

# Michigan

## TYPE 2 DIABETES REPORT | 2016

*Featuring Demographic, Utilization, Charge, Pharmacotherapy, and Hypoglycemia Data*

10th Edition





# MICHIGAN TYPE 2 DIABETES REPORT 2016

## Introduction

The Greater Detroit Area Health Council, Michigan Association of Health Plans, Michigan Primary Care Consortium, and National Kidney Foundation of Michigan are pleased to present the **Michigan Type 2 Diabetes Report** for 2016, an overview of demographic, utilization, financial, and pharmacotherapy measures for Type 2 diabetes patients in key local markets across the state of Michigan. The report also provides state and national benchmarks that can help providers and employers identify better opportunities to serve the needs of their patients. All data are drawn from the Sanofi **Managed Care Digest Series**®.

This 10th edition features a number of examples of the kinds of disease-specific data on Type 2 diabetes that can be provided by these organizations and the **Managed Care Digest Series**. The sponsoring organizations chose Type 2 diabetes (high blood glucose levels caused by either a lack of insulin or the body's inability to use insulin efficiently) as the focus of this resource, as the prevalence of this disease has grown considerably in recent years.

The data in this report (current as of calendar year 2015) were gathered by IMS Health, Parsippany, NJ, a leading provider of innovative health care data products and analytic services. A review process takes place, before and during production of this report, between IMS Health and Forte Information Resources LLC.

Sanofi, as sponsor of this report, maintains an arm's-length relationship with the organizations that prepare the report and carry out the research for its contents. The desire of Sanofi is that the information in this report be completely independent and objective.

## Methodology

IMS Health generated most of the Type 2 diabetes data for this report out of health care professional (837p) and institutional (837i) insurance claims, representing more than 9 million unique patients nationally in 2015 with a diagnosis of Type 2 diabetes (ICD-9 codes 249.00-250.92; ICD-10 codes E08, E09, E11, E13). Data from physicians of all specialties and from all hospital types are included.

IMS Health also gathers data on prescription activity from the National Council for Prescription Drug Programs (NCPDP). These data account for some 2 billion prescription claims annually, or more than 86% of the prescription universe. These prescription data represent the sampling of prescription activity from a variety of sources, including retail chains, mass merchandisers, and pharmacy benefit managers. Cash, Medicaid, and third-party transactions are tracked.

Hospital discharge data are derived from IMS Health's *Hospital Procedure/Diagnosis* (HPD) database. This database contains an extensive set of hospital inpatient and outpatient discharge records, including actual diagnoses and procedures data for about 75% of all discharges nationwide (including 100% of Medicare-reimbursed discharges).

IMS Health uses Medicare procedure counts and additional hospital-level information to estimate procedure counts for the remaining 25% of discharges—the non-Medicare hospital discharge information in non-reporting states. The HPD inpatient database also reports the numbers of procedures performed on patients discharged from a hospital. The hospital inpatient data provided are current as of calendar year 2014.

### DATA INTEGRITY

Data arriving into IMS Health are put through a rigorous process to ensure that data elements match to valid references, such as product codes, ICD-9/10 (diagnosis) and CPT-4 (procedure) codes, and provider and facility data.

Claims undergo a careful de-duplication process to ensure that when multiple, voided, or adjusted claims are assigned to a patient encounter, they are applied to the database, but only for a single, unique patient.

Through its patient encryption methods, IMS Health creates a unique, random numerical identifier for every patient, and then strips away all patient-specific health information that is protected under the Health Insurance Portability and Accountability Act (HIPAA). The identifier allows IMS Health to track disease-specific diagnosis and procedure activity across the various settings where patient care is provided (hospital inpatient, hospital outpatient, emergency rooms, clinics, doctors' offices, and pharmacies), while protecting the privacy of each patient.

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# PATIENT DEMOGRAPHICS



DISTRIBUTION OF TYPE 2 DIABETES PATIENTS, BY AGE, 2014-2015

MARKET	0-17		18-35		36-64		65-79		80+	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Ann Arbor	0.5%	0.9%	2.8%	3.1%	44.4%	43.4%	39.8%	40.5%	12.5%	12.2%
Detroit	0.7	1.2	3.4	3.5	47.4	47.0	35.7	36.1	12.9	12.3
Flint	0.4	0.8	2.8	3.1	47.6	47.0	37.1	37.5	12.1	11.7
Grand Rapids	0.8	1.0	3.6	3.6	47.0	46.9	36.5	36.7	12.1	11.8
Kalamazoo	0.4	0.7	3.5	3.5	46.2	46.1	37.0	37.2	13.0	12.6
Lansing	0.5	0.6	3.3	3.3	46.7	46.1	37.6	37.8	11.9	12.2
Saginaw	0.4	0.8	2.5	2.5	40.7	41.1	42.3	42.1	14.2	13.6
Michigan	0.6	1.0	3.2	3.3	45.9	45.6	37.4	37.7	12.9	12.4
NATION	0.5%	1.0%	2.9%	3.0%	45.1%	45.0%	38.4%	38.4%	13.2%	12.7%

