157 (15.0)	6,827 (1.8)	<.001	34,984 (6.3)
Long-term care	14,328 (7.6)	45 (0.0)	<.001	14,373 (2.6)

Abbreviation: COPD, chronic obstructive pulmonary disease.

Table 3. Cancer-Specific Characteristics of Study Cohorts

	High-Cost Patients n (%)	Non-High-Cost Patients n (%)	P Value	All Patients n (%)
Total, N	187,770	369,422		557,192
Type of cancer			<.001	
Hematologic	18,703 (10.0)	30,319 (8.3)		49,022 (8.8)
Solid	169,067 (90.0)	339,103 (91.7)		508,170 (91.2)
Cancer type ^a				
Head and neck	5,410 (2.9)	10,052 (2.7)	<.001	15,462 (2.8)
Esophageal	810 (0.4)	620 (0.2)	<.001	1,430 (0.3)
Pancreatic	1,299 (0.7)	809 (0.2)	<.001	2,108 (0.4)
Colorectal	23,506 (12.5)	36,867 (10.0)	<.001	60,373 (10.8)
Liver	1,188 (0.6)	747 (0.2)	<.001	1,935 (0.3)
Gastric	2,282 (1.2)	2,716 (0.7)	<.001	4,998 (0.9)
Lung	10,467 (5.6)	8,385 (2.3)	<.001	18,852 (3.4)
Leukemia	8,159 (4.3)	12,234 (3.3)	<.001	20,393 (3.7)
Melanoma	7,666 (4.1)	27,334 (7.4)	<.001	35,000 (6.3)
Female breast	36,402 (19.4)	77,540 (21.0)	<.001	113,942 (20.4)
Cervical	2,062 (1.1)	7,698 (2.1)	<.001	9,760 (1.8)
Uterine corpus	7,617 (4.1)	16,827 (4.6)	<.001	24,444 (4.4)
Ovarian	2,840 (1.5)	5,294 (1.4)	.019	8,134 (1.5)
Prostate	32,688 (17.4)	68,391 (18.5)	<.001	101,079 (18.1)
Testicular	1,021 (0.5)	6,850 (1.9)	<.001	7,871 (1.4)
Kidney	5,634 (3.0)	10,170 (2.8)	<.001	15,804 (2.8)
Bladder	7,499 (4.0)	9,059 (2.5)	<.001	16,558 (3.0)
Brain	1,714 (0.9)	2,768 (0.7)	<.001	4,482 (0.8)
Thyroid	6,819 (3.6)	25,567 (6.9)	<.001	32,386 (5.8)
Lymphoma	7,507 (4.0)	16,831 (4.6)	<.001	24,338 (4.4)
Multiple myeloma	3,037 (1.6)	1,254 (0.3)	<.001	4,291 (0.8)
Other tumor sites	12,143 (6.5)	21,409 (5.8)	<.001	33,552 (6.0)
Cancer stage at diagnosis				
Missing	108,951 (58.0)	258,592 (70.0)	<.001	367,543 (66.0)
0	301 (0.2)	651 (0.2)	.174	952 (0.2)
I	25,332 (13.5)	46,617 (12.6)	<.001	71,949 (12.9)
II	26,859 (14.3)	42,731 (11.6)	<.001	69,590 (12.5)
III	16,132 (8.6)	15,773 (4.3)	<.001	31,905 (5.7)
IV	9,485 (5.1)	4,326 (1.2)	<.001	13,811 (2.5)
Unknown/Occult	710 (0.4)	732 (0.2)	<.001	1,442 (0.3)
Treatment phase				
Initial ^b	46,822 (24.9)	16,829 (4.6)	<.001	63,651 (11.4)
Continuing	120,568 (64.2)	347,674 (94.1)	<.001	468,242 (84.0)
Terminal ^c	20,380 (10.9)	4,919 (1.3)	<.001	25,299 (4.5)
Days since first diagnosis, mean (SD)	2,917.9 (3,188.8)	3,844.6 (3,008.7)	<.001	3,532.3 (3,101.7)

^aSee supplemental eTable 2 for the ICD-O and histology codes used to define each cancer site.

^bDefined as the 6-month period after date of diagnosis.

^cDefined as the 12-month period before date of death.

Table 4. Costs of Preventable and Nonpreventable ED Visits

	High-Cost Patients CAD\$ (%)	Non-High-Cost Patients CAD\$ (%)	All Patients CAD\$ (%)
Category of visit			
Not emergent (A)	12,823,306 (10.7)	4,445,660 (14.9)	17,268,966 (11.6)
Emergent, primary care treatable (B)	15,811,564 (13.2)	4,625,172 (15.5)	20,436,736 (13.7)
ED care need, preventable (C)	8,222,187 (6.9)	1,456,994 (4.9)	9,679,181 (6.5)
ED care needed, nonpreventable	23,931,199 (20.1)	4,090,213 (13.8)	28,021,412 (18.8)
Alcohol-related	337,171 (0.3)	127,048 (0.4)	464,219 (0.3)
Drug-related	71,716 (0.1)	21,964 (0.1)	93,680 (0.1)
Injury	13,673,609 (11.5)	4,873,770 (16.4)	18,547,379 (12.4)
Mental health-related	1,936,973 (1.6)	417,858 (1.4)	2,354,831 (1.6)
Other/Unclassified	42,546,957 (35.6)	9,694,866 (32.6)	52,241,823 (35.0)
Total preventable (A+B+C)	36,857,057 (30.9)	10,527,826 (35.4)	47,384,883 (31.8)
Total nonpreventable	39,950,668 (33.5)	9,530,853 (32.0)	49,481,521 (33.2)
Not classified	42,546,957 (35.6)	9,694,866 (32.6)	52,241,823 (35.0)
Total	119,354,682 (100)	29,753,545 (100)	149,108,227 (100)

Abbreviation: ED, emergency department.

similar for the NHC cohort, with 35.3% of costs deemed preventable. Emergent, primary care treatable ED visits made up the highest proportion of preventable care costs for both HC and NHC patients (13.2% and 15.5%, respectively). However, HC patients had a higher proportion of nonpreventable ED visit costs than NHC patients (20.1% vs 13.8%). In addition, costs of ED visits with injuries represented a relatively high proportion among NHC patients (16.4%).

Inpatient Care

HC patients with cancer had a higher proportion of preventable inpatient costs than NHC patients (7.3% vs 6.6%) (Table 5). The most common reasons for preventable hospitalizations among HC patients with cancer included chronic obstructive pulmonary disease (COPD), bacterial pneumonia, and urinary tract infections; this was also the case for NHC patients (but with different rankings). In contrast, the most common reasons for nonpreventable hospitalizations were cancer and chemotherapy (28.1%), orthopedic conditions (5.0%), and ischemic heart disease (4.0%) for HC patients, and cancer and chemotherapy (13.8%), gastrointestinal infections and disorders (10.7%), and syncope and dizziness (3.3%) among NHC patients (data not shown).

Combining both acute settings, 9.0% of HC patients' costs were considered potentially preventable compared with 29.9% for HNC patients.

Discussion

We examined a population-based sample of HC patients with cancer and estimated potentially preventable acute

care spending while comparing them with NHC patients with cancer. HC patients were older, slightly more represented in the lowest neighborhood income quintile, sicker, and more likely to live in long-term care homes compared with NHC patients. HC patients were also more likely to be diagnosed with high-mortality cancers, such as multiple myeloma and pancreatic and liver cancers, and to have an advanced stage at diagnosis. Moreover, HC patients were more likely to be in the initial and terminal phases of treatment and to have a shorter length of time since first diagnosis. Roughly 30.9% of ED visit costs and 7.3% of hospitalization costs among HC patients could potentially be avoided, in contrast to roughly 35.4% and 6.6%, respectively, for NHC patients. The top categories for preventable care were primary care-treatable ED visits and hospitalizations for COPD, pneumonia, and urinary tract infections. Combining both acute settings, 9.0% of HC patients' costs were considered potentially preventable, whereas the corresponding value for NHC patients was more than 3 times higher (29.9%).

