



MANAGED CARE DIGEST SERIES[®]

HOSPITALS/SYSTEMS DIGEST

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Michigan Type 2 Diabetes Report 2014

Featuring Demographic, Utilization, Charge
and Pharmacotherapy Data

8th Edition



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MICHIGAN TYPE 2 DIABETES REPORT 2014

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Health Council
www.gdahc.org

Michigan Association of
Health Plans
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Introduction

The Alliance for Health, Greater Detroit Area Health Council, Michigan Association of Health Plans and National Kidney Foundation of Michigan are pleased to present the **Michigan Type 2 Diabetes Report** for 2014, 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**®.

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

This eighth 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 (covering 2011 through 2013) were gathered by IMS Health, Parsippany, NJ, a leading provider of innovative health care data products and analytic services. The data provide health care providers with independent, third-party information they can use to benchmark their own data on patient demographics, professional and facility charges, utilization and pharmacotherapy.

Methodology

IMS Health generated most of the data for this **Managed Care Digest Series**® report using health care professional and institutional insurance claims. Data for this report represent more than 7.7 million unique patients with a range of Type 2 diabetes diagnoses during calendar year 2013.

Average length of stay and inpatient charge data come 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 for about 75% of discharges nationwide (including 100% of Medicare-reimbursed discharges).

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 50% 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, mail-order, Medicaid and third-party transactions are tracked.

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 (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 each patient, then strips away all patient-specific health information protected under HIPAA. The identifier allows IMS Health to track disease-specific diagnosis and procedure activity across the many settings where patient care is provided, while protecting the privacy of each patient.

PATIENT DEMOGRAPHICS



PERCENTAGE OF TYPE 2 DIABETES PATIENTS, BY AGE

MARKET	0-17		18-35		36-64		65-79		80+	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Ann Arbor	0.4%	0.4%	2.8%	2.7%	45.5%	45.4%	38.1%	38.6%	13.2%	13.0%
Detroit	0.7	0.7	3.8	3.6	49.3	47.9	34.0	35.1	12.3	12.7
Flint	0.4	0.3	3.0	3.1	49.7	48.6	35.6	36.3	11.3	11.6
Grand Rapids	0.4	0.6	3.5	3.6	47.9	47.0	36.1	36.8	12.2	12.1
Kalamazoo	0.3	0.3	3.1	3.1	47.6	46.2	36.5	37.1	12.5	13.3
Lansing	0.6	0.6	3.3	3.3	48.2	47.6	35.8	36.6	12.0	12.0
Saginaw	0.4	0.3	2.4	2.5	42.2	41.9	40.9	41.2	14.2	14.2
Michigan	0.5	0.5	3.3	3.3	47.2	46.3	36.2	37.1	12.8	12.9
NATION	0.4%	0.4%	2.9%	2.9%	46.4%	45.4%	37.2%	38.1%	13.1%	13.2%

SHARES OF TYPE 2 DIABETES PTS. WITH >2 COMORBIDITIES RISE IN MICHIGAN MARKETS

In six of the seven Michigan markets for which data were available (Grand Rapids excepted), the shares of Type 2 diabetes patients diagnosed with more than two comorbidities increased from 2012 to 2013. Detroit had the largest rise, at 3.0 percentage points. The portion of such patients grew 2.6 percentage points across Michigan, compared with a 1.4 percentage point rise nationally.

PERCENTAGE OF TYPE 2 DIABETES PATIENTS, BY NUMBER OF COMORBIDITIES¹

MARKET	0		1		2		>2	
	2012	2013	2012	2013	2012	2013	2012	2013
Ann Arbor	57.2%	59.8%	14.1%	12.4%	10.8%	9.3%	17.9%	18.5%
Detroit	41.3	38.5	13.4	13.0	11.8	11.5	33.6	36.9
Flint	32.9	29.7	12.4	13.3	12.4	13.0	42.2	44.1
Grand Rapids	24.5	24.4	12.7	12.9	13.8	14.3	49.0	48.4
Kalamazoo	33.0	31.4	14.6	13.9	13.8	13.5	38.5	41.2
Lansing	—	33.4	15.1	11.1	13.6	10.7	—	44.9
Saginaw	41.1	39.2	14.6	14.1	12.4	12.5	31.8	34.2
Michigan	38.1	36.5	13.7	13.0	12.5	12.2	35.7	38.3
NATION	38.0%	37.3%	13.2%	12.7%	12.1%	11.8%	36.8%	38.2%

MI TYPE 2 DIABETES PATIENTS ARE MORE APT TO HAVE HIGH A1c LEVELS THAN U.S. PEERS

In 2013, Michigan Type 2 diabetes patients were more likely than such patients nationally to have high A1c levels (>9.0%). With the exception of Saginaw (15.6%), shares of such patients exceeded the national average (16.3%) in seven of the eight profiled Michigan markets.