DISTRIBUTION OF TYPE 2 DIABETES PATIENTS, BY NUMBER OF COMORBIDITIES, 2014-2015<sup>1</sup>

MARKET	0		1		2		>2	
	2014	2015	2014	2015	2014	2015	2014	2015
Ann Arbor	58.9%	57.8%	12.9%	12.9%	9.7%	9.8%	18.5%	19.5%
Detroit	36.7	40.8	13.4	13.2	12.3	11.3	37.7	34.7
Flint	35.5	36.4	12.4	14.3	11.9	12.4	40.2	36.9
Grand Rapids	25.2	25.1	12.4	12.2	13.8	13.3	48.7	49.5
Kalamazoo	30.5	39.7	13.8	16.9	13.2	16.8	42.6	26.6
Lansing	36.0	43.0	11.9	12.1	10.8	9.8	41.3	35.0
Saginaw	40.3	39.6	12.9	13.7	12.1	11.9	34.7	34.8
Michigan	36.2	39.0	12.9	13.4	12.3	12.1	38.6	35.5
NATION	36.8%	37.8%	12.6%	13.0%	11.9%	12.1%	38.7%	37.2%

PERCENTAGE OF TYPE 2 DIABETES PATIENTS WITH VARIOUS CO-OCCURRING CONDITIONS, 2015<sup>1</sup>

MARKET	Conges- tive Heart Failure	Depression	Hyper- lipidemia	Hyperten- sion	Obesity	Hypo- glycemia	PAD
Ann Arbor	10.6%	10.7%	44.3%	70.1%	22.9%	8.3%	6.3%
Detroit	13.3	9.2	54.1	77.6	31.1	8.4	14.4
Flint	10.4	11.8	49.7	79.4	33.3	7.5	14.6
Grand Rapids	10.9	15.6	64.9	80.4	25.3	10.7	11.8
Kalamazoo	12.5	12.8	51.5	74.7	22.3	13.4	12.8
Lansing	12.5	14.3	53.4	72.8	39.3	4.7	13.6
Saginaw	14.9	12.4	50.6	80.4	28.8	6.4	16.2
Michigan	12.3	11.8	55.4	77.1	29.4	8.4	13.8
NATION	11.6%	10.4%	60.9%	79.4%	19.5%	9.1%	15.0%

DISTRIBUTION OF TYPE 2 DIABETES PATIENTS, BY A1c LEVEL RANGE, 2015<sup>2</sup>

MARKET	≤7.0%	7.1-7.9%	8.0-9.0%	>9.0%
Ann Arbor	50.6%	22.4%	10.6%	16.5%
Detroit	45.7	20.7	14.6	19.1
Flint	52.6	16.1	12.4	19.0
Grand Rapids	50.7	23.8	12.1	13.3
Kalamazoo	51.9	20.4	11.1	16.6
Lansing	44.4	21.0	16.8	17.8
Saginaw	51.5	25.8	11.0	11.7
Michigan	46.7	21.2	13.8	18.3
NATION	48.3%	21.4%	13.7%	16.6%

## WORKING-AGE SHARES OF TYPE 2 DIABETES PTS. SURPASS THAT OF U.S. IN MOST MI MKTS.

In six of the eight profiled Michigan markets (Ann Arbor and Saginaw excluded), the percentages of Type 2 diabetes patients who were of working age (18-64) in 2015 were higher than the corresponding national mark of 48.0%. However, the shares of such patients in the 65-79 age range expanded from 2014 to 2015 in all but one Michigan market: Saginaw.

## RATE OF OBESITY AMONG MICHIGAN TYPE 2 DIABETES PATIENTS TOPS U.S. MARK

Compared with their peers across the country, Type 2 diabetes patients in the featured Michigan markets were considerably more prone to be diagnosed with obesity as a comorbid condition in 2015. Statewide, 29.4% of Type 2 diabetes patients were diagnosed with obesity, compared with 19.5% nationally. Michigan patients were likewise more likely than similar patients across the U.S. to have congestive heart failure or depression.

<sup>1</sup> A co-occurring condition is a diagnosis a Type 2 diabetes patient may also have, which may or may not be directly related to the diabetes. Such conditions were narrowed down to a subset of conditions which are typically present in patients with Type 2 diabetes. Co-occurring conditions of Type 2 diabetes include, but are not limited to, congestive heart failure, depression, hyperlipidemia, hypertension, obesity, hypoglycemia, and peripheral artery disease (PAD).

<sup>2</sup> The A1c test measures how much glucose has been in the blood during the past 2-3 months. Figures reflect the percentage of Type 2 diabetes patients who have had at least one A1c test in a given year.

NOTE: Throughout this report, the Grand Rapids market includes Muskegon and Holland; Kalamazoo includes Battle Creek; Lansing includes East Lansing; and Saginaw includes Bay City and Midland.



# CASES/ALOS/HOSPITAL CHARGES

NUMBER OF DIABETES MELLITUS CASES PER HOSPITAL PER YEAR, BY PAYER, 2014

MARKET	Inpatient				Outpatient			
	Overall		With Hypoglycemia		Overall		With Hypoglycemia	
	Medicare	Commercial	Medicare	Commercial	Medicare	Non-Medicare	Medicare	Non-Medicare
Ann Arbor	961.2	237.5	55.0	15.2	9,775.1	5,333.1	512.3	183.0
Detroit	911.7	190.8	41.9	9.0	8,850.3	5,711.6	374.3	135.7
Flint	1,287.3	328.3	89.3	27.3	9,057.7	7,389.0	537.0	254.3
Grand Rapids	1,005.8	184.9	30.0	6.6	9,162.9	5,309.6	216.3	115.8
Kalamazoo	550.8	138.5	34.7	12.6	8,619.5	6,116.0	369.8	125.3
Lansing	641.4	158.4	38.3	22.0	7,933.8	6,340.4	309.0	211.8
Saginaw	783.0	97.3	38.5	4.7	9,337.2	5,755.5	346.0	140.3
Michigan	627.2	133.2	31.6	8.5	6,544.2	4,113.3	253.4	101.8
NATION	578.8	200.2	43.7	18.8	3,334.9	3,270.6	154.7	133.0