Previous research has found that patients with high-mortality cancers have higher treatment costs.⁴³ This is also the case for patients with advanced cancer¹ and those in the initial and terminal phases of treatment.^{1,2,44,45} Moreover, another study on HC patients showed that long-term care residence has a large impact on costs.⁴⁶ Therefore, it is not surprising that patients with these characteristics were more often in the HC category.

Some research has examined the relationship between being an HC patient and having cancer. For example,

Table 5. Costs of Preventable and Nonpreventable Hospitalizations

Condition	High-Cost Patients CAD\$ (%)	Non-High-Cost Patients CAD\$ (%)	All Patients CAD\$ (%)
COPD	36,583,566 (2.4)	82,513 (1.2)	36,666,079 (2.4)
Bacterial pneumonia	28,957,726 (1.9)	183,180 (2.6)	29,140,907 (1.9)
Urinary tract infection	23,411,096 (1.5)	105,769 (1.5)	23,516,864 (1.5)
Lower extremity amputation	3,136,072 (0.2)	–	3,136,072 (0.2)
Dehydration	3,125,701 (0.2)	3,150 (0.0)	3,128,851 (0.2)
Hypertension	1,816,776 (0.1)	13,970 (0.2)	1,830,745 (0.1)
Perforated appendix	1,521,413 (0.1)	8,239 (0.1)	1,529,652 (0.1)
Congestive heart failure	1,090,453 (0.1)	–	1,090,453 (0.1)
Asthma	870,016 (0.1)	35,941 (0.5)	905,956 (0.1)
Diabetes			
Long-term complication	3,072,494 (0.2)	4,264 (0.1)	3,076,758 (0.2)
Uncontrolled	1,685,917 (0.1)	9,522 (0.1)	1,695,439 (0.1)
Other	457,630 (0.0)	10,754 (0.2)	468,384 (0.0)
Short-term complication	313,123 (0.0)	3,335 (0.0)	316,458 (0.0)
Unclassified ^a	6,665,790 (0.4)	1,438 (0.0)	6,667,228 (0.4)
Total preventable	112,707,773 (7.3)	462,075 (6.6)	113,169,846 (7.3)
Total nonpreventable	836,243,714 (54.4)	2,556,995 (36.3)	838,800,712 (54.3)
Not classified	588,976,908 (38.3)	4,027,593 (57.2)	593,004,501 (38.4)
All	1,537,928,396 (100)	7,046,662 (100)	1,544,975,062 (100)

Abbreviation: COPD, chronic obstructive pulmonary disease.

^aIncludes all diabetes codes that do not fall in any of the other existing diabetes categories.

Wodchis et al¹⁴ examined the cost trajectories of patients with cancer over time to understand the predictors of being an HC patient after a cancer diagnosis. The most common trajectory was low-cost in the years before and after cancer treatment (31.4%). The next most common trajectory, which accounted for nearly 15% of cases examined, included patients who were low-cost before diagnosis but HC in the year after cancer treatment ended, suggesting that cancer plays a role in becoming a HC patient. Lam et al¹⁵ examined Medicare data for HC and NHC patients with and without cancer in 2014 and found that the prevalence of cancer was higher among HC patients (33% vs 13%) and that these patients had 3 times greater odds of having cancer and higher total annual spending. No existing studies have specifically examined preventable acute care among specific HC subgroups, such as HC patients with cancer; most of the literature on this topic has examined *all* HC patients and found that only a small percentage of costs were due to preventable acute care.^{13,16,17} We also found this to be the case for HC patients with cancer. In particular, we found that only 9% of acute care costs were considered preventable, which is close to what other researchers have found in the United States, albeit for the entire HC population.

These results suggest that overall, among HC patients with cancer, there is limited scope to prevent acute care costs. However, a greater opportunity may exist to prevent these costs among some types of cancer and/or cancer sites. For example, despite small differences, HC patients with hematologic cancers had a slightly higher proportion of preventable acute care costs than those with solid cancers (data not reported). Future work should seek to undertake this analysis by cancer type/site. Despite the fact that more than one-third of acute care costs were for healthcare encounters that could not be classified, a large proportion of costs were for nonpreventable acute care. In particular, the largest proportion of nonpreventable hospitalization costs was for episodes of care involving chemotherapy, which is standard treatment for many patients with cancer. Chemotherapy costs tend to represent a large proportion of treatment costs, and these costs have been increasing over time.⁵ Thus, the ability to lower acute care costs through better outpatient care may be limited. Nonetheless, there may be instances when chemotherapy may be avoided⁴⁷ or deemed unnecessary,⁴⁸ despite these hospitalizations being defined as nonpreventable by the algorithm. Moreover, costs could potentially be reduced

by making hospital care more efficient so that each inpatient care episode is less costly,¹⁶ and through less costly encounters involving chemotherapy.

Strengths of our study include its use of a population-based sample of *all* adult HC patients with cancer in Ontario, which is Canada's most populous province, whereas many existing studies tend to be limited to older populations.^{15,16} Additionally, we accounted for all costs associated with ED visits and hospitalization, given the presence of a (sole) third-party public payer for acute care in Ontario. We provided an in-depth characterization of the HC patient population with cancer and quantified the costs of potentially preventable acute care.

Nonetheless, this study is not without limitations. We did not examine patients aged <18 years, because these patients typically have different cancers compared with adults and their cancer-related care is organized differently compared with adults. We also did not examine the preventability of end-of-life care, because this was outside the scope of the analysis. Additionally, data on cancer stage were missing for most patients during the analysis period. Lastly, we used algorithms developed in the United States to identify preventable acute care; however, these algorithms could not classify all visits, and considered all ED visits for mental health and alcohol and drug use as nonpreventable, although it is likely that some of these visits could potentially be preventable. Furthermore, these algorithms are not disease-specific and thus did not examine preventable cancer-specific acute care; future work should explore this area and what

constitutes potentially preventable cancer-specific acute care.

Conclusions

HC patients with cancer are a unique subpopulation within the HC patient population, with specific needs and health-care utilization patterns. Given the care they receive, there seems to be limited scope to prevent acute care spending. To reduce costs, other strategies should be explored, such as making hospital care more efficient and ensuring encounters involving chemotherapy are less costly.

