

Supplementary Online Content

Gilstrap LG, Blair RA, Huskamp HA, Zelevinsky K, Normand S-L. Assessment of second-generation diabetes medication initiation among Medicare enrollees from 2007 to 2015. *JAMA Netw Open*. 2020;3(5):e205411.
doi:10.1001/jamanetworkopen.2020.5411

eFigure 1. Consort Diagram

eTable 1. A Priori Defined Patient, Prescriber, and Practice Characteristics Adjusted for in the Poisson Random Effect Regression Models to Calculate Interpractice Variation

eTable 2. Initiation Drug Choice in 2007 and 2015 and from 2007 to 2015

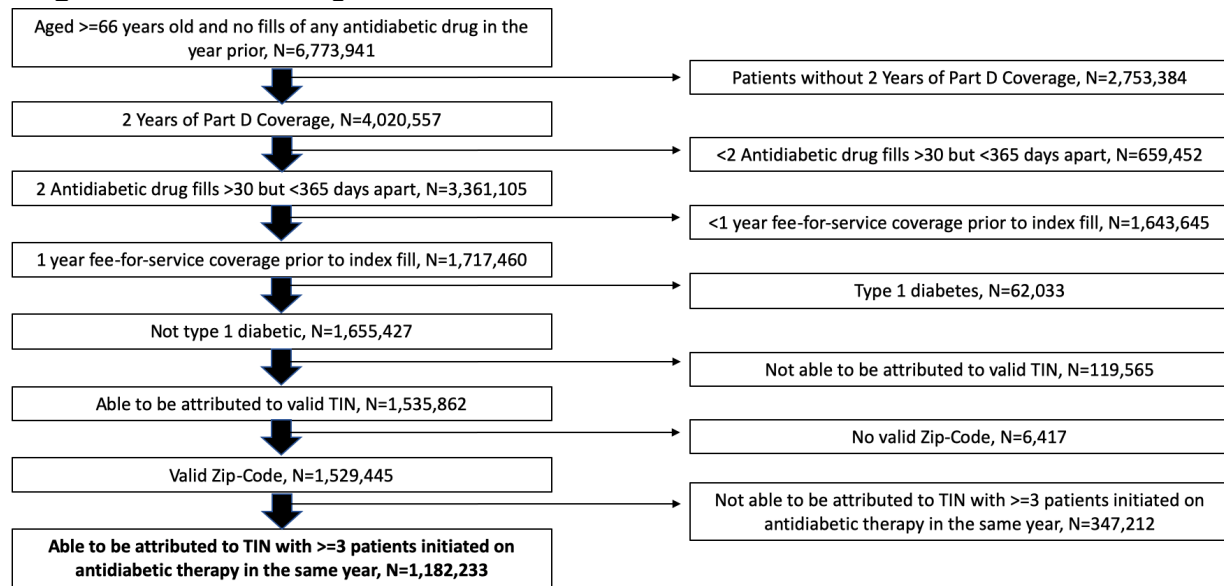
eFigure 2. Time to First Use and Time to Routine Use of Second-Generation Diabetes Drugs, Including Combination Preparations From 2007 to 2015

eTable 3. Comparison of Patients Dropped Owing to Small Practice Size or Inability to Attribute to a Practice vs Those Included in Initiation Cohort

eTable 4. Comparison of Patients Dropped Owing to Missing Zip Code vs Those Included in Initiation Cohort

This supplementary material has been provided by the authors to give readers additional information about their work.

eFigure 1. Consort diagram



eTable 1. A Priori Defined Patient, Prescriber, and Practice Characteristics Adjusted for in the Poisson Random Effect Regression Models to Calculate Interpractice Variation

Patient Characteristics

Demographics: Age, sex, race, dual Medicare/Medicaid eligibility, disability, ZCTA-level % below poverty line, ZCTA-level %with high school degree, median income, geographic region, population density