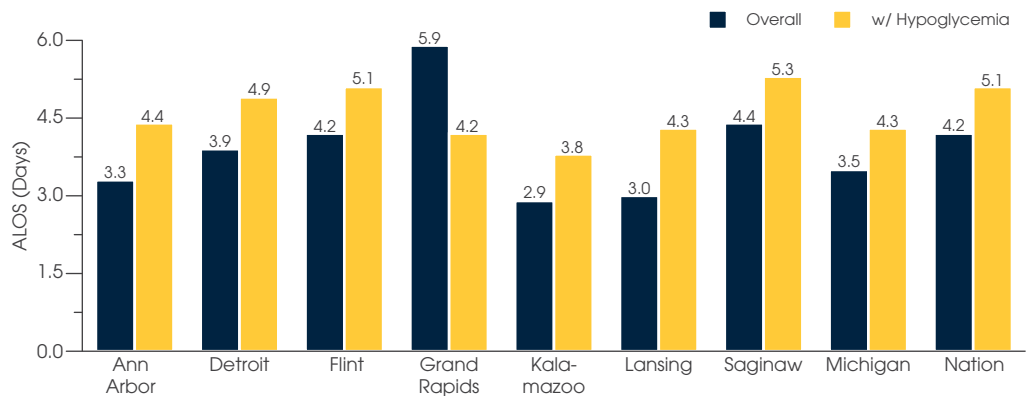
## MICHIGAN HOSPITALS REPORT HIGH OP DIABETES MELLITUS CASE COUNTS

In each of the seven Michigan local markets shown, as well as across the state, hospitals treated much higher average numbers of outpatient (OP) Medicare and non-Medicare diabetes mellitus cases in 2014 than those of the nation. Of the profiled markets, Ann Arbor recorded the highest number of such Medicare cases in 2014 (9,775.1) and Flint had the highest non-Medicare average case count (7,389.0) that year.

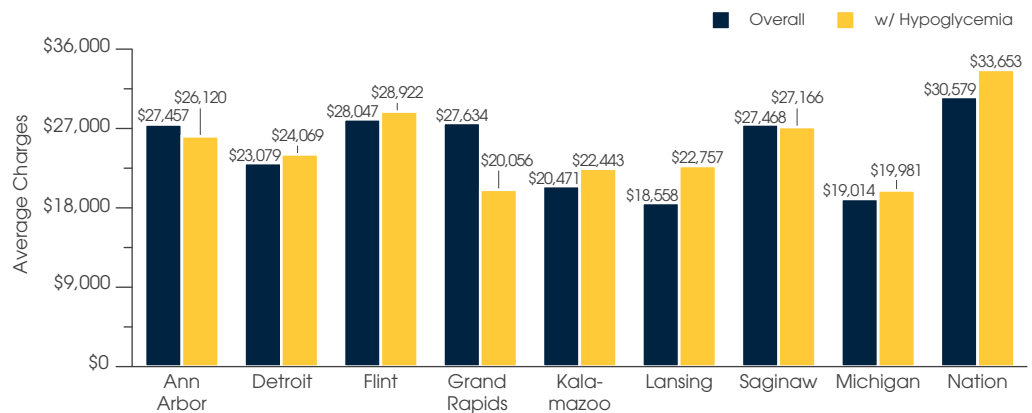
<sup>1</sup> Charge data are per-case averages for inpatients with a particular diagnosis of interest. Charges may be for treatment related to other diagnoses. Data reflect the total charges billed by the hospital for the entire episode of care, and may include accommodation, pharmacy, laboratory, radiology, and other charges not billed by the physician. Data do not necessarily indicate final amounts paid.

NOTE: Case counts, average length of stay, and hospital inpatient charge data come from IMS Health's Hospital Procedure/Diagnosis (HPD) database. Data are based on all short-term, acute-care, nonfederal hospitals and are effective as of end of year 2014.

AVERAGE LENGTH OF STAY PER DIABETES MELLITUS HOSPITAL INPATIENT CASE (DAYS), 2014



CHARGES PER DIABETES MELLITUS HOSPITAL INPATIENT CASE, 2014<sup>1</sup>



Data source: IMS Health © 2016



# FACILITY CHARGES

FACILITY CHARGES PER YEAR FOR TYPE 2 DIABETES PATIENTS, 2014-2015<sup>1</sup>

MARKET	Inpatient		Outpatient	
	2014	2015	2014	2015
Ann Arbor	—	\$32,985	\$8,213	\$8,293
Detroit	\$25,083	25,680	6,948	8,042
Flint	—	44,933	—	8,265
Grand Rapids	35,279	37,829	8,953	10,012
Kalamazoo	28,556	36,296	9,929	8,985
Lansing	26,295	33,719	7,001	7,258
Saginaw	22,366	24,947	8,416	5,205
Michigan	28,809	30,953	8,439	9,413
NATION	\$41,859	\$43,183	\$11,762	\$12,253

## IP FACILITY CHARGES FOR MI TYPE 2 DIABETES PATIENTS GROW FASTER THAN NATION'S

From 2014 (\$28,809) to 2015 (\$30,953), average annual inpatient (IP) facility charges for Michigan Type 2 diabetes patients increased 7.4%, while the corresponding national means rose 3.2%, to \$43,183 from \$41,859.