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High-Cost Patients and Preventable Spending: A Population-Based Study

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eTable 1: Summary of Administrative Healthcare Databases

eTable 2: ICD-O Codes by Cancer Site

eAppendix 1: Agency for Healthcare Research and Quality Prevention Quality Indicators and Common Nonpreventable Clinical Diagnostic Groups

eTable 1. Summary of Administrative Healthcare Databases

Database	Setting	Description
Discharge Abstract Database (DAD)	Acute inpatient hospitalizations	A national database that contains demographic and clinical data on inpatient hospital admissions.
Ontario Mental Health Reporting System (OMHRS)	Psychiatric inpatient hospitalizations	Collects demographic and clinical information on individuals admitted to designated adult psychiatric beds in Ontario. Some patients with mental health issues are still in inpatient acute beds (ie, the DAD).
Continuing Care Reporting System (CCRS)	Complex continuing care, long-term care	Contains demographic and clinical information on individuals receiving facility-based continuing care. Services include medical long-term care, rehabilitation, geriatric assessment, respite palliative care, and nursing home care.
National Rehabilitation Reporting System (NRS)	Rehabilitation	Contains national data on rehabilitation facilities and clients, collected from participating adult inpatient rehabilitation facilities and programs.
National Ambulatory Care Reporting System (NACRS)	Emergency department visits, day surgery, and outpatient clinics	Contains data for all ambulatory care including emergency department visits, day surgery, and outpatient clinic visits (eg, chemotherapy and dialysis).
Ontario Health Insurance Plan (OHIP) claims database	Outpatient and physician services	Covers all services and procedures provided by healthcare providers who can claim under OHIP (eg, physician and laboratory/diagnostic services).
Ontario Drug Benefit (ODB) program database	Outpatient prescription drugs	Includes data on all drugs dispensed in community pharmacies and long-term care/nursing facilities. Also covers prescription drugs listed in the provincial formulary for all seniors (aged ≥ 65 years) and those aged < 65 years on social assistance.
Home Care Database (HCD)	Home care	Provides data on government-funded services coordinated by Ontario's Community Care Access Centres for individuals requiring home care.

eTable 2. ICD-O Codes by Cancer Site

Cancer	ICD-O Codes
Head and neck	C00*–C06* C09*–C14* C30*–C33*
Esophageal	C15*
Gastric	C16*
Colorectal	C18.0, C18.2–C18.9 C19.9 C20.9
Liver	C22.0
Pancreatic	C25*
Lung	C34*
Leukemia	C42.0, C42.1, C42.4
Melanoma	C44*
Female breast	C50* (female)
Cervical	C53*
Uterine corpus	C54* C55.9
Ovarian	C56.9
Prostate	C61.9
Testicular	C62*
Kidney	C64.9 C65.9
Bladder	C67*
Brain	C71*
Thyroid	C73.9
Lymphoma	C77*
Multiple myeloma	Not applicable; histology codes 9731, 9732, and 9734 were used to ascertain cancer site
Other tumor sites	C07*–C08* C17* C18.1 C21* C22.1 C23.9 C24* C26* C37.9 C38*–C41* C42.2, C42.3 C47*–C49* C50* (male) C51* C52.9 C57* C58.9 C60* C63* C66* C68*–C70* C72* C74*–C75* C76* C80.9

eAppendix 1. Agency for Healthcare Research and Quality Prevention Quality Indicators and Common Nonpreventable Clinical Diagnostic Groups

Prevention Quality Indicators (PQIs) and ICD-10 Codes Used to Indicate Diagnosis

PQI 01: Diabetes Short-Term Complications

Diabetes Short-Term Complications Diagnosis Codes: (ACDIASD)

E1010 Type 1 diabetes mellitus with ketoacidosis without coma

E1011 Type 1 diabetes mellitus with ketoacidosis with coma

E10641 Type 1 diabetes mellitus with hypoglycemia with coma

E1100 Type 2 diabetes mellitus with hyperosmolarity without nonketotichyperglycemic-hyperosmolar coma (NKHHC)

E1101 Type 2 diabetes mellitus with hyperosmolarity with coma

E11641 Type 2 diabetes mellitus with hypoglycemia with coma

PQI 02: Perforated Appendix

Perforations or Abscesses of Appendix Diagnosis Codes: (ACSAPPD)

K352 Acute appendicitis with generalized peritonitis

K353 Acute appendicitis with localized peritonitis

PQI 03: Diabetes Long-Term Complications

Diabetes With Long-Term Complications Diagnosis Codes: (ACDIALD)

E1021 Type 1 diabetes mellitus with diabetic nephropathy

E1022 Type 1 diabetes mellitus with diabetic chronic kidney disease

E1029 Type 1 diabetes mellitus with other diabetic kidney complication

E10311 Type 1 diabetes mellitus with unspecified diabetic retinopathy with macular edema

E10319 Type 1 diabetes mellitus with unspecified diabetic retinopathy without macular edema

E10321 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema

E103211 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye

E103212 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye

E103213 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral

E103219 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, unspecified eye

E10329 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema

E103291 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye

E103292 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye

E103293 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral

E103299 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye

E10331 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema

E103311 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye

E103312 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye

E103313 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral

E103319 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye

E10339 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema

E103391 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye

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E103392 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
E103393 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
E103399 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye
E10341 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema
E103411 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye
E103412 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye
E103413 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral
E103419 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, unspecified eye
E10349 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema
E103491 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye
E103492 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye
E103493 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral
E103499 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, unspecified eye
E10351 Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema
E103511 Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye
E103512 Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye
E103513 Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral
E103519 Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, unspecified eye
E103521 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
E103522 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
E103523 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
E103529 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, unspecified eye
E103531 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye
E103532 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
E103533 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
E103539 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye
E103541 Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
E103542 Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye
E103543 Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral
E103549 Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye
E103551 Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, right eye
E103552 Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, left eye
E103553 Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, bilateral
E103559 Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, unspecified eye
E10359 Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema
E103591 Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye
E103592 Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye
E103593 Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral

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E103599 Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, unspecified eye
 E1036 Type 1 diabetes mellitus with diabetic cataract
 E1037×1 Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, right eye
 E1037×2 Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, left eye
 E1037×3 Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral
 E1037×9 Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, unspecified eye
 E1039 Type 1 diabetes mellitus with other diabetic ophthalmic complication
 E1040 Type 1 diabetes mellitus with diabetic neuropathy, unspecified
 E1041 Type 1 diabetes mellitus with diabetic mononeuropathy
 E1042 Type 1 diabetes mellitus with diabetic polyneuropathy
 E1043 Type 1 diabetes mellitus with diabetic autonomic (poly)neuropathy
 E1044 Type 1 diabetes mellitus with diabetic amyotrophy
 E1049 Type 1 diabetes mellitus with other diabetic neurologic complication
 E1051 Type 1 diabetes mellitus with diabetic peripheral angiopathy without gangrene
 E1052 Type 1 diabetes mellitus with diabetic peripheral angiopathy with gangrene
 E1059 Type 1 diabetes mellitus with other circulatory complications
 E10610 Type 1 diabetes mellitus with diabetic neuropathic arthropathy
 E10618 Type 1 diabetes mellitus with other diabetic arthropathy
 E10620 Type 1 diabetes mellitus with diabetic dermatitis
 E10621 Type 1 diabetes mellitus with foot ulcer
 E10622 Type 1 diabetes mellitus with other skin ulcer
 E10628 Type 1 diabetes mellitus with other skin complications
 E10630 Type 1 diabetes mellitus with periodontal disease
 E10638 Type 1 diabetes mellitus with other oral complications
 E1069 Type 1 diabetes mellitus with other specified complication
 E108 Type 1 diabetes mellitus with unspecified complications
 E1121 Type 2 diabetes mellitus with diabetic nephropathy
 E1122 Type 2 diabetes mellitus with diabetic chronic kidney disease
 E1129 Type 2 diabetes mellitus with other diabetic kidney complication
 E11311 Type 2 diabetes mellitus with unspecified diabetic retinopathy with macular edema
 E11319 Type 2 diabetes mellitus with unspecified diabetic retinopathy without macular edema
 E11321 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema
 E113211 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye
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 E113292 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye
 E113293 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral
 E113299 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye
 E11331 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema
 E113311 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye
 E113312 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye
 E113313 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
 E113319 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye
 E11339 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema

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E113391 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye
E113392 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
E113393 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
E113399 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye
E11341 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema
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E11351 Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema
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E113539 Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye
E113541 Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
E113542 Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye
E113543 Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral
E113549 Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye
E113551 Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, right eye
E113552 Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, left eye
E113553 Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, bilateral
E113559 Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, unspecified eye
E11359 Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema
E113591 Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye

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E113592 Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye
 E113593 Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral
 E113599 Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, unspecified eye
 E1136 Type 2 diabetes mellitus with diabetic cataract
 E1137×1 Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, right eye
 E1137×2 Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, left eye
 E1137×3 Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral
 E1137×9 Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, unspecified eye
 E1139 Type 2 diabetes mellitus with other diabetic ophthalmic complication
 E1140 Type 2 diabetes mellitus with diabetic neuropathy, unspecified
 E1141 Type 2 diabetes mellitus with diabetic mononeuropathy
 E1142 Type 2 diabetes mellitus with diabetic polyneuropathy
 E1143 Type 2 diabetes mellitus with diabetic autonomic (poly)neuropathy
 E1144 Type 2 diabetes mellitus with diabetic amyotrophy
 E1149 Type 2 diabetes mellitus with other diabetic neurologic complication
 E1151 Type 2 diabetes mellitus with diabetic peripheral angiopathy without gangrene
 E1152 Type 2 diabetes mellitus with diabetic peripheral angiopathy with gangrene
 E1159 Type 2 diabetes mellitus with other circulatory complications
 E11610 Type 2 diabetes mellitus with diabetic neuropathic arthropathy
 E11618 Type 2 diabetes mellitus with other diabetic arthropathy
 E11620 Type 2 diabetes mellitus with diabetic dermatitis
 E11621 Type 2 diabetes mellitus with foot ulcer
 E11622 Type 2 diabetes mellitus with other skin ulcer
 E11628 Type 2 diabetes mellitus with other skin complications
 E11630 Type 2 diabetes mellitus with periodontal disease
 E11638 Type 2 diabetes mellitus with other oral complications
 E1169 Type 2 diabetes mellitus with other specified complication
 E118 Type 2 diabetes mellitus with unspecified complications

PQI 05: Chronic Obstructive Pulmonary Disease (COPD) or Asthma in Older Adults

COPD (Excluding Acute Bronchitis) Diagnosis Codes: (ACCOPDD)

J410 Simple chronic bronchitis
 J411 Mucopurulent chronic bronchitis
 J418 Mixed simple and mucopurulent chronic bronchitis
 J42 Unspecified chronic bronchitis
 J430 Unilateral pulmonary emphysema (MacLeod's syndrome)
 J431 Panlobular emphysema
 J432 Centrilobular emphysema
 J439 Emphysema, unspecified
 J440 COPD with acute lower respiratory infection
 J441 COPD with (acute) exacerbation
 J449 COPD, unspecified
 J470 Bronchiectasis with acute lower respiratory infection
 J471 Bronchiectasis with (acute) exacerbation
 J479 Bronchiectasis, uncomplicated

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PQI 07: Hypertension

Hypertension Diagnosis Codes: (ACSHYPD)

I10 Essential (primary) hypertension

I119 Hypertensive heart disease without heart failure

I129 Hypertensive chronic kidney disease with stage I through stage IV chronic kidney disease, or unspecified chronic kidney disease

I1310 Hypertensive heart and chronic kidney disease without heart failure, with stage I through stage IV chronic kidney disease, or unspecified chronic kidney disease

I160 Hypertensive urgency

I161 Hypertensive emergency

I169 Hypertensive crisis, unspecified

PQI 08: Heart Failure

Heart Failure Diagnosis Codes: (MRTCHFD)

I0981 Rheumatic heart failure

I110 Hypertensive heart disease with heart failure

I130 Hypertensive heart and chronic kidney disease with heart failure and stage I through stage IV chronic kidney disease, or unspecified chronic kidney disease

I132 Hypertensive heart and chronic kidney disease with heart failure and with stage V chronic kidney disease, or end-stage renal disease

I501 Left ventricular failure

I5020 Unspecified systolic (congestive) heart failure

I5021 Acute systolic (congestive) heart failure

I5022 Chronic systolic (congestive) heart failure

I5023 Acute on chronic systolic (congestive) heart failure

I5030 Unspecified diastolic (congestive) heart failure

I5031 Acute diastolic (congestive) heart failure

I5032 Chronic diastolic (congestive) heart failure

I5033 Acute on chronic diastolic (congestive) heart failure

I5040 Unspecified combined systolic (congestive) and diastolic (congestive) heart failure

I5041 Acute combined systolic (congestive) and diastolic (congestive) heart failure

I5042 Chronic combined systolic (congestive) and diastolic (congestive) heart failure

I5043 Acute on chronic combined systolic (congestive) and diastolic (congestive) heart failure

I509 Heart failure, unspecified

PQI 09: Low Birth Weight

Not included

PQI 10: Dehydration

Dehydration Diagnosis Codes: (ACSDEHD)

E860 Dehydration

E861 Hypovolemia

E869 Volume depletion, unspecified

PQI 11: Community-Acquired Pneumonia

Community-Acquired Bacterial Pneumonia Diagnosis Codes: (ACSBACD)

J13 Pneumonia due to *Streptococcus pneumoniae*

J14 Pneumonia due to *Haemophilus influenzae*

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J15211 Pneumonia due to methicillin-susceptible *Staphylococcus aureus*
 J15212 Pneumonia due to methicillin-resistant *Staphylococcus aureus*
 J153 Pneumonia due to *Streptococcus*, group B
 J154 Pneumonia due to other streptococci
 J157 Pneumonia due to *Mycoplasma pneumoniae*
 J159 Unspecified bacterial pneumonia
 J160 Chlamydial pneumonia
 J168 Pneumonia due to other specified infectious organisms
 J180 Bronchopneumonia, unspecified organism
 J181 Lobar pneumonia, unspecified organism
 J188 Other pneumonia, unspecified organism
 J189 Pneumonia, unspecified organism

PQI 12: Urinary Tract Infection

Urinary Tract Infection Diagnosis Codes: (ACSUTID)

N10 Acute tubulo-interstitial nephritis
 N119 Chronic tubulo-interstitial nephritis, unspecified
 N12 Tubulo-interstitial nephritis, not specified as acute or chronic
 N151 Renal and perinephric abscess
 N159 Renal tubulo-interstitial disease, unspecified
 N16 Renal tubulo-interstitial disorders in diseases classified elsewhere
 N2884 Pyelitis cystica
 N2885 Pyeloureteritis cystica
 N2886 Ureteritis cystica
 N3000 Acute cystitis without hematuria
 N3001 Acute cystitis with hematuria
 N3090 Cystitis, unspecified without hematuria
 N3091 Cystitis, unspecified with hematuria
 N390 Urinary tract infection, site not specified

PQI 14: Uncontrolled Diabetes

Uncontrolled Diabetes Without Mention of a Short-Term or Long-Term Complication Diagnosis Codes: (ACDIAUD)

E10649 Type 1 diabetes mellitus with hypoglycemia without coma
 E1065 Type 1 diabetes mellitus with hyperglycemia
 E11649 Type 2 diabetes mellitus with hypoglycemia without coma
 E1165 Type 2 diabetes mellitus with hyperglycemia

PQI 15: Asthma in Younger Adults

Asthma Diagnosis Codes: (ACSASTD)

J4521 Mild intermittent asthma with (acute) exacerbation
 J4522 Mild intermittent asthma with status asthmaticus
 J4531 Mild persistent asthma with (acute) exacerbation
 J4532 Mild persistent asthma with status asthmaticus

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J4541 Moderate persistent asthma with (acute) exacerbation
 J4542 Moderate persistent asthma with status asthmaticus
 J4551 Severe persistent asthma with (acute) exacerbation
 J4552 Severe persistent asthma with status asthmaticus
 J45901 Unspecified asthma with (acute) exacerbation
 J45902 Unspecified asthma with status asthmaticus
 J45990 Exercise-induced bronchospasm
 J45991 Cough-variant asthma
 J45998 Other asthma

PQI 16: Lower-Extremity Amputation Among Patients With Diabetes

Lower-Extremity Amputation Procedure Codes: (ACSLEAP)

Note: These are Canadian Classification of Health Intervention (CCI) codes, which correspond to the ICD-10 Procedure Coding System codes for this PQI; more information on CCI codes can be found at <https://www.cihi.ca/en/cci-coding-structure>.