PERCENTAGE OF TYPE 2 DIABETES PATIENTS, BY ACTUAL COMORBIDITY, 2013¹

MARKET	Congestive Heart Failure	Depression	Hyperlipidemia	Hypertension	Obesity
Ann Arbor	12.0%	9.0%	47.1%	68.4%	10.6%
Detroit	13.5	7.8	59.7	80.9	17.6
Flint	13.5	10.9	54.3	80.7	25.8
Grand Rapids	9.5	14.8	67.1	80.1	20.2
Kalamazoo	14.7	11.6	64.4	79.7	16.9
Lansing	12.8	12.3	60.3	79.0	36.8
Saginaw	14.7	10.6	57.6	79.9	17.8
Michigan	12.6	10.6	60.6	79.3	20.1
NATION	12.4%	9.0%	63.3%	79.8%	15.2%

PERCENTAGE OF TYPE 2 DIABETES PATIENTS, BY A1c LEVEL RANGE, 2013²

MARKET	≤7.0%	7.1-7.9%	8.0-9.0%	>9.0%
Ann Arbor	48.3%	18.8%	15.9%	17.1%
Detroit	49.2	20.1	13.4	17.4
Flint	47.3	15.3	17.3	20.0
Grand Rapids	49.8	18.1	14.8	17.3
Kalamazoo	45.4	17.4	11.2	26.0
Lansing	45.4	18.6	16.7	19.4
Saginaw	48.9	19.9	15.6	15.6
Michigan	48.6	19.3	14.0	18.1
NATION	49.5%	20.8%	13.4%	16.3%

¹ A comorbidity is a condition a Type 2 diabetes patient may also have, which is not directly related to the diabetes. Comorbidities were narrowed down to a subset of conditions which are typically present in patients with Type 2 diabetes. Comorbidities of Type 2 diabetes include, but are not limited to, congestive heart failure, dysmetabolic syndrome, hyperlipidemia, hypertension and obesity.

² 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. Some comorbidity data were unavailable for Lansing.