Comorbidities: Acute myocardial infarction, Atrial fibrillation, Chronic kidney disease, Congestive heart failure, Hyperlipidemia, Hypertension, Ischemic heart disease, Stroke/TIA, Cancer, Hierarchical condition category score

Prescriber Characteristics

Prescriber is an Endocrinologist, Prescriber is a primary care physician (PCP), Prescriber is another type of physician (not endocrinologist or PCP), Prescriber's average panel size, % patients in prescriber's panel with diabetes,

Practice Characteristics

Number of beneficiaries attributed to practice, Number of providers affiliated with practice, Number of beneficiaries per provider in practice, Practice is part of an academic center, Practice is hospital owned

eTable 2. Initiation Drug Choice in 2007 and 2015 and from 2007 to 2015

Initiation Drug	N	%
2007		
Initiated on a First-Generation Antidiabetic Drug (n=138516)		
Metformin, n (%)	66867	46.4
* Sulfonylurea, n (%)	39095	27.2
† Thiazolidinediones, n (%)	19703	13.7
‡ Alpha-glucosidase Inhibitors, n (%)	204	0.1
§ Meglitinides, n (%)	1913	1.3
Insulin, n (%)	10734	7.5
Initiated on a Second-Generation Antidiabetic Drug (n=5468)		
# Amylin Analogue, n (%)	17	<0.1
** GLP-1, n (%)	390	0.3
†† DPP-4, n (%)	5061	3.5
‡‡ SGLT-2, n (%)	-	-
2015		
Initiated on a First-Generation Antidiabetic Drug (n=148010)		
Metformin, n (%)	107351	65.88
* Sulfonylurea, n (%)	22786	13.98
† Thiazolidinediones, n (%)	2151	1.32
‡ Alpha-glucosidase Inhibitors, n (%)	209	0.13
§ Meglitinides, n (%)	977	0.6
Insulin, n (%)	14536	8.92
Initiated on a Second-Generation Antidiabetic Drug (n=14929)		
# Amylin Analogue, n (%)	N/A	N/A
** GLP-1, n (%)	1377	0.85
†† DPP-4, n (%)	12181	7.48
‡‡ SGLT-2, n (%)	1371	0.84
2007-2015 (pooled)		
Initiated on a First-Generation Diabetes Drug (n=1,104,718)		
Metformin, n (%)	690612	58.42
* Sulfonylurea, n (%)	242126	20.48
† Thiazolidinediones, n (%)	51710	4.37
‡ Alpha-glucosidase Inhibitors, n (%)	1994	0.17
§ Meglitinides, n (%)	10140	0.86
Insulin, n (%)	108136	9.15
Initiated on a Second-Generation Antidiabetic Drug (n=77,515)		
# Amylin Analogue, n (%)	64	<0.1
** GLP-1, n (%)	4989	0.42
†† DPP-4, n (%)	70471	5.96
‡‡ SGLT-2, n (%)	1991	0.17

All combination drugs where one of the active ingredients is metformin are counted as “metformin” except metformin+sitagliptin which is counted as sitagliptin (DPP-4).

* Sulfonylureas include: glipizide, glyburide, glimepiride.

† Thiazolidinediones include: rosiglitazone, pioglitazone.