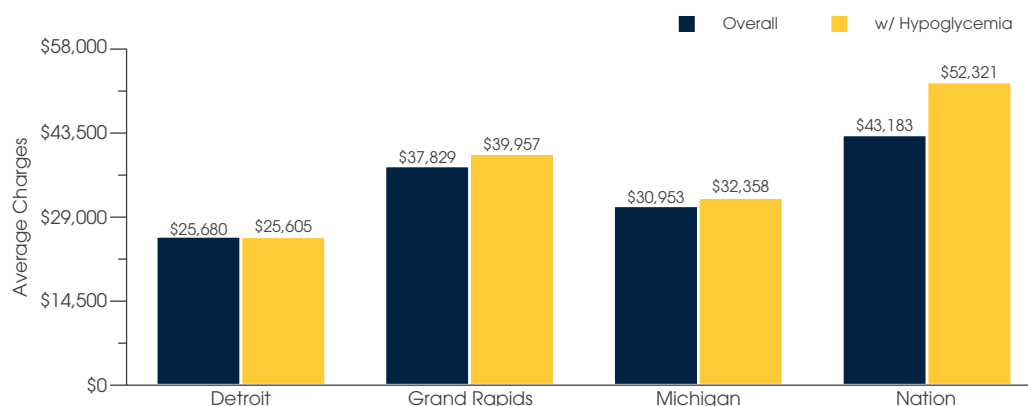
## OP FACILITY CHARGES FOR MI TYPE 2 DIABETES PATIENTS INCREASE BY MORE THAN 10%

Average annual outpatient (OP) facility charges for Michigan Type 2 diabetes patients climbed 11.5% from 2014 to 2015. As with inpatient facility charges for these Michigan patients, this rate of growth exceeded that of the nation (4.2%).

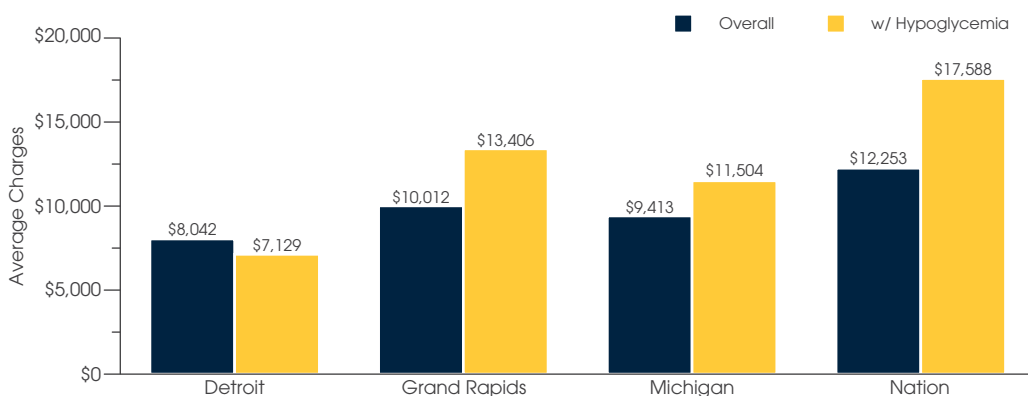
## MI TYPE 2 DIABETES PATIENTS WITH HYPOGLYCEMIA HAVE HIGHER FACILITY CHARGES

Both inpatient (\$32,358) and outpatient (\$11,504) facility charges for Michigan Type 2 diabetes patients with a complication of hypoglycemia were higher than those of Michigan Type 2 diabetes patients overall (\$30,953 and \$9,413, respectively) in 2015.

INPATIENT FACILITY CHARGES FOR TYPE 2 DIABETES PATIENTS, OVERALL VS. TYPE 2 DIABETES PATIENTS WITH A COMPLICATION OF HYPOGLYCEMIA, 2015<sup>1,2</sup>



OUTPATIENT FACILITY CHARGES FOR TYPE 2 DIABETES PATIENTS, OVERALL VS. TYPE 2 DIABETES PATIENTS WITH A COMPLICATION OF HYPOGLYCEMIA, 2015<sup>1,2</sup>



<sup>1</sup> Figures reflect the charges generated by the facilities that delivered care. The data also reflect the amounts charged, not the amounts paid.

<sup>2</sup> A complication is defined as a patient condition caused by the Type 2 diabetes of the patient. These conditions are a direct result of having Type 2 diabetes. Complications of Type 2 diabetes include, but are not limited to, cardiovascular disease, hypoglycemia, nephropathy, neuropathy, peripheral artery disease (PAD), and retinopathy.

NOTE: Some facility charge data were unavailable for the selected markets.

Data source: IMS Health © 2016



# USE OF SERVICES/PHARMACOTHERAPY

## SHARE OF MI TYPE 2 DIABETES PTS. RECEIVING AN A1c TEST EXCEEDS THAT OF NATION

Despite falling in four (Ann Arbor, Detroit, Kalamazoo, and Lansing) of the seven profiled Michigan markets from 2014 to 2015, the share of Michigan Type 2 diabetes patients who received an A1c test (76.7%) in 2015 exceeded that of the nation (74.0%).