Data source: IMS Health © 2014

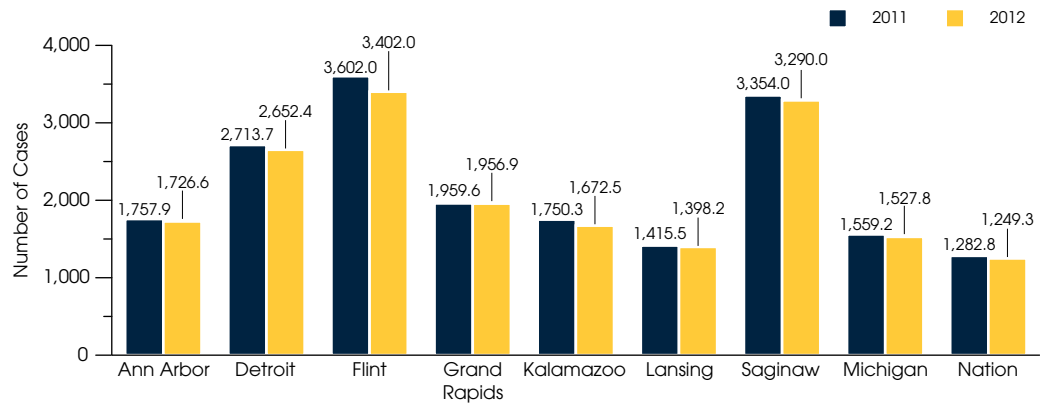


CASES/ALOS/HOSPITAL CHARGES

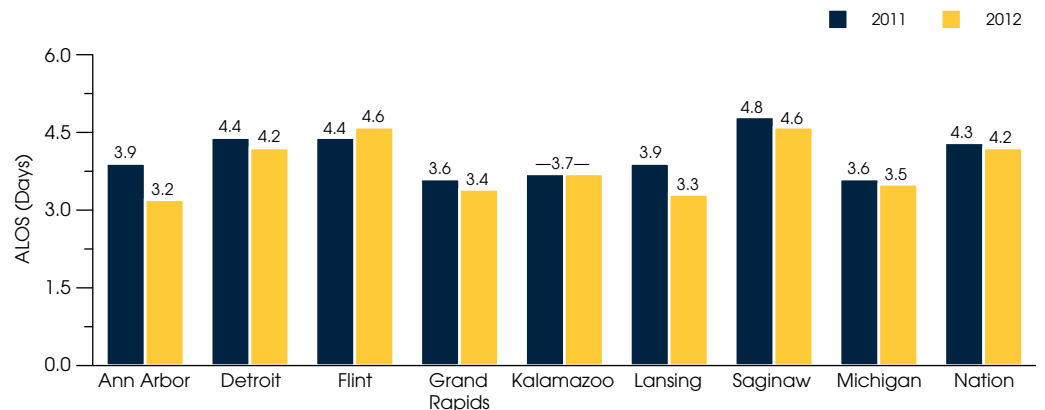
INPATIENT DIABETES MELLITUS CASE COUNTS DECLINE ACROSS ALL MI MARKETS

From 2011 to 2012, the average number of inpatient diabetes mellitus cases per hospital declined across all eight profiled Michigan markets, though only slightly in some cases. The year-over-year percentage changes were largest in Flint (-5.6%) and Kalamazoo (-4.4%). Case counts in Detroit (2,652.4), Flint (3,402.0) and Saginaw (3,290.0) were more than double the national mean (1,249.3).

NUMBER OF INPATIENT DIABETES MELLITUS CASES PER HOSPITAL



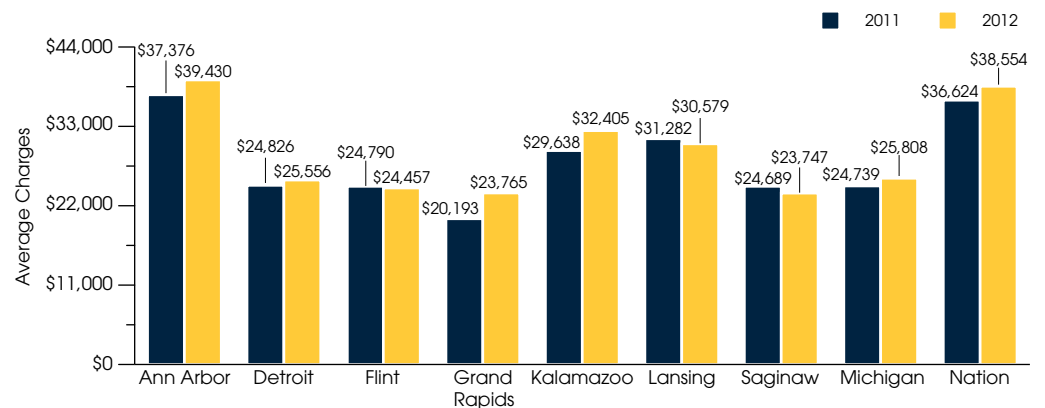
AVERAGE LENGTH OF STAY PER HOSPITAL INPATIENT DIABETES MELLITUS CASE (DAYS)



ALOS IN TWO MI MARKETS SURPASSES THAT OF THE U.S.

Average length of stay (ALOS) for Type 2 diabetes inpatients in Flint and Saginaw (both 4.6 days) exceeded that of the nation (4.2) in 2012. Flint was the only market shown in which ALOS increased from 2011, when it was 4.4 days. ALOS in the other six profiled Michigan markets was equal to or lower than that of the nation.

CHARGES PER HOSPITAL INPATIENT DIABETES MELLITUS CASE¹



¹ Data reflect the charges generated for diabetes mellitus patients by the facilities that delivered care. The data also reflect the average amounts charged, not the amounts paid.

NOTE: Average length of stay (ALOS) and hospital inpatient charge data come from IMS Health's Hospital Procedure/Diagnosis (HPD) database and are current as of calendar year 2012.

