

# Disproportionately High Direct Economic Burden of Type 2 Diabetes Mellitus Patients With Comorbid Cardiovascular Disease

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## BACKGROUND

- Patients with type 2 diabetes mellitus (T2DM) are at an increased risk of complications, including cardiovascular disease (CVD).<sup>1</sup>
- More than half of the \$245 billion spent in the United States (US) on diabetes care is related to complications.<sup>1</sup>
- Quantifying the CVD-related economic burden is necessary to determine the extent to which prevention of CVD should be a focus of T2DM care.

## STUDY OBJECTIVES

- Assess the proportion of patients with CVD in a population with T2DM.
- Describe healthcare resource utilization (HCRU) and costs among patients with and without CVD.
  - By setting of care (inpatient, emergency department [ED], physician office, other outpatient, pharmacy)
  - By reason for care (all-cause, T2DM-, CVD-, neuropathy-, nephropathy-, retinopathy-, and other-related)

## METHODS

### Data Source and Study Design

- IMS LifeLink PharMetrics Plus™ Claims Database.
- Retrospective observational cross-sectional cohort study.

### Sample/Population Selection

- Target population: patients with a diagnosis of T2DM during 2014.

- Inclusion:
  - ≥18 years old in 2014
  - Continuous health plan enrollment from January 2013 through December 2014

- Exclusion:
  - Diagnosis of gestational, secondary, or type 1 diabetes, or pregnancy in 2013 through 2014
  - Missing demographic information (eg, age, gender, geographic region)
  - Diagnosis of CVD only in the index year and not in pre-index year

- Cohorts:
  - Patients were placed into cohorts based upon the diagnosis of a CVD condition in 2013; T2DM with CVD or T2DM without CVD

### Definitions

- T2DM status: identified during 2014, and defined as having:
  - ≥1 hospitalization with a diagnosis of T2DM in any diagnosis field OR
  - ≥2 medical claims at least 30 days apart within 12 months in the outpatient setting, except lab and radiology, with a diagnosis of T2DM in any diagnosis field OR
  - ≥1 pharmacy claim indicated for T2DM, including a) a non-insulin injectable, or b) an oral anti-diabetic agent, except metformin, or c) metformin pharmacy claim without a diagnosis code for pre-diabetes or polycystic ovary syndrome<sup>2</sup>

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- CVD status: identified during 2013, and defined as having:
  - 1 hospitalization with diagnosis of a CVD condition (myocardial infarct, angina, heart failure, stroke, other ischemic disease, arrhythmias, cardiac arrest, atherosclerosis, peripheral vascular disease, arterial thrombosis and embolism, cardiomyopathy, endocarditis, pericarditis, myocarditis, rheumatic heart disease and fever, conduction disorders, other unspecified CVD conditions) in any diagnosis field or with a revascularization procedure OR
  - At least 2 non-diagnostic outpatient medical claims ≥30 days apart within 12 months with a diagnosis of a CVD in any diagnosis field

### Study Outcomes

- HCRU in 2014:
  - Bed-days per patient
  - Number of visits by setting of care, all-cause, and by reason for care (CVD, T2DM, neuropathy, nephropathy, retinopathy, and other)
- Healthcare costs in 2014, reported in 2014 United States dollars (USD):
  - All-cause and by reason for care

### Statistical Analysis

- Sample characteristics: unpaired t-tests and chi-square tests.
- Healthcare resource use and costs: unpaired t-tests and chi-square tests.
- Statistical analyses were conducted using SAS® version 9.2 (SAS Institute; Cary, NC, USA).

## RESULTS

### Sample Characteristics

**Table 1. Baseline Demographic and Clinical Characteristics**

Characteristics during the Pre-index period	T2DM with CVD (N=138,384)		T2DM without CVD (N=639,960)		P-value
Age as of index (in years), mean (SD)	65.0	(10.4)	56.4	(10.2)	<0.001
Male, n (%)	90,040	(65.1%)	338,428	(64.1%)	<0.001
Region, n (%)					
East	33,687	(24.3%)	136,279	(21.3%)	<0.0001
Midwest	37,500	(27.1%)	173,793	(27.2%)	-
South	59,069	(42.7%)	289,938	(45.3%)	-
West	8,128	(5.9%)	39,950	(6.2%)	-
Payer type, n (%)					
Commercial	131,399	(95.0%)	623,478	(97.4%)	<0.001
Medicaid/SCHIP	1,356	(1.0%)	4,470	(0.7%)	-
Medicare	4,214	(3.0%)	5,487	(0.9%)	-
Unknown/other	1,415	(1.0%)	6,525	(1.0%)	-
Charlson Comorbidity Index,* mean (SD)	0.97	(1.46)	0.36	(0.89)	<0.001
Presence of CVD risk factors, n (%)					
Dyslipidemia	111,792	(80.8%)	416,650	(65.1%)	<0.001
Hypertension	100,447	(72.6%)	290,307	(45.4%)	<0.001
Obesity	15,052	(10.9%)	52,094	(8.1%)	<0.001