1VA93 Amputation, hip joint
 1VC93 Amputation, femur
 1VG93 Amputation, knee joint
 1VQ93 Amputation, tibia and fibula
 1WA93 Amputation, ankle joint
 1WE93 Amputation, tarsal bones and intertarsal joints (hindfoot, midfoot)
 1WI93 Amputation, first metatarsal bone and first metatarsophalangeal joint
 1WJ93 Amputation, tarsometatarsal joints, metatarsal bones, and metatarsophalangeal joints (forefoot)
 1WK93 Amputation, first phalanx of foot
 1WL93 Amputation, phalanx of foot

Traumatic Amputation of the Lower Extremity Diagnosis Codes: (ACLEA2D)

Note: These codes were excluded in line with PQI 16 Lower-Extremity Amputation Among Patients With Diabetes Rate (ie, codes with a main diagnosis of S78, S88*, and S98*). See http://www.qualityindicators.ahrq.gov/Downloads/Modules/PQI/V70/TechSpecs/PQI_16_Lower-Extremity_Amputation_among_Patients_with_Diabetes_Rate.pdf*

S78011A Complete traumatic amputation at right hip joint, initial encounter
 S78012A Complete traumatic amputation at left hip joint, initial encounter
 S78019A Complete traumatic amputation at unspecified hip joint, initial encounter
 S78021A Partial traumatic amputation at right hip joint, initial encounter
 S78022A Partial traumatic amputation at left hip joint, initial encounter
 S78029A Partial traumatic amputation at unspecified hip joint, initial encounter
 S78111A Complete traumatic amputation at level between right hip and knee, initial encounter
 S78112A Complete traumatic amputation at level between left hip and knee, initial encounter
 S78119A Complete traumatic amputation at level between unspecified hip and knee, initial encounter
 S78121A Partial traumatic amputation at level between right hip and knee, initial encounter
 S78122A Partial traumatic amputation at level between left hip and knee, initial encounter
 S78129A Partial traumatic amputation at level between unspecified hip and knee, initial encounter
 S78911A Complete traumatic amputation of right hip and thigh, level unspecified, initial encounter
 S78912A Complete traumatic amputation of left hip and thigh, level unspecified, initial encounter
 S78919A Complete traumatic amputation of unspecified hip and thigh, level unspecified, initial encounter
 S78921A Partial traumatic amputation of right hip and thigh, level unspecified, initial encounter

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S78922A Partial traumatic amputation of left hip and thigh, level unspecified, initial encounter
 S78929A Partial traumatic amputation of unspecified hip and thigh, level unspecified, initial encounter
 S88011A Complete traumatic amputation at knee level, right lower leg, initial encounter
 S88012A Complete traumatic amputation at knee level, left lower leg, initial encounter
 S88019A Complete traumatic amputation at knee level, unspecified lower leg, initial encounter
 S88021A Partial traumatic amputation at knee level, right lower leg, initial encounter
 S88022A Partial traumatic amputation at knee level, left lower leg, initial encounter
 S88029A Partial traumatic amputation at knee level, unspecified lower leg, initial encounter
 S88111A Complete traumatic amputation at level between knee and ankle, right lower leg, initial encounter
 S88112A Complete traumatic amputation at level between knee and ankle, left lower leg, initial encounter
 S88119A Complete traumatic amputation at level between knee and ankle, unspecified lower leg, initial encounter
 S88121A Partial traumatic amputation at level between knee and ankle, right lower leg, initial encounter
 S88122A Partial traumatic amputation at level between knee and ankle, left lower leg, initial encounter
 S88129A Partial traumatic amputation at level between knee and ankle, unspecified lower leg, initial encounter
 S88911A Complete traumatic amputation of right lower leg, level unspecified, initial encounter
 S88912A Complete traumatic amputation of left lower leg, level unspecified, initial encounter
 S88919A Complete traumatic amputation of unspecified lower leg, level unspecified, initial encounter
 S88921A Partial traumatic amputation of right lower leg, level unspecified, initial encounter
 S88922A Partial traumatic amputation of left lower leg, level unspecified, initial encounter
 S88929A Partial traumatic amputation of unspecified lower leg, level unspecified, initial encounter
 S98012A Complete traumatic amputation of left foot at ankle level, initial encounter
 S98019A Complete traumatic amputation of unspecified foot at ankle level, initial encounter
 S98021A Partial traumatic amputation of right foot at ankle level, initial encounter
 S98022A Partial traumatic amputation of left foot at ankle level, initial encounter
 S98029A Partial traumatic amputation of unspecified foot at ankle level, initial encounter
 S98111A Complete traumatic amputation of right great toe, initial encounter
 S98112A Complete traumatic amputation of left great toe, initial encounter
 S98119A Complete traumatic amputation of unspecified great toe, initial encounter
 S98121A Partial traumatic amputation of right great toe, initial encounter
 S98122A Partial traumatic amputation of left great toe, initial encounter
 S98129A Partial traumatic amputation of unspecified great toe, initial encounter
 S98131A Complete traumatic amputation of one right lesser toe, initial encounter
 S98132A Complete traumatic amputation of one left lesser toe, initial encounter
 S98139A Complete traumatic amputation of one unspecified lesser toe, initial encounter
 S98141A Partial traumatic amputation of one right lesser toe, initial encounter
 S98142A Partial traumatic amputation of one left lesser toe, initial encounter
 S98149A Partial traumatic amputation of one unspecified lesser toe, initial encounter
 S98211A Complete traumatic amputation of two or more right lesser toes, initial encounter
 S98212A Complete traumatic amputation of two or more left lesser toes, initial encounter
 S98219A Complete traumatic amputation of two or more unspecified lesser toes, initial encounter
 S98221A Partial traumatic amputation of two or more right lesser toes, initial encounter
 S98222A Partial traumatic amputation of two or more left lesser toes, initial encounter
 S98229A Partial traumatic amputation of two or more unspecified lesser toes, initial encounter
 S98311A Complete traumatic amputation of right midfoot, initial encounter
 S98312A Complete traumatic amputation of left midfoot, initial encounter
 S98319A Complete traumatic amputation of unspecified midfoot, initial encounter

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S98321A Partial traumatic amputation of right midfoot, initial encounter
 S98322A Partial traumatic amputation of left midfoot, initial encounter
 S98329A Partial traumatic amputation of unspecified midfoot, initial encounter
 S98911A Complete traumatic amputation of right foot, level unspecified, initial encounter
 S98912A Complete traumatic amputation of left foot, level unspecified, initial encounter
 S98919A Complete traumatic amputation of unspecified foot, level unspecified, initial encounter
 S98921A Partial traumatic amputation of right foot, level unspecified, initial encounter
 S98922A Partial traumatic amputation of left foot, level unspecified, initial encounter
 S98929A Partial traumatic amputation of unspecified foot, level unspecified, initial encounter

Diabetes Diagnosis Codes: (ACSLEAD)