Data source: IMS Health © 2014

PROFESSIONAL CHARGES



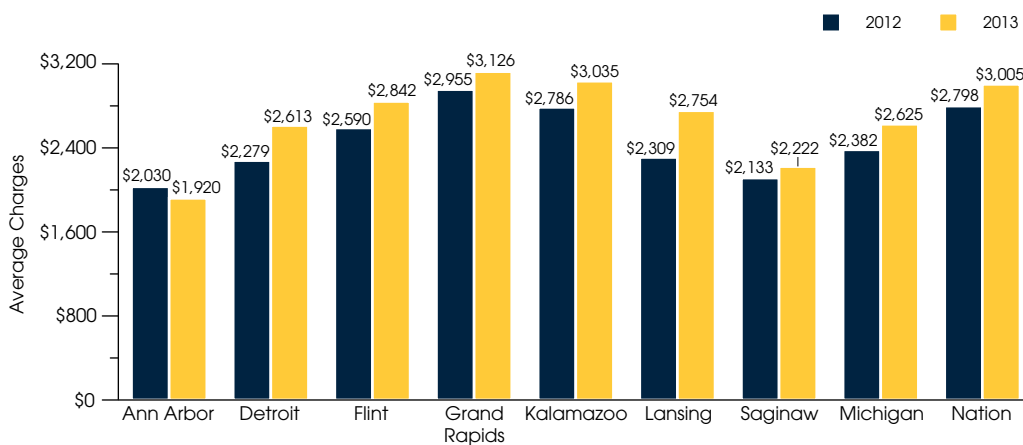
PROFESSIONAL CHARGES PER YEAR FOR TYPE 2 DIABETES PATIENTS¹

MARKET	Ambulatory Surgery Center		Emergency Room		Hospital Inpatient		Hospital Outpatient		Office/Clinic	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Ann Arbor	\$2,125	\$2,312	\$950	\$1,770	\$2,030	\$1,920	\$731	\$682	\$1,129	\$1,193
Detroit	2,378	2,589	1,050	1,438	2,279	2,613	991	1,010	1,466	1,642
Flint	2,208	2,275	317	406	2,590	2,842	1,129	1,240	1,591	1,712
Grand Rapids	2,733	3,114	883	926	2,955	3,126	1,044	1,051	1,302	1,302
Kalamazoo	2,566	2,630	548	668	2,786	3,035	1,074	1,178	1,161	1,192
Lansing	3,290	3,223	561	562	2,309	2,754	868	974	1,375	1,656
Saginaw	2,418	3,018	429	600	2,133	2,222	680	748	1,041	1,171
Michigan	2,640	2,915	851	1,182	2,382	2,625	967	1,000	1,331	1,457
NATION	\$2,480	\$2,724	\$953	\$1,088	\$2,798	\$3,005	\$1,102	\$1,175	\$1,857	\$2,024

PROFESSIONAL CHARGES FOR MI TYPE 2 PTS. INCREASE ACROSS ALL PROFILED MKTS.

Average professional charges for Type 2 diabetes patients across Michigan increased in all settings from 2012 to 2013, with the largest jump (38.9%) occurring in emergency room charges. Additionally, average ambulatory surgery center and emergency room charges for such patients in Michigan were, respectively, 7.0% and 8.6% higher than the U.S. means.

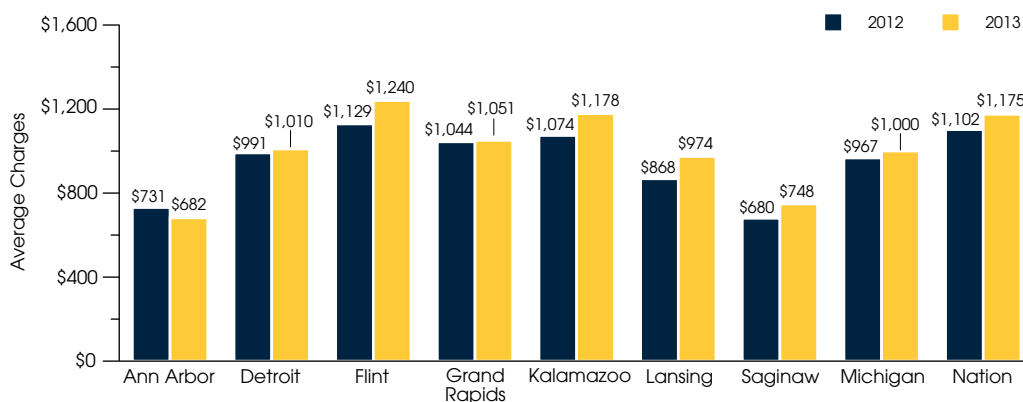
PROFESSIONAL INPATIENT CHARGES PER YEAR FOR TYPE 2 DIABETES PATIENTS¹



TYPE 2 DIABETES INPATIENT CHARGES RISE ACROSS MI

From 2012 to 2013, annual professional inpatient charges per Type 2 diabetes patient increased in seven of the eight profiled Michigan markets (Ann Arbor excepted). In Grand Rapids (\$3,126) and Kalamazoo (\$3,035), the 2013 averages surpassed the national mean (\$3,005). Ann Arbor was also the only Michigan market in which professional outpatient charges for such patients declined from 2012 to 2013. Outpatient charges in Flint were 5.5% higher than the national average.

PROFESSIONAL OUTPATIENT CHARGES PER YEAR FOR TYPE 2 DIABETES PATIENTS¹



¹ Professional charges are those generated by the providers delivering care to Type 2 diabetes patients in various settings.

Data source: IMS Health © 2014



USE OF SERVICES/PHARMACOTHERAPY

MI TYPE 2 DIABETES PTS. ARE MORE LIKELY THAN THEIR U.S. PEERS TO HAVE A1c TESTS

In 2013, across seven of eight profiled Michigan markets (Saginaw excepted), the shares of Type 2 diabetes patients who had at least one A1c test during the calendar year exceeded the national average (74.2%). Saginaw's portion was equal to the U.S. mean. Meanwhile, such patients across Michigan were less likely than their national peers to receive blood glucose tests, serum cholesterol tests or ophthalmologic exams.