## RATE AT WHICH MICHIGAN TYPE 2 DIABETES PTS. FILL ANY INSULINS IS UNCHANGED

In both 2014 and 2015, the percentage of Michigan Type 2 diabetes patients who filled a prescription for any insulin products was 34.5%; nationally, this percentage fell, to 34.0% from 34.3%. Of the profiled Michigan markets, decreases in the shares of such patients filling any insulin products were recorded in Ann Arbor, Grand Rapids, and Lansing.

<sup>1</sup> The A1c test measures the amount of glucose present in the blood during the past 2-3 months. Figures reflect the percentage of Type 2 diabetes patients who have had at least one A1c test in a given year.

<sup>2</sup> Patients who filled prescriptions for any insulin products may have also filled prescriptions for products in the non-insulin category, and vice versa.

<sup>3</sup> A complication is defined as a patient condition caused by the Type 2 diabetes of the patient. These conditions are a direct result of having Type 2 diabetes. Complications of Type 2 diabetes include, but are not limited to, cardiovascular disease, hypoglycemia, nephropathy, neuropathy, peripheral artery disease (PAD), and retinopathy.

PERCENTAGE OF TYPE 2 DIABETES PATIENTS, BY TYPE OF SERVICE, 2014-2015

MARKET	A1c Test <sup>1</sup>		Blood Glucose Test		Serum Cholesterol Test		Urine Microalbumin Test		Ophthalmologic Exam	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Ann Arbor	74.9%	74.5%	84.7%	84.6%	83.8%	83.7%	75.0%	74.3%	71.4%	72.3%
Detroit	77.1	77.0	86.7	86.7	84.7	84.7	75.1	75.2	68.1	67.5
Flint	75.3	75.3	84.8	85.9	83.7	83.5	74.6	74.4	67.3	67.7
Grand Rapids	79.1	79.8	85.9	85.8	83.6	83.8	75.5	75.8	64.8	64.8
Kalamazoo	76.4	75.3	85.8	84.9	83.5	83.5	75.0	74.9	71.9	71.8
Lansing	74.8	73.7	86.0	85.3	83.6	83.7	74.9	75.0	73.1	74.4
Saginaw	73.3	74.7	84.6	84.8	84.0	83.4	75.3	74.7	72.5	69.3
Michigan	76.7	76.7	86.0	86.0	84.1	84.1	75.1	75.1	69.0	68.6
NATION	73.9%	74.0%	86.7%	86.6%	84.4%	84.3%	71.4%	71.3%	69.7%	69.4%

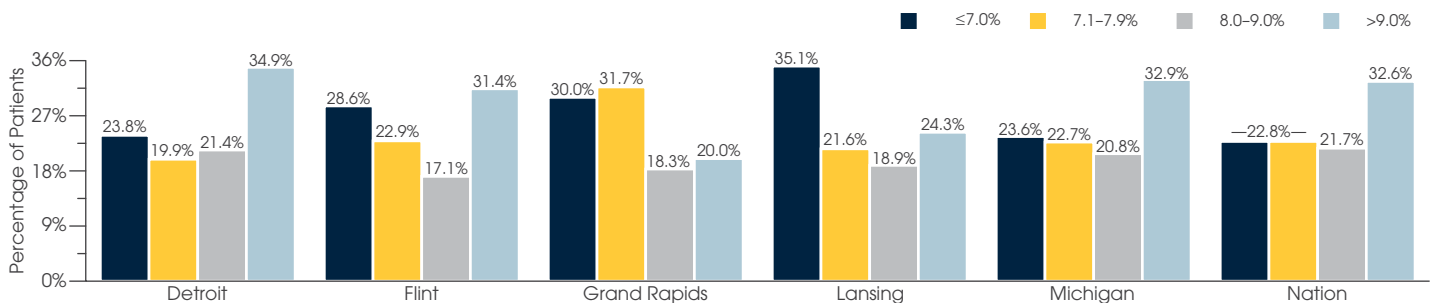
PERCENTAGE OF TYPE 2 DIABETES PATIENTS USING VARIOUS INSULIN THERAPIES, 2014-2015<sup>2</sup>

MARKET	Any Insulin Products		Long-Acting Insulin		Rapid-Acting Insulin		Short-Acting Insulin		Mixed Insulin	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Ann Arbor	37.1%	36.8%	27.9%	28.0%	17.4%	18.0%	18.7%	19.0%	5.6%	4.8%
Detroit	33.9	34.0	26.2	26.9	16.9	17.5	17.9	18.4	4.8	4.1
Flint	37.9	38.2	28.6	29.3	16.9	17.5	18.9	19.4	6.6	6.0
Grand Rapids	33.9	33.8	27.2	27.8	17.7	17.8	18.4	18.5	3.1	2.6
Kalamazoo	34.3	34.3	28.4	28.5	18.1	18.0	19.0	18.9	2.0	1.6
Lansing	31.7	31.4	25.1	25.5	14.6	14.4	15.6	15.2	3.9	3.5
Saginaw	36.1	36.1	28.5	29.4	18.6	19.2	20.0	20.5	3.6	3.1
Michigan	34.5	34.5	27.0	27.6	17.2	17.6	18.2	18.5	4.3	3.7
NATION	34.3%	34.0%	26.2%	26.4%	16.7%	16.7%	17.9%	17.8%	4.9%	4.4%