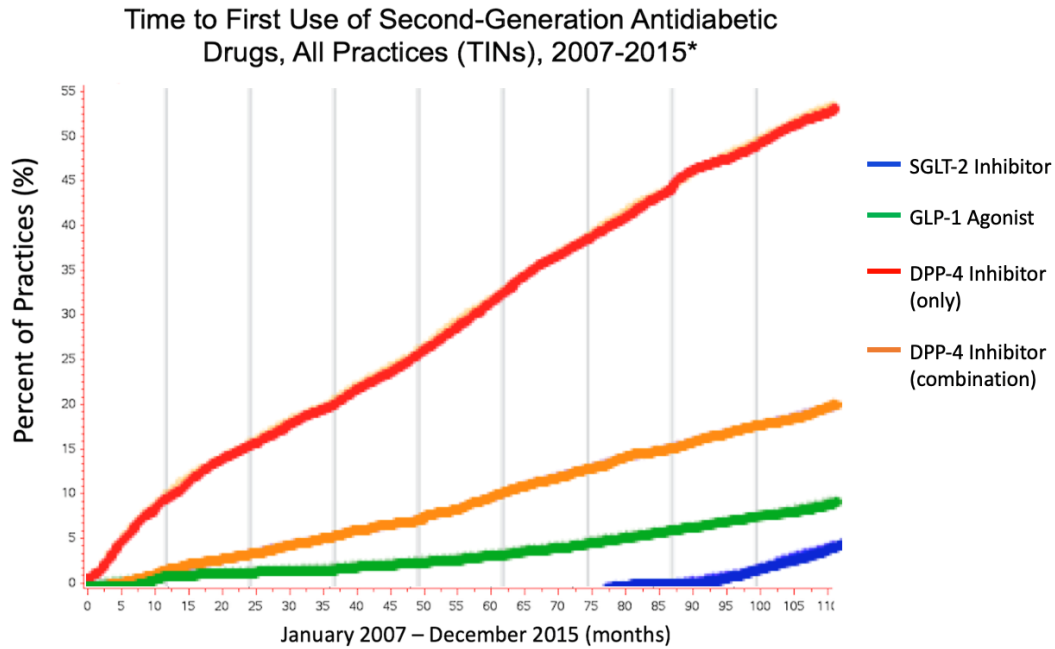
‡ Alpha-glucosidase inhibitors include: acarbose, miglitol.

§ Meglitinides: repaglinide, nateglinide.

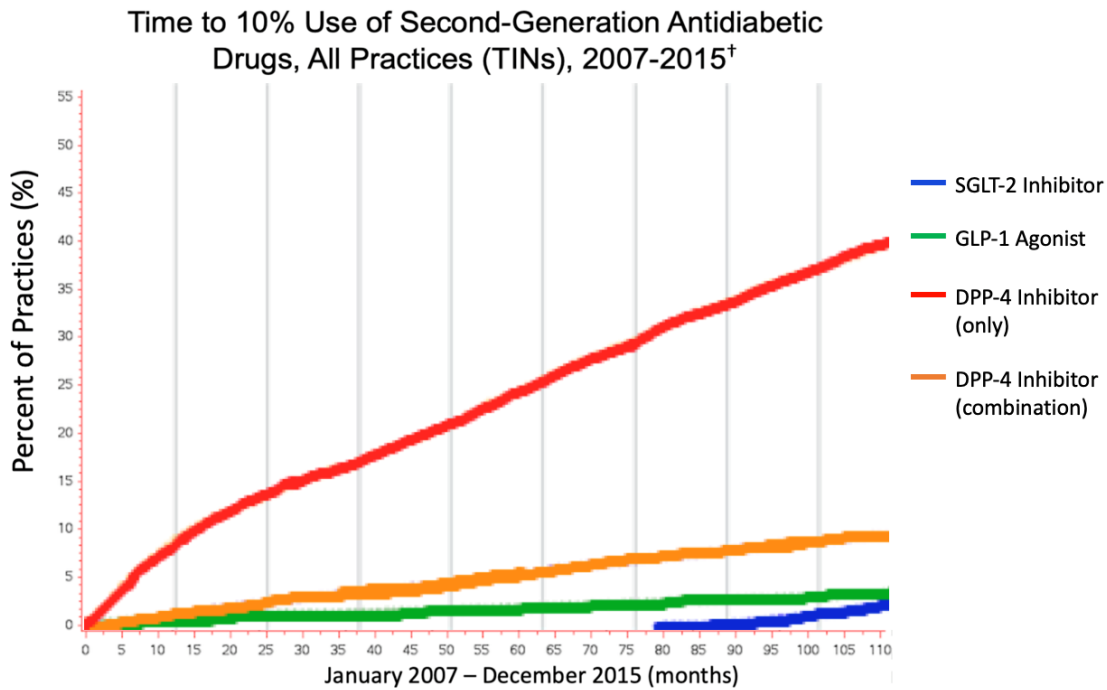
|| Insulins include: Short acting - aspart, glulisine, regular, lispro, human (inhaled))and Long acting - NPH, glargine, degludec, detemir.