SHARES OF INSULIN PEN RXs AMONG MI TYPE 2 PTS. VARY BY TYPE OF THERAPY

The percentages of Michigan Type 2 diabetes patients who were dispensed long-acting insulin pens in 2013 were fractionally higher than the national average. The shares who filled rapid-, short-acting or mixed insulin pens were fractionally lower than the U.S. means.

¹ 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.

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

PERCENTAGE OF TYPE 2 DIABETES PATIENTS, BY TYPE OF SERVICE

MARKET	A1c Test ¹		Blood Glucose Test		Serum Cholesterol Test		Urine Microalbumin Test		Ophthalmologic Exam	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Ann Arbor	75.4%	74.9%	84.5%	84.6%	84.1%	83.8%	74.8%	75.1%	72.4%	71.1%
Detroit	77.3	77.8	86.6	86.7	84.6	84.6	75.0	75.0	69.1	68.9
Flint	74.7	75.3	85.0	84.7	83.4	82.9	74.8	74.4	68.0	67.7
Grand Rapids	79.3	78.4	86.1	85.8	83.9	83.5	75.5	75.7	64.5	64.8
Kalamazoo	76.0	77.1	85.9	85.7	83.6	83.9	74.7	75.3	68.2	69.4
Lansing	74.8	75.3	85.7	86.0	83.9	83.1	75.0	75.1	65.8	65.0
Saginaw	74.1	74.2	83.8	85.0	83.6	83.4	74.5	74.2	71.8	71.2
Michigan	76.8	77.0	85.9	86.0	84.2	84.0	75.0	75.0	68.8	68.6
NATION	74.1%	74.2%	86.7%	86.8%	84.4%	84.4%	71.5%	71.5%	69.6%	69.6%

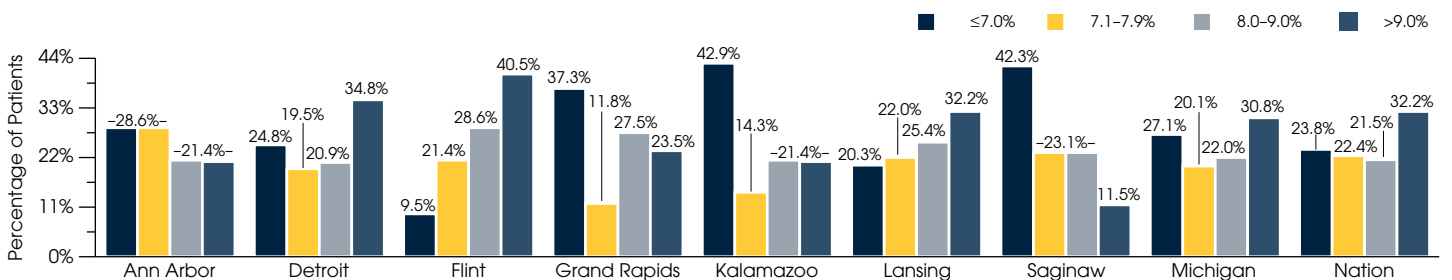
PERCENTAGE OF TYPE 2 DIABETES PATIENTS USING VARIOUS INSULIN THERAPIES²

MARKET	Any Insulin Product		Long-Acting Insulin		Rapid-Acting Insulin		Short-Acting Insulin		Mixed Insulin	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Ann Arbor	37.2%	37.8%	26.2%	28.2%	16.5%	16.8%	18.2%	18.3%	7.0%	6.0%
Detroit	35.5	34.7	26.1	26.3	16.7	16.8	18.0	18.0	6.6	5.6
Flint	38.8	38.5	27.9	28.5	15.6	16.2	18.5	18.7	8.5	7.7
Grand Rapids	35.0	34.8	27.4	28.0	18.3	18.0	19.3	18.8	3.9	3.4
Kalamazoo	35.2	34.9	28.2	28.2	18.5	18.4	19.7	19.5	2.3	1.9
Lansing	34.0	33.1	25.2	25.4	15.4	14.8	16.7	16.0	5.4	4.8
Saginaw	38.1	36.8	29.3	28.6	19.7	19.0	21.5	20.4	4.6	4.0
Michigan	35.8	35.3	26.8	27.2	17.2	17.2	18.6	18.4	5.7	4.9
NATION	33.9%	34.3%	24.9%	25.8%	15.9%	16.5%	17.6%	17.8%	5.7%	5.3%