PERCENTAGE OF TYPE 2 DIABETES PATIENTS WITH A COMPLICATION OF HYPOGLYCEMIA USING VARIOUS THERAPIES, 2015<sup>3</sup>

MARKET	Long-Acting Insulin	Rapid-Acting Insulin	Short-Acting Insulin	Mixed Insulin	2+ Non-Insulin Products
Ann Arbor	52.0%	51.0%	51.5%	12.0%	—
Detroit	52.3	44.5	47.1	8.7	13.4%
Flint	49.0	35.0	38.7	9.8	16.5
Grand Rapids	51.1	49.1	50.5	4.0	13.4
Kalamazoo	46.8	39.7	42.3	1.9	16.3
Lansing	57.1	41.6	42.9	7.5	—
Saginaw	57.0	53.9	55.9	3.9	10.7
Michigan	51.9	45.4	47.6	6.7	13.6
NATION	44.5%	34.8%	37.1%	8.1%	19.5%

A1c LEVEL RANGES FOR TYPE 2 DIABETES PATIENTS USING ANY INSULIN PRODUCTS, 2015<sup>1,2</sup>



Data source: IMS Health © 2016

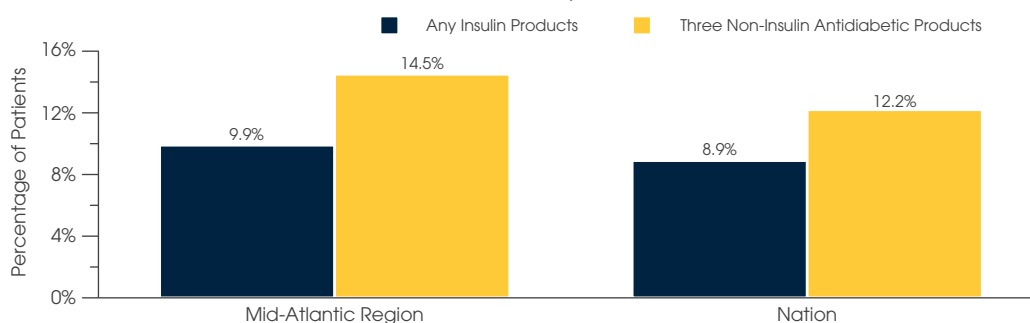
# PHARMACOTHERAPY



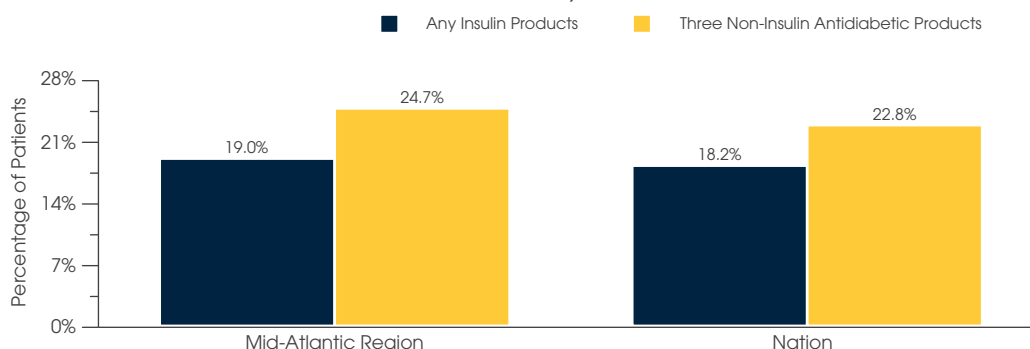
PERCENTAGE OF TYPE 2 DIABETES PATIENTS USING VARIOUS NON-INSULIN ANTIDIABETIC THERAPIES, 2014-2015<sup>1</sup>

MARKET	Any Non-Insulin Antidiabetic Product		Sulfonylureas		Insulin Sensitizing Agents		GLP-1 Receptor Agonists		GLP-1 + Long-Acting Insulin		DPP-4 Inhibitors		SGLT-2 Inhibitors	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Ann Arbor	82.9%	83.5%	31.2%	30.6%	3.4%	3.8%	3.5%	4.5%	1.1%	1.9%	6.2%	7.1%	1.7%	3.9%
Detroit	84.3	84.9	30.5	29.2	4.1	3.9	3.4	3.9	1.2	1.5	9.3	9.8	2.3	4.3
Flint	83.6	83.7	32.5	31.4	4.0	3.8	4.6	4.6	1.5	1.6	6.1	6.7	1.8	3.4
Grand Rapids	83.9	84.5	25.1	23.5	8.0	8.0	5.9	7.7	1.8	2.5	6.3	7.1	2.2	4.5
Kalamazoo	84.5	85.4	23.3	22.9	7.1	6.7	8.2	9.4	2.8	3.2	7.3	7.6	2.5	5.0
Lansing	87.0	88.0	26.2	25.4	6.3	6.3	5.3	6.3	1.5	2.1	12.3	12.8	2.5	5.3
Saginaw	83.6	84.6	31.5	30.8	3.4	3.5	5.0	5.6	1.4	1.8	6.0	6.8	2.2	4.1
Michigan	84.3	84.9	29.0	27.8	5.1	5.0	4.6	5.5	1.5	1.9	8.3	8.9	2.3	4.5
NATION	85.1%	85.8%	32.5%	31.3%	5.1%	5.1%	5.5%	6.4%	1.7%	2.2%	12.4%	12.5%	4.1%	6.8%