eFigure 2. Time to First Use and Time to Routine Use of Second-Generation Diabetes Drugs, Including Combination Preparations From 2007 to 2015

Time to First Use



Time to 10% Use



eTable 3. Comparison of Patients Dropped Owing to Small Practice Size or Inability to Attribute to a Practice vs Those Included in Initiation Cohort

Binary Characteristics	Total N	Overall %	Patients in final cohort			
			No (excluded)		Yes (included)	
			N	%	N	%
All	1655427	100	472339	100	1182233	100
Year of Study						
2007	206276	12.4606	62161	13.1603	143984	12.18
2008	182972	11.0529	58967	12.484	123855	10.48
2009	172258	10.4057	55773	11.8078	116414	9.85
2010	169379	10.2317	53040	11.2292	116270	9.83
2011	169677	10.2497	51557	10.9153	118053	9.99
2012	168210	10.1611	49364	10.451	118778	10.05
2013	176673	10.6724	48142	10.1923	128472	10.87
2014	201330	12.1618	47756	10.1105	153467	12.98
2015	208652	12.6041	45579	9.6496	162940	13.78
Female	951839	57.4981	279535	59.181	671831	56.83
Male	703588	42.5019	192804	40.819	510402	43.17
Race						
White	1232440	74.4485	317612	67.2424	914374	77.34
Black	168641	10.1872	63176	13.3751	105319	8.91
Hispanic	154784	9.3501	59674	12.6337	94937	8.03
Other	99562	6.0143	31877	6.7488	67603	5.72
Population Density						
Urban	1346357	81.3299	383774	81.2497	962472	81.41
Large Rural	148405	8.9648	35327	7.4792	113075	9.56
Small Rural	88037	5.3181	27456	5.8128	60578	5.12
Isolated	68996	4.1679	22887	4.8455	46108	3.90
Geography						
Northeast	282362	17.0567	93879	19.8753	188450	15.94
Midwest	388773	23.4848	95136	20.1415	293551	24.83
South	691515	41.7726	180027	38.1139	511327	43.25
West	286807	17.3253	97715	20.6875	188905	15.98
Socioeconomics (ZCTA-level)						
Dual Eligibility	444098	26.80%	185379	39.20%	258524	21.90%
Disability	227844	13.80%	72320	15.30%	155403	13.10%
% Poverty	238532	14.40%	80933	17.10%	157401	13.30%
Comorbidities						
Acute Myocardial Infarction	106009	6.40%	30255	6.41%	75706	6.40%

Atrial Fibrillation	280085	16.90%	79386	16.80%	200577	17.00%
Chronic Kidney Disease	455431	27.50%	138807	29.40%	316392	26.80%
Congestive Heart Failure	592467	35.80%	190624	40.40%	401562	34.00%
Hyperlipidemia	1416941	85.60%	385172	81.50%	1031039	87.20%
Hypertension	1521818	91.90%	432991	91.70%	1088044	92.00%
Ischemic Heart Disease	956726	57.80%	278924	59.10%	677313	57.30%
Stroke/TIA	305073	18.40%	104650	22.20%	200279	16.90%
Cancer	256431	15.50%	68440	14.50%	187840	15.90%
Provider Characteristics						
Endocrinologist	49821	3.01%	9580	2.03%	40207	3.40%
Primary Care Physician	1199441	72.50%	305119	64.60%	893735	75.60%
Other Provider * (has outpatient claims)	208432	12.60%	68230	14.40%	140076	11.80%
Hospital Based Provider (no outpatient claims)	197733	11.90%	89410	18.90%	108215	9.15%
Provider Panel <250	701350	42.40%	280182	59.30%	420779	35.60%
Provider panel 250-500	589361	35.60%	136726	28.90%	452351	38.30%
Provider panel >500	364716	22.00%	55431	11.70%	309103	26.10%
Patients with diabetes in panel <25%	265841	16.10%	90806	19.20%	174880	14.80%
Patients with diabetes in panel 25-50%	1063971	64.30%	272963	57.80%	790518	66.90%
Patients with diabetes in panel >50%	325615	19.70%	108570	23.00%	216835	18.30%
Practice Characteristics						
Hospital Owned	106009	6.40%	30255	6.41%	87721	7.42%
Academic Center Affiliated	280085	16.90%	79386	16.80%	56018	4.74%