PERCENTAGE OF TYPE 2 DIABETES PATIENTS USING VARIOUS INSULIN THERAPIES, 2013

MARKET	Long-Acting Insulin		Rapid-Acting Insulin		Short-Acting Insulin		Mixed Insulin	
	Pens	Vials	Pens	Vials	Pens	Vials	Pens	Vials
Ann Arbor	17.8%	11.9%	9.7%	8.2%	9.7%	9.8%	2.9%	3.4%
Detroit	17.0	10.9	10.0	8.0	10.0	9.2	2.8	3.1
Flint	16.6	13.6	8.5	8.9	8.5	11.5	3.1	4.9
Grand Rapids	19.8	9.7	11.4	7.7	11.4	8.6	1.8	1.8
Kalamazoo	17.9	11.9	10.6	9.0	10.6	10.2	0.8	1.1
Lansing	15.8	11.1	8.3	7.5	8.3	8.8	2.0	3.0
Saginaw	16.8	13.5	10.2	10.1	10.2	11.6	1.7	2.5
Michigan	17.4	11.4	10.0	8.3	10.0	9.6	2.4	2.8
NATION	17.2%	10.3%	10.1%	7.5%	10.1%	9.0%	2.6%	3.0%

A1c LEVEL RANGES FOR TYPE 2 DIABETES PATIENTS USING ANY INSULIN PRODUCTS, 2013^{1,2}



Data source: IMS Health © 2014



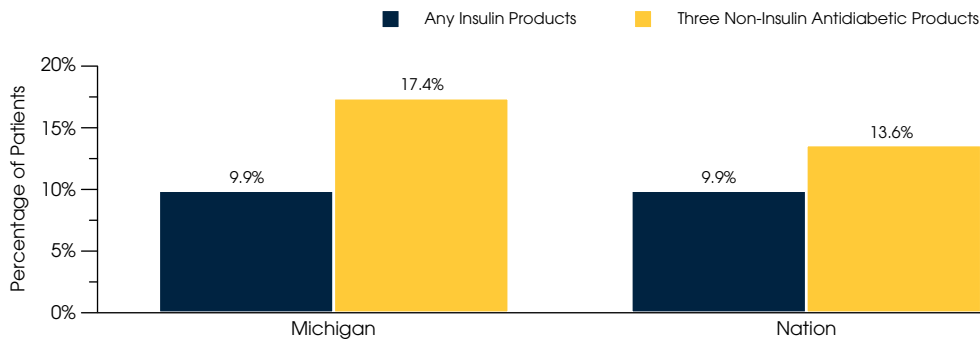
PERCENTAGE OF TYPE 2 DIABETES PATIENTS USING VARIOUS NON-INSULIN ANTIDIABETIC THERAPIES

MARKET	Any Non-Insulin Antidiabetic Product		Sulfonylureas		Insulin Sensitizing Agents		GLP-1 Receptor Agonists		DPP-4 Inhibitors	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Ann Arbor	81.8%	82.6%	34.3%	32.8%	5.1%	4.0%	3.1%	3.5%	5.6%	6.0%
Detroit	82.6	83.6	33.4	32.0	5.4	4.3	3.2	3.4	8.8	8.9
Flint	82.6	83.1	35.6	34.1	5.1	4.1	4.0	3.9	5.1	5.7
Grand Rapids	82.0	82.9	27.3	26.1	9.3	8.1	4.9	5.5	5.7	6.2
Kalamazoo	83.0	84.1	26.1	24.5	9.0	7.6	6.7	8.1	7.1	7.3
Lansing	84.5	85.9	30.5	27.7	7.7	6.6	4.0	4.4	11.3	11.3
Saginaw	82.0	83.2	34.2	32.9	4.4	3.6	5.0	5.3	5.3	5.2
Michigan	82.6	83.5	31.9	30.5	6.5	5.3	4.0	4.4	7.7	7.9
NATION	84.6%	84.7%	34.4%	33.6%	7.1%	5.5%	4.9%	5.3%	12.8%	12.7%

SHARES OF MI TYPE 2 PTS. WHO FILLED RXs FOR SOME NON-INSULINS INCREASE

The percentage of Michigan Type 2 diabetes patients who filled prescriptions for any non-insulin antidiabetic product rose to 83.5% in 2013 from 82.6% in 2012. The shares of such patients dispensed GLP-1 receptor agonists or DPP-4 inhibitors increased a fractional 0.4 and 0.2 percentage points, respectively.

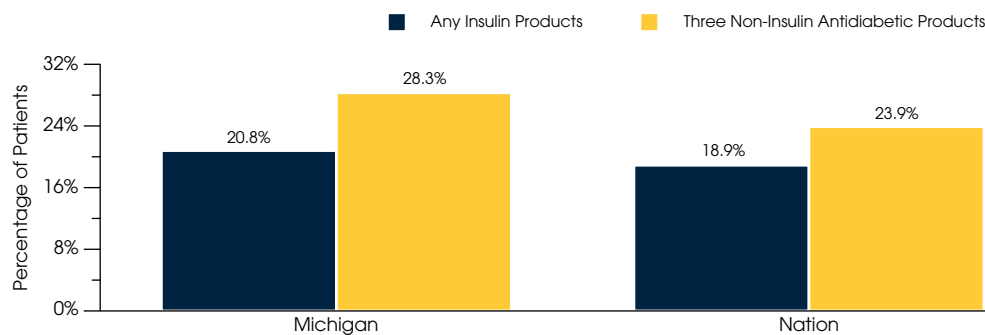
3-DAY READMISSION RATES FOR PATIENTS DIAGNOSED WITH TYPE 2 DIABETES, BY TYPE OF THERAPY, 2011-2013^{1,2}