THREE-DAY READMISSION RATES FOR PATIENTS DIAGNOSED WITH TYPE 2 DIABETES, BY TYPE OF THERAPY, 2013-2015<sup>1,2</sup>



30-DAY READMISSION RATES FOR PATIENTS DIAGNOSED WITH TYPE 2 DIABETES, BY TYPE OF THERAPY, 2013-2015<sup>1,2</sup>



EMERGENCY DEPARTMENT (ED) UTILIZATION FOR PATIENTS DIAGNOSED WITH TYPE 2 DIABETES, BY TYPE OF THERAPY, 2013-2015<sup>1,3</sup>

MARKET	Any Insulin Products		Three Non-Insulin Antidiabetic Products	
	Percentage of Unique Patients With at Least One ED Visit	ED Visits per Patient	Percentage of Unique Patients With at Least One ED Visit	ED Visits per Patient
Mid-Atlantic Region	21.2%	2.2	24.0%	2.1
NATION	18.3%	2.1	20.9%	2.2

Data source: IMS Health © 2016

<sup>1</sup> Patients who filled prescriptions for any insulin products may have also filled prescriptions for products in the non-insulin category, and vice versa.

<sup>2</sup> Figures reflect the percentages of Type 2 diabetes patients who were readmitted to an inpatient facility in the three-year period between 2013 and 2015. These percentages include patients who filled multiple prescriptions. Readmissions are not necessarily due to Type 2 diabetes. Data were available at the regional level only.

<sup>3</sup> Figures reflect the percentages of and the visits for Type 2 diabetes patients who visited an emergency department in the three-year period between 2013 and 2015. These include patients who filled multiple prescriptions. Data were available at the regional level only.

## NON-INSULIN THERAPY FILL RATES EXPAND AMONG MI TYPE 2 DIABETES PATIENTS

The percentage of Type 2 diabetes patients in Michigan who filled prescriptions for any non-insulin antidiabetic product grew marginally from 2014 (84.3%) to 2015 (84.9%), as did the shares of such patients who received GLP-1 receptor agonists, GLP-1 receptor agonists and long-acting insulin combination, DPP-4 inhibitors, or SGLT-2 inhibitors.

## MID-ATLANTIC TYPE 2 DIABETES INPATIENTS ON INSULIN HAVE LOWER 30-DAY READMIT RATE

Among Mid-Atlantic Type 2 diabetes patients admitted to hospitals from 2013 through 2015, those who filled prescriptions for any insulin products were less likely to be readmitted within 30 days of their initial discharge than similar patients who received three non-insulin antidiabetic products: 19.0% versus 24.7%.

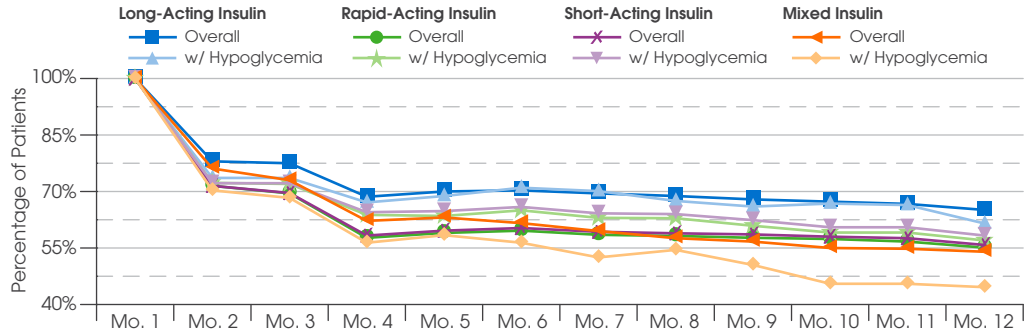


# PERSISTENCY

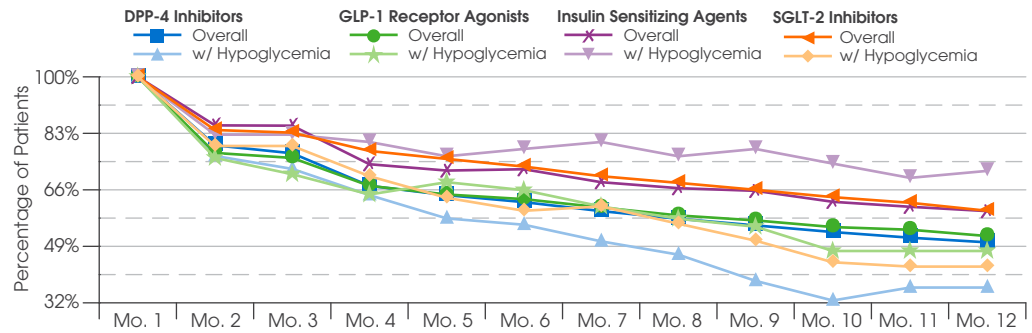
## PERSISTENCY IS HIGH FOR MI TYPE 2 DIABETES PTS. WHO FILLED LONG-ACTING INSULIN

In 2015, 65.1% of Michigan Type 2 diabetes patients who filled a prescription for a long-acting insulin continued or restarted their therapy at month 12, a higher percentage than that of any other profiled insulin therapy. Long-acting insulin persistency was also highest, by insulin therapy, for such patients with hypoglycemia. Insulin sensitizing agents had the highest non-insulin therapy persistency at month 12 for Michigan Type 2 diabetes patients overall and those with hypoglycemia.