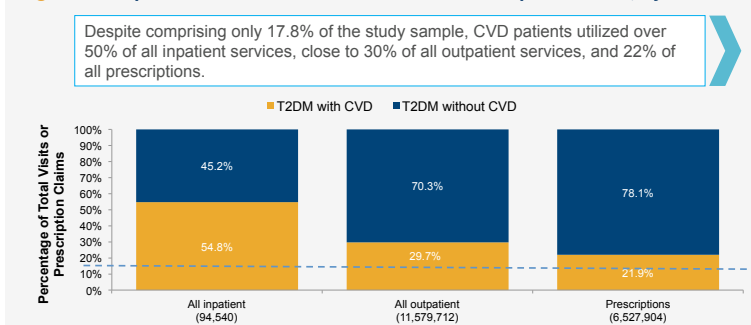
\* The CCI excluded diagnosis codes used to define T2DM and CVD.

CVD – cardiovascular disease; SCHIP – State Children's Health Insurance Program; SD – standard deviation; T2DM – type 2 diabetes mellitus.

## RESULTS (CONTINUED)

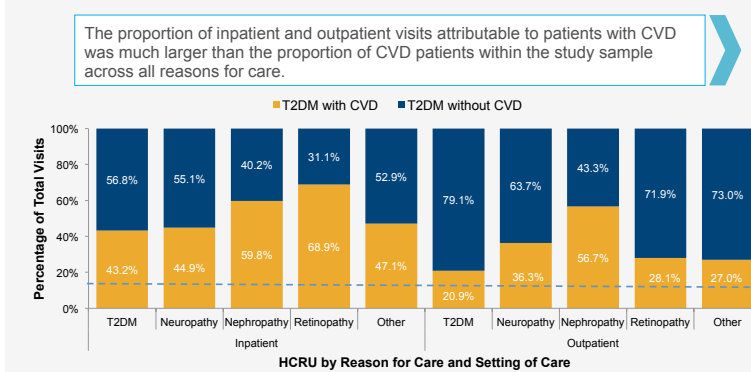
### Study Outcomes

**Figure 1. Proportion of Total All-cause Visits and Prescription Claims, by Cohort**



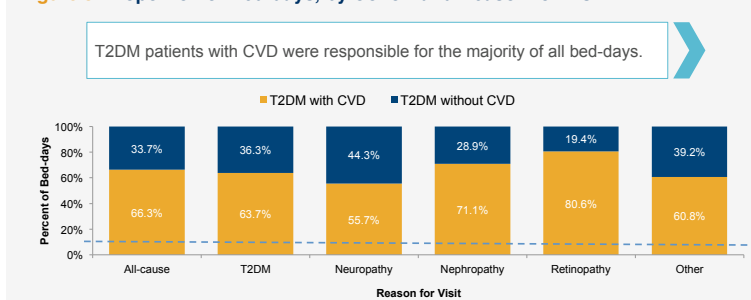
CVD – cardiovascular disease; HCRU – healthcare resource utilization; T2DM – type 2 diabetes mellitus.

**Figure 2. Proportion of Visits, by Cohort and Reason for Care**



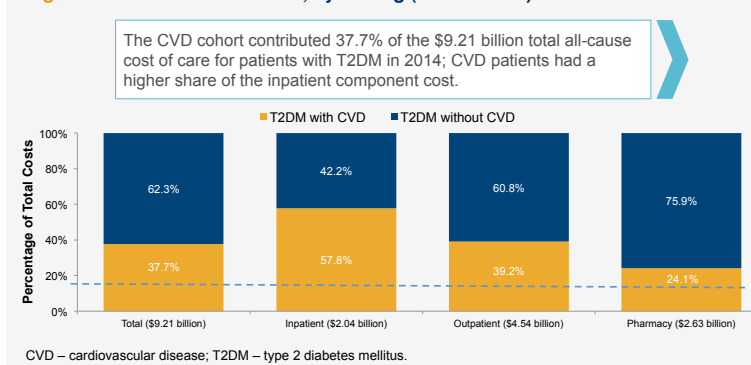
CVD – cardiovascular disease; HCRU – healthcare resource utilization; T2DM – type 2 diabetes mellitus.

**Figure 3. Proportion of Bed-days, by Cohort and Reason for Visit**



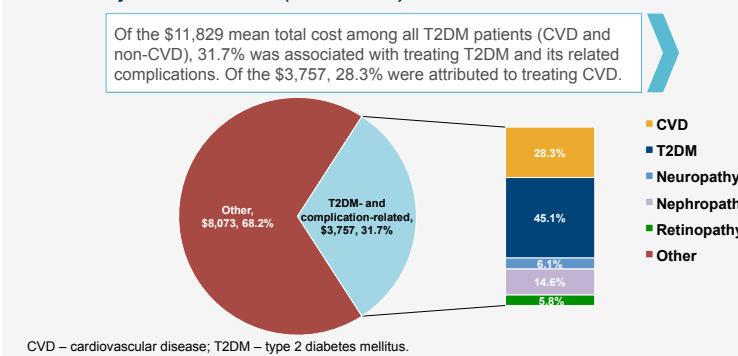
CVD – cardiovascular disease; T2DM – type 2 diabetes mellitus.