READMISSION RATES ARE LOWER FOR TYPE 2 DIABETES PTS. DISPENSED ANY INSULIN

Three- and 30-day readmission rates for Michigan Type 2 diabetes inpatients who filled prescriptions for any insulin were lower from 2011 to 2013 than they were for such patients dispensed three non-insulin antidiabetic products. Both the three- and 30-day readmission rates for Michigan patients dispensed three non-insulins exceeded the corresponding national averages.

30-DAY READMISSION RATES FOR PATIENTS DIAGNOSED WITH TYPE 2 DIABETES, BY TYPE OF THERAPY, 2011-2013^{1,2}



EMERGENCY DEPARTMENT (ED) UTILIZATION FOR PATIENTS DIAGNOSED WITH TYPE 2 DIABETES, BY TYPE OF THERAPY, 2011-2013^{2,3}

MARKET	Any Insulin Products			Three Non-Insulin Antidiabetic Products		
	Percentage of Unique Patients with at Least One ED Visit	ED Visits per Patient	Average Charges per Visit	Percentage of Unique Patients with at Least One ED Visit	ED Visits per Patient	Average Charges per Visit
Michigan	9.0%	1.6	\$3,084	8.7%	1.0	\$1,989
Mid-Atlantic Region	17.5	2.3	9,632	20.9	2.5	13,309
NATION	15.9%	2.4	\$11,905	18.1%	2.6	\$14,816

Data source: IMS Health © 2014

¹ Figures reflect the percentages of Type 2 diabetes patients who were readmitted to an inpatient facility in the three-year period between 2011 and 2013. These percentages include patients who filled multiple prescriptions. Readmissions are not necessarily due to Type 2 diabetes.

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

³ Figures reflect the percentages of and the visits and charges for Type 2 diabetes patients who visited an emergency department in the three-year period between 2011 and 2013. These include patients who filled multiple prescriptions.

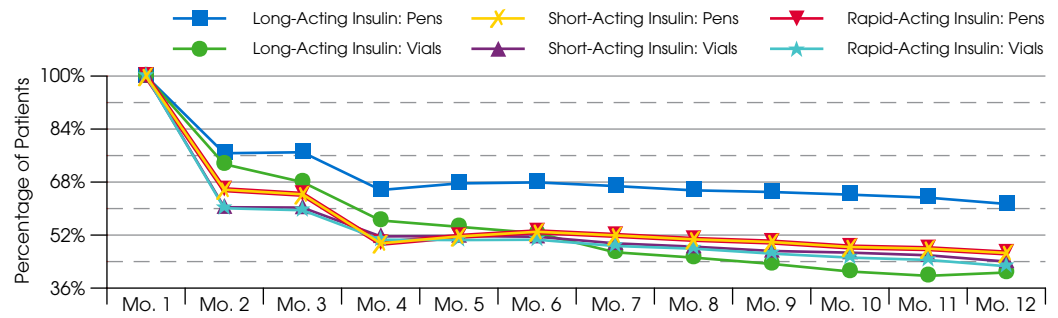


PERSISTENCY

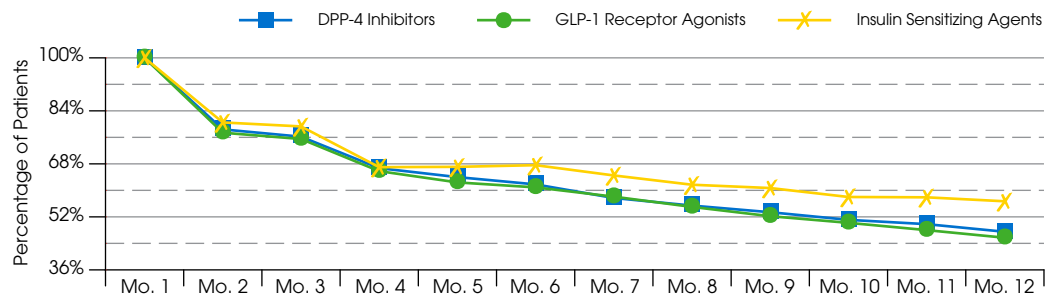
PERSISTENCY IS HIGHEST FOR MI TYPE 2 PTS. WITH RXs FOR INSULIN PENS

In 2013, Michigan Type 2 diabetes patients who were dispensed insulin pens were more likely to continue or restart their prescriptions at every month of treatment than such patients who received insulin vials, regardless of insulin type. For instance, by month 12, the persistency rate for long-acting insulin pens was 61.4% versus 40.7% for long-acting insulin vials.