Continuous Characteristics									
	Overall Mean	Overall SD	Overall Range	Patients in final cohort					
				No (excluded)			Yes (included)		
				Mean	SD	Range	Mean	SD	Range
Age	75.76	7.02	44	76.57	7.58	44	75.44	6.75	42
Percent Poverty	11.88	8.36	100	12.60	8.92	100	11.59	8.10	100
Percent with High School Degree	84.54	9.81	100	83.64	10.33	100	84.90	9.56	100
Median Income (\$)	53324	21555	242089	53168	22536	242089	53386	21151	242089
Hierarchical Condition Category Risk Score†	2.31	2.00	19	2.62	2.29	18	2.19	1.85	19
Number of Patients per Practice	5065.54	9329.41	68400	212.88	189.19	4698	6512.51	10191.40	68393

Number of Providers per Practice	122.75	417.62	14221	7.26	49.35	4275	157.19	469.60	14221
Number of Providers per Patient	166.35	164.55	3228	134.78	125.67	1417	175.76	173.36	3228
Provider Panel Size	362.06	262.04	4815	272.84	224.03	4217	396.11	267.43	4815
Percent of Provider's Panel with Diabetes	0.41	0.16	1	0.43	0.17	1	0.40	0.16	1

* Prescriber has no face-to-face office visits in the outpatient or carrier file

† HCC scores of less than one are considered relatively healthy, higher numbers suggest of more comorbidities and disease complexity

HCC is hierarchical condition category; SD is standard deviation; TIA is transient ischemic attack

eTable 4. Comparison of Patients Dropped Owing to Missing Zip Code vs Those Included in Initiation Cohort

Binary Characteristics	Total N	Overall %	Patients in final cohort			
			No (excluded)		Yes (included)	
			N	%	N	%
			All	1183088	100	855
Year of Study						
2007	144115	12.18	131	15.32	143984	12.18
2008	124005	10.48	150	17.54	123855	10.48
2009	116485	9.85	71	8.30	116414	9.85
2010	116339	9.83	69	8.07	116270	9.83
2011	118120	9.98	67	7.84	118053	9.99
2012	118846	10.05	68	7.95	118778	10.05
2013	128531	10.86	59	6.90	128472	10.87
2014	153574	12.98	107	12.51	153467	12.98
2015	163073	13.78	133	15.56	162940	13.78
Female	672304	56.83	473	55.32	671831	56.83
Male	510784	43.17	382	44.68	510402	43.17
Race						
White	914828	77.33	454	53.10	914374	77.34
Black	105465	8.91	146	17.08	105319	8.91
Hispanic	95110	8.04	173	20.23	94937	8.03
Other	67685	5.72	82	9.59	67603	5.72
Population Density						
Urban	962583	81.36	****	****	962472	81.41
Large Rural	113078	9.56	****	****	113075	9.56
Small Rural	60581	5.12	****	****	60578	5.12
Isolated	46109	3.90	****	****	46108	3.90
Geography						
Northeast	188483	15.93	****	****	188450	15.94
Midwest	293637	24.82	****	****	293551	24.83
South	511488	43.23	****	****	511327	43.25
West	189092	15.98	****	****	188905	15.98
Socioeconomics (ZCTA-level)						
Dual Eligibility	258719	21.90%	195	22.80%	258524	21.90%
Disability	155524	13.10%	121	14.20%	155403	13.10%
% Poverty	157599	13.30%	198	23.20%	157401	13.30%
Comorbidities						
Acute Myocardial Infarction	75754	6.40%	48	5.61%	75706	6.40%