**Figure 4. All-cause Total Costs, by Setting (in 2014 USD)**



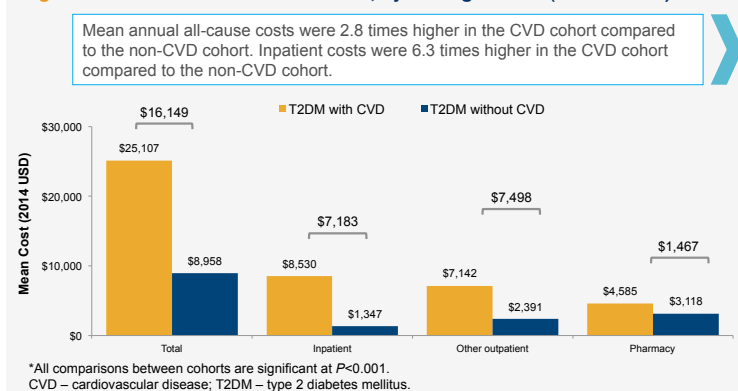
CVD – cardiovascular disease; T2DM – type 2 diabetes mellitus.

**Figure 5. Mean Annual All-cause Cost for All T2DM Patients (CVD and non-CVD), by Reason for Care (in 2014 USD)**



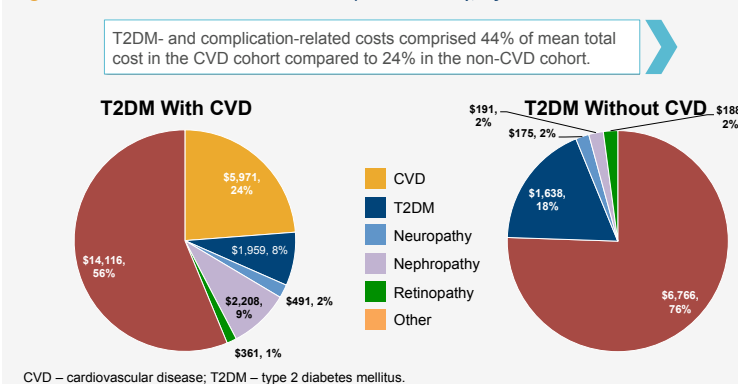
CVD – cardiovascular disease; T2DM – type 2 diabetes mellitus.

**Figure 6. Mean Annual All-cause Costs, by Setting of Care (in 2014 USD)**



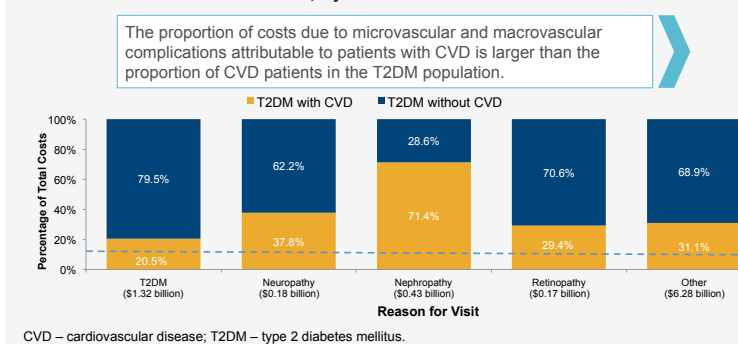
\*All comparisons between cohorts are significant at P<0.001. CVD – cardiovascular disease; T2DM – type 2 diabetes mellitus.

**Figure 7. Mean Annual All-cause Cost (in 2014 USD), by Reason for Care and Cohort**



CVD – cardiovascular disease; T2DM – type 2 diabetes mellitus.

**Figure 8. Percent of Total Population Costs (in 2014 USD) for Patients With and Without CVD, by Reason for Care**



CVD – cardiovascular disease; T2DM – type 2 diabetes mellitus.

## LIMITATIONS

- Baseline characteristics between cohorts were not controlled, thus confounding, rather than CVD, may have contributed to the differences observed in outcomes.
- The appropriate allocation of HCRU and associated costs was dependent upon the accuracy of coding.
- Results of the analysis are primarily generalizable to a commercially insured population.

## CONCLUSION

- Nearly 1 out of every 5 T2DM patients had comorbid CVD.
- Despite comprising only 17.8% of the study sample, T2DM patients with comorbid CVD utilized over 50% of all inpatient services, 30% of all outpatient services, and 22% of all prescriptions.
- T2DM patients with comorbid CVD accounted for approximately 38% of the total all-cause costs for patients with T2DM in 2014.
- Results of this study demonstrate that T2DM patients with CVD have high economic burden.

## REFERENCES

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