PERSISTENCY: VARIOUS INSULIN PRODUCTS, MICHIGAN, 2013



PERSISTENCY: VARIOUS NON-INSULIN ANTIDIABETIC PRODUCTS, MICHIGAN, 2013

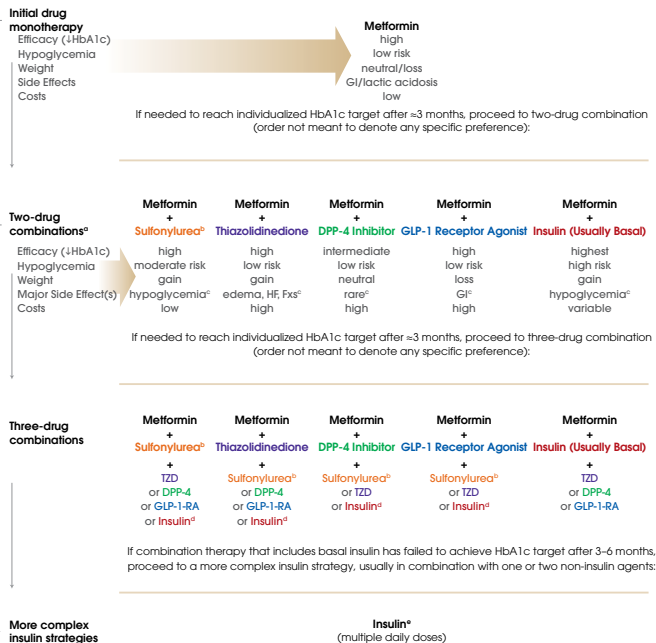


Data source: IMS Health © 2014

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 2012 ADA/EASD Position Statement

Healthy eating, weight control, increased physical activity



Antihyperglycemic therapy in Type 2 diabetes: general recommendations. Moving from the top to the bottom of the figure, potential sequences of antihyperglycemic therapy. In most patients, begin with lifestyle changes; metformin monotherapy is added at, or soon after, diagnosis (unless there are explicit contraindications). If the HbA1c target is not achieved after approximately 3 months, consider one of the five treatment options combined with metformin: a sulfonyleurea, TZD, DPP-4 inhibitor, GLP-1 receptor agonist, or basal insulin. (The order in the chart is determined by historical introduction and route of administration and is not meant to denote any specific preference.) Choice is based on patient and drug characteristics, with the overriding goal of improving glycemic control while minimizing side effects. Shared decision making with the patient may help in the selection of therapeutic options. The figure displays drugs commonly used both in the U.S. and/or Europe. Rapid-acting secretagogues (meglitinides) may be used in place of sulfonyleureas. Other drugs not shown (α -glucosidase inhibitors, colesevelam, dopamine agonists, pramlintide) may be used where available in selected patients but have modest efficacy and/or limiting side effects. In patients intolerant of, or with contraindications for, metformin, select initial drug from other classes depicted and proceed accordingly. In this circumstance, while published trials are generally lacking, it is reasonable to consider three-drug combinations other than metformin. Insulin is likely to be more effective than most other agents as a third-line therapy, especially when HbA1c is very high (e.g., $\geq 9.0\%$). The therapeutic regimen should include some basal insulin before moving to more complex insulin strategies. Dashed arrow line on the left-hand side of the figure denotes the option of a more rapid progression from a two-drug combination directly to multiple daily insulin doses, in those patients with severe hyperglycemia (e.g., HbA1c ≥ 10.0 – 12.0%).

^a Consider beginning at this stage in patients with very high HbA1c (e.g., $\geq 9.0\%$).
^b Consider rapid-acting, non-sulfonyleurea secretagogues (meglitinides) in patients with irregular meal schedules or who develop late postprandial hypoglycemia on sulfonyleureas.
^c See Table 1 of the Position Statement for additional potential adverse effects and risks.
^d Usually a basal insulin in combination with non-insulin agents.
^e Certain non-insulin agents may be continued with insulin. Consider beginning at this stage if patient presents with severe hyperglycemia (≥ 16.7 – 19.4 mmol/L [≥ 300 – 350 mg/dL]; HbA1c ≥ 10.0 – 12.0%) with or without catabolic features (weight loss, ketosis, etc.).
 Key: DPP-4=DPP-4 inhibitor; Fxs=bone fractures; GI=gastrointestinal; GLP-1-RA=GLP-1 receptor agonist; HF=heart failure; TZD=thiazolidinedione.

Inzucchi, S. E., et al. (2012). Management of Hyperglycemia in Type 2 Diabetes: A Patient-Centered Approach: 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/early/2012/04/17/17/4/17-413-413.full.pdf+html>

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