Atrial Fibrillation	200699	17.00%	122	14.30%	200577	17.00%
Chronic Kidney Disease	316624	26.80%	232	27.10%	316392	26.80%
Congestive Heart Failure	401843	34.00%	281	32.90%	401562	34.00%
Hyperlipidemia	1031769	87.20%	730	85.40%	1031039	87.20%
Hypertension	1088827	92.00%	783	91.60%	1088044	92.00%
Ischemic Heart Disease	677802	57.30%	489	57.20%	677313	57.30%
Stroke/TIA	200423	16.90%	144	16.80%	200279	16.90%
Cancer	187991	15.90%	151	17.70%	187840	15.90%
Provider Characteristics						
Endocrinologist	40241	3.40%	34	3.98%	40207	3.40%
Primary Care Physician	894322	75.60%	587	68.70%	893735	75.60%
Other Provider * (has outpatient claims)	140202	11.90%	126	14.70%	140076	11.80%
Hospital Based Provider (no outpatient claims)	108323	9.16%	108	12.60%	108215	9.15%
Provider Panel <250	421168	35.60%	389	45.50%	420779	35.60%
Provider panel 250-500	452635	38.30%	284	33.20%	452351	38.30%
Provider panel >500	309285	26.10%	182	21.30%	309103	26.10%
Patients with diabetes in panel <25%	175035	14.80%	155	18.10%	174880	14.80%
Patients with diabetes in panel 25-50%	791008	66.90%	490	57.30%	790518	66.90%
Patients with diabetes in panel >50%	217045	18.30%	210	24.60%	216835	18.30%
Practice Characteristics						
Hospital Owned	87823	7.42%	102	11.90%	87721	7.42%
Academic Center Affiliated	56087	4.74%	69	8.07%	56018	4.74%

Continuous Characteristics									
	Overall Mean	Overall SD	Overall I Range	Patients in final cohort					
				No (excluded)			Yes (included)		
				Mean	SD	Range	Mean	SD	Range
Age	75.76	7.02	44	76.57	7.58	44	75.44	6.75	42
Percent Poverty	11.88	8.36	100	12.60	8.92	100	11.59	8.10	100
Percent with High School Degree	84.54	9.81	100	83.64	10.33	100	84.90	9.56	100
Median Income (\$)	53324	21555	24208 9	53168	22536	24208 9	53386	21151	24208 9
Hierarchical Condition Category Risk Score†	2.31	2.00	19	2.62	2.29	18	2.19	1.85	19
Number of Patients	5065.5 4	9329.4 1	68400	212.8 8	189.1 9	4698	6512.5 1	10191.4 0	68393

per Practice									
Number of Providers per Practice	122.75	417.62	14221	7.26	49.35	4275	157.19	469.60	14221
Number of Providers per Patient	166.35	164.55	3228	134.78	125.67	1417	175.76	173.36	3228
Provider Panel Size	362.06	262.04	4815	272.84	224.03	4217	396.11	267.43	4815
Percent of Provider's Panel with Diabetes	0.41	0.16	1	0.43	0.17	1	0.40	0.16	1

* Prescriber has no face-to-face office visits in the outpatient or carrier file

† HCC scores of less than one are considered relatively healthy, higher numbers suggest of more comorbidities and disease complexity

HCC is hierarchical condition category; SD is standard deviation; TIA is transient ischemic attack