E1010 Type 1 diabetes mellitus with ketoacidosis without coma
 E1011 Type 1 diabetes mellitus with ketoacidosis with coma
 E1021 Type 1 diabetes mellitus with diabetic nephropathy
 E1022 Type 1 diabetes mellitus with diabetic chronic kidney disease
 E1029 Type 1 diabetes mellitus with other diabetic kidney complication
 E10311 Type 1 diabetes mellitus with unspecified diabetic retinopathy with macular edema
 E10319 Type 1 diabetes mellitus with unspecified diabetic retinopathy without macular edema
 E10321 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema
 E103211 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye
 E103212 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye
 E103213 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral
 E103219 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, unspecified eye
 E10329 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema
 E103291 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye
 E103292 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye
 E103293 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral
 E103299 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye
 E10331 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema
 E103311 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye
 E103312 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye
 E103313 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
 E103319 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye
 E10339 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema
 E103391 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye
 E103392 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
 E103393 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
 E10341 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema
 E103399 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye
 E103411 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye
 E103412 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye
 E103413 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral
 E103419 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, unspecified eye
 E10349 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema
 E103491 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye
 E103492 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye

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E103493 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral

E103499 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, unspecified eye

E10351 Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema

E103511 Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye

E103512 Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye

E103513 Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral

E103519 Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, unspecified eye

E103521 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye

E103522 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye

E103523 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral

E103529 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, unspecified eye

E103531 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye

E103532 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye

E103533 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral

E103539 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye

E103541 Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye

E103542 Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye

E103543 Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral

E103549 Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye

E103551 Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, right eye

E103552 Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, left eye

E103553 Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, bilateral

E103559 Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, unspecified eye

E10359 Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema

E103591 Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye

E103592 Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye

E103593 Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral

E103599 Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, unspecified eye

E1036 Type 1 diabetes mellitus with diabetic cataract

E1037×1 Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, right eye

E1037×2 Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, left eye

E1037×3 Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral

E1037×9 Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, unspecified eye

E1039 Type 1 diabetes mellitus with other diabetic ophthalmic complication

E1040 Type 1 diabetes mellitus with diabetic neuropathy, unspecified

E1041 Type 1 diabetes mellitus with diabetic mononeuropathy

E1042 Type 1 diabetes mellitus with diabetic polyneuropathy

E1043 Type 1 diabetes mellitus with diabetic autonomic (poly)neuropathy

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E1044 Type 1 diabetes mellitus with diabetic amyotrophy

E1049 Type 1 diabetes mellitus with other diabetic neurologic complication

E1051 Type 1 diabetes mellitus with diabetic peripheral angiopathy without gangrene

E1052 Type 1 diabetes mellitus with diabetic peripheral angiopathy with gangrene

E1059 Type 1 diabetes mellitus with other circulatory complications

E10610 Type 1 diabetes mellitus with diabetic neuropathic arthropathy

E10618 Type 1 diabetes mellitus with other diabetic arthropathy

E10620 Type 1 diabetes mellitus with diabetic dermatitis

E10621 Type 1 diabetes mellitus with foot ulcer

E10622 Type 1 diabetes mellitus with other skin ulcer

E10628 Type 1 diabetes mellitus with other skin complications

E10630 Type 1 diabetes mellitus with periodontal disease

E10638 Type 1 diabetes mellitus with other oral complications

E10641 Type 1 diabetes mellitus with hypoglycemia with coma

E10649 Type 1 diabetes mellitus with hypoglycemia without coma

E1065 Type 1 diabetes mellitus with hyperglycemia

E1069 Type 1 diabetes mellitus with other specified complication

E108 Type 1 diabetes mellitus with unspecified complications

E109 Type 1 diabetes mellitus without complications

E1100 Type 2 diabetes mellitus with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma (NKHHC)

E1101 Type 2 diabetes mellitus with hyperosmolarity with coma

E1121 Type 2 diabetes mellitus with diabetic nephropathy

E1122 Type 2 diabetes mellitus with diabetic chronic kidney disease

E1129 Type 2 diabetes mellitus with other diabetic kidney complication

E11311 Type 2 diabetes mellitus with unspecified diabetic retinopathy with macular edema

E11319 Type 2 diabetes mellitus with unspecified diabetic retinopathy without macular edema

E11321 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema

E113211 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye

E113212 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye

E113213 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral

E113219 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, unspecified eye

E11329 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema

E113291 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye

E113292 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye

E113293 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral

E113299 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye

E11331 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema

E113311 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye

E113312 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye

E113313 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral

E113319 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye

E11339 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema

E113391 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye

E113392 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye

E113393 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral

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E113399 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye

E11341 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema

E113411 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye

E113412 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye

E113413 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral

E113419 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, unspecified eye

E11349 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema

E113491 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye

E113492 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye

E113493 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral

E113499 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, unspecified eye

E11351 Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema

E113511 Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye

E113512 Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye

E113513 Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral

E113519 Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema, unspecified eye

E113521 Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye

E113522 Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye

E113523 Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral

E113529 Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, unspecified eye

E113531 Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye

E113532 Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye

E113533 Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral

E113539 Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye

E113541 Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye

E113542 Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye

E113543 Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral

E113549 Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye

E113551 Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, right eye

E113552 Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, left eye

E113553 Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, bilateral

E113559 Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, unspecified eye

E11359 Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema

E113591 Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye

E113592 Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye

E113593 Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral

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E113599 Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, unspecified eye
E1136 Type 2 diabetes mellitus with diabetic cataract
E1137×1 Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, right eye
E1137×2 Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, left eye
E1137×3 Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral
E1137×9 Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, unspecified eye
E1139 Type 2 diabetes mellitus with other diabetic ophthalmic complication
E1140 Type 2 diabetes mellitus with diabetic neuropathy, unspecified
E1141 Type 2 diabetes mellitus with diabetic mononeuropathy
E1142 Type 2 diabetes mellitus with diabetic polyneuropathy
E1143 Type 2 diabetes mellitus with diabetic autonomic (poly)neuropathy
E1144 Type 2 diabetes mellitus with diabetic amyotrophy
E1149 Type 2 diabetes mellitus with other diabetic neurologic complication
E1151 Type 2 diabetes mellitus with diabetic peripheral angiopathy without gangrene
E1152 Type 2 diabetes mellitus with diabetic peripheral angiopathy with gangrene
E1159 Type 2 diabetes mellitus with other circulatory complications
E11610 Type 2 diabetes mellitus with diabetic neuropathic arthropathy
E11618 Type 2 diabetes mellitus with other diabetic arthropathy
E11620 Type 2 diabetes mellitus with diabetic dermatitis
E11621 Type 2 diabetes mellitus with foot ulcer
E11622 Type 2 diabetes mellitus with other skin ulcer
E11628 Type 2 diabetes mellitus with other skin complications
E11630 Type 2 diabetes mellitus with periodontal disease
E11638 Type 2 diabetes mellitus with other oral complications
E11641 Type 2 diabetes mellitus with hypoglycemia with coma
E11649 Type 2 diabetes mellitus with hypoglycemia without coma
E1165 Type 2 diabetes mellitus with hyperglycemia
E1169 Type 2 diabetes mellitus with other specified complication
E118 Type 2 diabetes mellitus with unspecified complications
E119 Type 2 diabetes mellitus without complications
E1300 Other specified diabetes mellitus with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma (NKHHC)
E1301 Other specified diabetes mellitus with hyperosmolarity with coma
E1310 Other specified diabetes mellitus with ketoacidosis without coma
E1311 Other specified diabetes mellitus with ketoacidosis with coma
E1321 Other specified diabetes mellitus with diabetic nephropathy
E1322 Other specified diabetes mellitus with diabetic chronic kidney disease
E1329 Other specified diabetes mellitus with other diabetic kidney complication
E13311 Other specified diabetes mellitus with unspecified diabetic retinopathy with macular edema
E13319 Other specified diabetes mellitus with unspecified diabetic retinopathy without macular edema
E13321 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema
E133211 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye
E133212 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye
E133213 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral
E133219 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, unspecified eye
E13329 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema

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E133291 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye
E133292 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye
E133293 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral
E133299 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye
E13331 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema
E133311 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye
E133312 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye
E133313 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
E133319 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye
E13339 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema
E133391 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye
E133392 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
E133393 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
E133399 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye
E13341 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema
E133411 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye
E133412 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye
E133413 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral
E133419 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, unspecified eye
E13349 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema
E133491 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye
E133492 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye
E133493 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral
E133499 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, unspecified eye
E13351 Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema
E133511 Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye
E133512 Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye
E133513 Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral
E133519 Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema, unspecified eye
E133521 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
E133522 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
E133523 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
E133529 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, unspecified eye

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E133531 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye

E133532 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye

E133533 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral

E133539 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye

E133541 Other specified diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye

E133542 Other specified diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye

E133543 Other specified diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral

E133549 Other specified diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye

E133551 Other specified diabetes mellitus with stable proliferative diabetic retinopathy, right eye

E133552 Other specified diabetes mellitus with stable proliferative diabetic retinopathy, left eye

E133553 Other specified diabetes mellitus with stable proliferative diabetic retinopathy, bilateral

E133559 Other specified diabetes mellitus with stable proliferative diabetic retinopathy, unspecified eye

E13359 Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema

E133591 Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye

E133592 Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye

E133593 Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral

E133599 Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema, unspecified eye

E1336 Other specified diabetes mellitus with diabetic cataract

E1337×1 Other specified diabetes mellitus with diabetic macular edema, resolved following treatment, right eye

E1337×2 Other specified diabetes mellitus with diabetic macular edema, resolved following treatment, left eye

E1337×3 Other specified diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral

E1337×9 Other specified diabetes mellitus with diabetic macular edema, resolved following treatment, unspecified eye

E1339 Other specified diabetes mellitus with other diabetic ophthalmic complication

E1340 Other specified diabetes mellitus with diabetic neuropathy, unspecified

E1341 Other specified diabetes mellitus with diabetic mononeuropathy

E1342 Other specified diabetes mellitus with diabetic polyneuropathy

E1343 Other specified diabetes mellitus with diabetic autonomic (poly)neuropathy

E1344 Other specified diabetes mellitus with diabetic amyotrophy

E1349 Other specified diabetes mellitus with other diabetic neurologic complication

E1351 Other specified diabetes mellitus with diabetic peripheral angiopathy without gangrene

E1352 Other specified diabetes mellitus with diabetic peripheral angiopathy with gangrene

E1359 Other specified diabetes mellitus with other circulatory complications

E13610 Other specified diabetes mellitus with diabetic neuropathic arthropathy

E13618 Other specified diabetes mellitus with other diabetic arthropathy

E13620 Other specified diabetes mellitus with diabetic dermatitis

E13621 Other specified diabetes mellitus with foot ulcer

E13622 Other specified diabetes mellitus with other skin ulcer

E13628 Other specified diabetes mellitus with other skin complications

E13630 Other specified diabetes mellitus with periodontal disease

E13638 Other specified diabetes mellitus with other oral complications

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E13641 Other specified diabetes mellitus with hypoglycemia with coma
 E13649 Other specified diabetes mellitus with hypoglycemia without coma
 E1365 Other specified diabetes mellitus with hyperglycemia
 E1369 Other specified diabetes mellitus with other specified complication
 E138 Other specified diabetes mellitus with unspecified complications
 E139 Other specified diabetes mellitus without complications

Diabetes Diagnosis Codes: Other

Note: This category includes all diabetes cases for which there is no amputation and that do not fit elsewhere.

E109 Type 1 diabetes mellitus without complications
 E11618 Type 2 diabetes mellitus with other diabetic arthropathy
 E119 Type 2 diabetes mellitus without complications
 E1300 Other specified diabetes mellitus with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma (NKHHC)
 E1301 Other specified diabetes mellitus with hyperosmolarity with coma
 E1310 Other specified diabetes mellitus with ketoacidosis without coma
 E1311 Other specified diabetes mellitus with ketoacidosis with coma
 E1321 Other specified diabetes mellitus with diabetic nephropathy
 E1322 Other specified diabetes mellitus with diabetic chronic kidney disease
 E1329 Other specified diabetes mellitus with other diabetic kidney complication
 E13311 Other specified diabetes mellitus with unspecified diabetic retinopathy with macular edema
 E13319 Other specified diabetes mellitus with unspecified diabetic retinopathy without macular edema
 E13321 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema
 E133211 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye
 E133212 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye
 E133213 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral
 E133219 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, unspecified eye
 E13329 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema
 E133291 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye
 E133292 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye
 E133293 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral
 E133299 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye
 E13331 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema
 E133311 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye
 E133312 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye
 E133313 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
 E133319 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye
 E13339 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema
 E133391 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye
 E133392 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
 E133393 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral

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E133399 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye

E13341 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema

E133411 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye

E133412 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye

E133413 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral

E133419 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, unspecified eye

E13349 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema

E133491 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye

E133492 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye

E133493 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral

E133499 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, unspecified eye

E13351 Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema

E133511 Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye

E133512 Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye

E133513 Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral

E133519 Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema, unspecified eye

E133521 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye

E133522 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye

E133523 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral

E133529 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, unspecified eye

E133531 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye

E133532 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye

E133533 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral

E133539 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye

E133541 Other specified diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye

E133542 Other specified diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye

E133543 Other specified diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral

E133549 Other specified diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye

E133551 Other specified diabetes mellitus with stable proliferative diabetic retinopathy, right eye

E133552 Other specified diabetes mellitus with stable proliferative diabetic retinopathy, left eye

E133553 Other specified diabetes mellitus with stable proliferative diabetic retinopathy, bilateral

E133559 Other specified diabetes mellitus with stable proliferative diabetic retinopathy, unspecified eye

E13359 Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema

E133591 Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye

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E133592 Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye
 E133593 Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral
 E133599 Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema, unspecified eye
 E1336 Other specified diabetes mellitus with diabetic cataract
 E1337×1 Other specified diabetes mellitus with diabetic macular edema, resolved following treatment, right eye
 E1337×2 Other specified diabetes mellitus with diabetic macular edema, resolved following treatment, left eye
 E1337×3 Other specified diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral
 E1337×9 Other specified diabetes mellitus with diabetic macular edema, resolved following treatment, unspecified eye
 E1339 Other specified diabetes mellitus with other diabetic ophthalmic complication
 E1340 Other specified diabetes mellitus with diabetic neuropathy, unspecified
 E1341 Other specified diabetes mellitus with diabetic mononeuropathy
 E1342 Other specified diabetes mellitus with diabetic polyneuropathy
 E1343 Other specified diabetes mellitus with diabetic autonomic (poly)neuropathy
 E1344 Other specified diabetes mellitus with diabetic amyotrophy
 E1349 Other specified diabetes mellitus with other diabetic neurologic complication
 E1351 Other specified diabetes mellitus with diabetic peripheral angiopathy without gangrene
 E1352 Other specified diabetes mellitus with diabetic peripheral angiopathy with gangrene
 E1359 Other specified diabetes mellitus with other circulatory complications
 E13610 Other specified diabetes mellitus with diabetic neuropathic arthropathy
 E13618 Other specified diabetes mellitus with other diabetic arthropathy
 E13620 Other specified diabetes mellitus with diabetic dermatitis
 E13621 Other specified diabetes mellitus with foot ulcer
 E13622 Other specified diabetes mellitus with other skin ulcer
 E13628 Other specified diabetes mellitus with other skin complications
 E13630 Other specified diabetes mellitus with periodontal disease
 E13638 Other specified diabetes mellitus with other oral complications
 E13641 Other specified diabetes mellitus with hypoglycemia with coma
 E13649 Other specified diabetes mellitus with hypoglycemia without coma
 E1365 Other specified diabetes mellitus with hyperglycemia
 E1369 Other specified diabetes mellitus with other specified complication
 E138 Other specified diabetes mellitus with unspecified complications
 E139 Other specified diabetes mellitus without complications

Diabetes Diagnosis Codes: Unclassified

Note: This category includes all diabetes codes that do not fall in any of the other existing diabetes categories.