PERSISTENCY: TYPE 2 DIABETES PATIENTS OVERALL VS. TYPE 2 DIABETES PATIENTS WITH HYPOGLYCEMIA, VARIOUS INSULIN THERAPIES, MICHIGAN, 2015<sup>1</sup>



PERSISTENCY: TYPE 2 DIABETES PATIENTS OVERALL VS. TYPE 2 DIABETES PATIENTS WITH HYPOGLYCEMIA, VARIOUS NON-INSULIN ANTIDIABETIC THERAPIES, MICHIGAN, 2015<sup>1</sup>



Data source: IMS Health © 2016

<sup>1</sup> A complication is defined as a patient condition caused by the Type 2 diabetes of the patient. These conditions are a direct result of having Type 2 diabetes. Complications of Type 2 diabetes include, but are not limited to, cardiovascular disease, hypoglycemia, nephropathy, neuropathy, peripheral artery disease (PAD), and retinopathy. NOTE: "Persistency" measures whether patients maintain their prescribed therapy. It is calculated by identifying patients who filled a prescription for the reported drug class in the four months prior to the reported year, and then tracking prescription fills for those same patients in each of the months in the current reported year. If a patient fills a prescription in a month they are reported among the patients who have continued or restarted on therapy. Continued means that the patient has filled the drug group in each of the preceding months. Restarted means that the patient did not fill in one or more of the preceding months. Continuing and restarted patients are reported together. Persistency data track patients who are "new-to-brand," meaning they have not filled a prescription for their cohort product during the six months prior to initiation of therapy on that product.

## Adapted From the 2015 ADA/EASD Position Statement

Healthy eating, weight control, increased physical activity, and diabetes education

### Monotherapy

Efficacy\*  
Hypo risk  
Weight  
Side effects  
Costs\*

### Dual therapy<sup>1</sup>

Efficacy\*  
Hypo risk  
Weight  
Side effects  
Costs\*

### Triple therapy

### Combination injectable therapy<sup>2</sup>

### Metformin

high  
low risk  
neutral/loss  
GI/lactic acidosis  
low

If A1C target not achieved after ~3 months of monotherapy, proceed to 2-drug combination (order not meant to denote any specific preference—choice dependent on a variety of patient- and disease-specific factors):

Metformin + Sulfonylurea	Metformin + Thiazolidinedione	Metformin + DPP-4 Inhibitor	Metformin + SGLT2 Inhibitor	Metformin + GLP-1 Receptor Agonist	Metformin + Insulin (basal)
high moderate risk gain hypoglycemia low	high low risk gain edema, HF, txs low	intermediate low risk neutral rare high	intermediate low risk loss GU, dehydration high	high low risk loss GI high	highest high risk gain hypoglycemia variable

If A1C target not achieved after ~3 months of dual therapy, proceed to 3-drug combination (order not meant to denote any specific preference—choice dependent on a variety of patient- and disease-specific factors):

Metformin + Sulfonylurea + TZD or DPP-4i or SGLT2-i or GLP-1-RA or Insulin <sup>3</sup>	Metformin + Thiazolidinedione + SU or DPP-4i or SGLT2-i or GLP-1-RA or Insulin <sup>3</sup>	Metformin + DPP-4 Inhibitor + SU or TZD or SGLT2-i or Insulin <sup>3</sup>	Metformin + SGLT2 Inhibitor + SU or TZD or DPP-4i or Insulin <sup>3</sup>	Metformin + GLP-1 Receptor Agonist + SU or TZD or Insulin <sup>3</sup>	Metformin + Insulin (basal) + TZD or DPP-4i or SGLT2-i or GLP-1-RA
-----------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------	----------------------------------------------------------------------------	---------------------------------------------------------------------------	------------------------------------------------------------------------	--------------------------------------------------------------------

If A1C target not achieved after ~3 months of triple therapy and patient (1) on oral combination, move to injectables; (2) on GLP-1-RA, add basal insulin; or (3) on optimally titrated basal insulin, add GLP-1-RA or mealttime insulin. In refractory patients consider adding TZD or SGLT2-i:

Metformin + Basal insulin + Mealttime insulin or GLP-1-RA

Antihyperglycemic therapy in Type 2 diabetes: general recommendations (see Reference). The order in the chart was determined by historical availability and the route of administration, with injectables to the right; it is not meant to denote any specific preference. Potential sequences of antihyperglycemic therapy for patients with Type 2 diabetes are displayed, with the usual transition moving vertically from top to bottom (although horizontal movement within therapy stages is also possible, depending on the circumstances). DPP-4-i, DPP-4 inhibitor; fxs, fractures; GI, gastrointestinal; GLP-1-RA, GLP-1 receptor agonist; GU, genitourinary; HF, heart failure; Hypo, hypoglycemia; SGLT2-i, SGLT2 inhibitor; SU, sulfonylurea; TZD, thiazolidinedione. \*See Reference for description of efficacy categorization. † Consider starting at this stage when A1C is ≥9%. ‡ Consider starting at this stage when blood glucose is ≥300–350 mg/dL (16.7–19.4 mmol/L) and/or A1C is ≥10–12%, especially if symptomatic or catabolic features are present, in which case basal insulin + mealttime insulin is the preferred initial regimen. § Usually a basal insulin (NPH, glargine, detemir, degludec). Adapted with permission from Inzucchi et al. (see Reference).

Reference: Inzucchi, S. E., et al. (2015). Management of Hyperglycemia in Type 2 Diabetes, 2015: A Patient-Centered Approach: Update to a Position Statement of the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). Diabetes Care. Retrieved from <http://care.diabetesjournals.org/content/38/1/140.full.pdf.html>

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