E100, E1012, E1020, E1023, E1028, E1030, E1050, E1060, E1068, E1070, E1071, E1078, E110, E1110, E1111, E1112, E1120, E1123, E1128, E1130, E1138, E1150, E1160, E1168, E1170, E1171, E1178, E130, E1312, E1323, E1328, E1368, E1370

Data from Agency for Healthcare Research and Quality. Prevention Quality Indicator Technical Specifications. Available at: http://www.qualityindicators.ahrq.gov/Modules/PQI_TechSpec_ICD10_v70.aspx. Accessed October 20, 2019.

Common Nonpreventable Clinical Diagnosis Groups and Respective ICD-10 Codes Used to Indicate Diagnosis

Sepsis

- A40 Streptococcal septicaemia
- A41 Other septicaemia
- R65 Systemic Inflammatory Response Syndrome [SIRS]

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Stroke, Transient Ischemic Attack, Intracranial Hemorrhage

- I60 Subarachnoid hemorrhage
- I61 Intracerebral hemorrhage
- I62 Other nontraumatic intracranial hemorrhage
- I63 Cerebral infarction
- I64 Stroke, not specified as hemorrhage or infarction
- I65 Occlusion and stenosis of precerebral arteries, not resulting in cerebral infarction
- I66 Occlusion and stenosis of cerebral arteries, not resulting in cerebral infarction
- G45 Transient cerebral ischemic attacks and related syndromes
- S06.6 Traumatic subarachnoid hemorrhage

Cancer and Chemotherapy

- C00–C97 Malignant neoplasms
- No code for chemotherapy

Cardiac Valve Disease

- I05–I08 Chronic rheumatic heart diseases

Arrhythmia

- I44 Atrioventricular and left bundle-branch block
- I45 Other conduction disorders
- I46 Cardiac arrest
- I47 Paroxysmal tachycardia
- I48 Atrial fibrillation and flutter
- I49 Other cardiac arrhythmias

Ischemic Heart Disease

- I20–I25 Ischemic heart diseases

Dementia

- F00–F03 Dementia
- G30 Alzheimer's disease

Gastrointestinal Infections and Disorders

- A08 Viral and other specified intestinal infections
- K20–K31 Diseases of esophagus, stomach, and duodenum
- K55–K63 Other diseases of intestines
- K65–K67 Diseases of peritoneum

Kidney Failure

- N00–N08 Glomerular diseases
- N10–N16 Renal tubulo-interstitial diseases
- N17–N19 Renal failure

Cellulitis

- L02 Cutaneous abscess, furuncle, and carbuncle
- L03 Cellulitis

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Orthopedic Conditions

- M00 Pyogenic arthritis
- M01 Direct infections of joint in infectious and parasitic diseases classified elsewhere
- M02 Reactive arthropathies
- M05 Seropositive rheumatoid arthritis
- M06 Other rheumatoid arthritis
- M08 Juvenile arthritis
- M11 Other crystal arthropathies
- M12 Other specific arthropathies
- M13 Other arthritis
- M14 Arthropathies in other diseases classified elsewhere
- M15 Polyarthrosis
- M19 Other arthrosis
- M20 Acquired deformities of fingers and toes
- M21 Other acquired deformities of limbs
- M22 Disorders of patella
- M23 Internal derangement of knee
- M24 Other specific joint derangements
- M25 Other joint disorders, not elsewhere classified
- M32 Systemic lupus erythematosus
- M33 Dermatopolymyositis
- M35 Other systemic involvement of connective tissue
- M42 Spinal osteochondrosis
- M43 Other deforming dorsopathies
- M45 Ankylosing spondylitis
- M46 Other inflammatory spondylopathies
- M47 Spondylosis
- M48 Other spondylopathies
- M49 Spondylopathies in diseases classified elsewhere
- M50 Cervical disc disorders
- M51 Other intervertebral disc disorders
- M53 Other dorsopathies, not elsewhere classified
- M54 Dorsalgia
- M60 Myositis
- M62 Other disorders of muscle
- M63 Disorders of muscle in diseases classified elsewhere
- M65 Synovitis and tenosynovitis
- M66 Spontaneous rupture of synovium and tendon
- M67 Other disorders of synovium and tendon
- M68 Disorders of synovium and tendon in diseases classified elsewhere
- M70 Soft tissue disorders related to use, overuse, and pressure
- M71 Other bursopathies
- M72 Fibroblastic disorders
- M73 Soft tissue disorders in diseases classified elsewhere
- M75 Shoulder lesions
- M76 Enthesopathies of lower limb, excluding foot

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M77 Other enthesopathies
M79 Other soft tissue disorders, not elsewhere classified
M80 Osteoporosis with pathologic fracture
M81 Osteoporosis without pathologic fracture
M82 Osteoporosis in diseases classified elsewhere
M84 Pathologic fracture, not elsewhere classified
M86 Osteomyelitis
M88 Paget's disease of bone (osteitis deformans)
M89 Other disorders of bone
M90 Osteopathies in diseases classified elsewhere
M91 Juvenile osteochondrosis of hip and pelvis
M92 Other juvenile osteochondrosis
M93 Other osteochondropathies
M99 Biomechanical lesions, not elsewhere classified
R29 Other symptoms and signs involving the nervous and musculoskeletal systems
S12 Fracture of neck
S14 Injury of nerves and spinal cord at neck level
S22 Fracture of rib(s), sternum, and thoracic spine
S24 Injury of nerves and spinal cord at thorax level
S32 Fracture of lumbar spine and pelvis
S34 Injury of nerves and lumbar spinal cord at abdomen, lower back, and pelvis level
S72 Fracture of femur

Syncope and Dizziness

R55 Syncope and collapse
R42 Dizziness and giddiness

Other Pulmonary

J44 Other chronic obstructive pulmonary disease
J69 Pneumonitis due to solids and liquids
J91 Pleural effusion in conditions classified elsewhere
J96 Respiratory failure, not elsewhere classified

Peripheral Atherosclerosis

I70 Atherosclerosis
K55 Vascular disorders of intestine

Pulmonary Embolism and Deep Vein Thrombosis

I26 Pulmonary embolism
I27 Other pulmonary heart diseases
I82.4 Acute embolism and thrombosis of deep veins of lower extremity

Procedure or Device Complications

T82 Complications of cardiac and vascular prosthetic devices, implants, and grafts
T83 Complications of genitourinary prosthetic devices, implants, and grafts
T84 Complications of internal orthopedic prosthetic devices, implants, and grafts
T85 Complications of other internal prosthetic devices, implants, and grafts

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Rehabilitation

Z50 Care involving use of rehabilitation procedures

Data from Joynt KE, Gawande AA, Orav EJ, et al. Contribution of preventable acute care spending to total spending for high-cost Medicare patients. JAMA 2013;309:2572–2578.