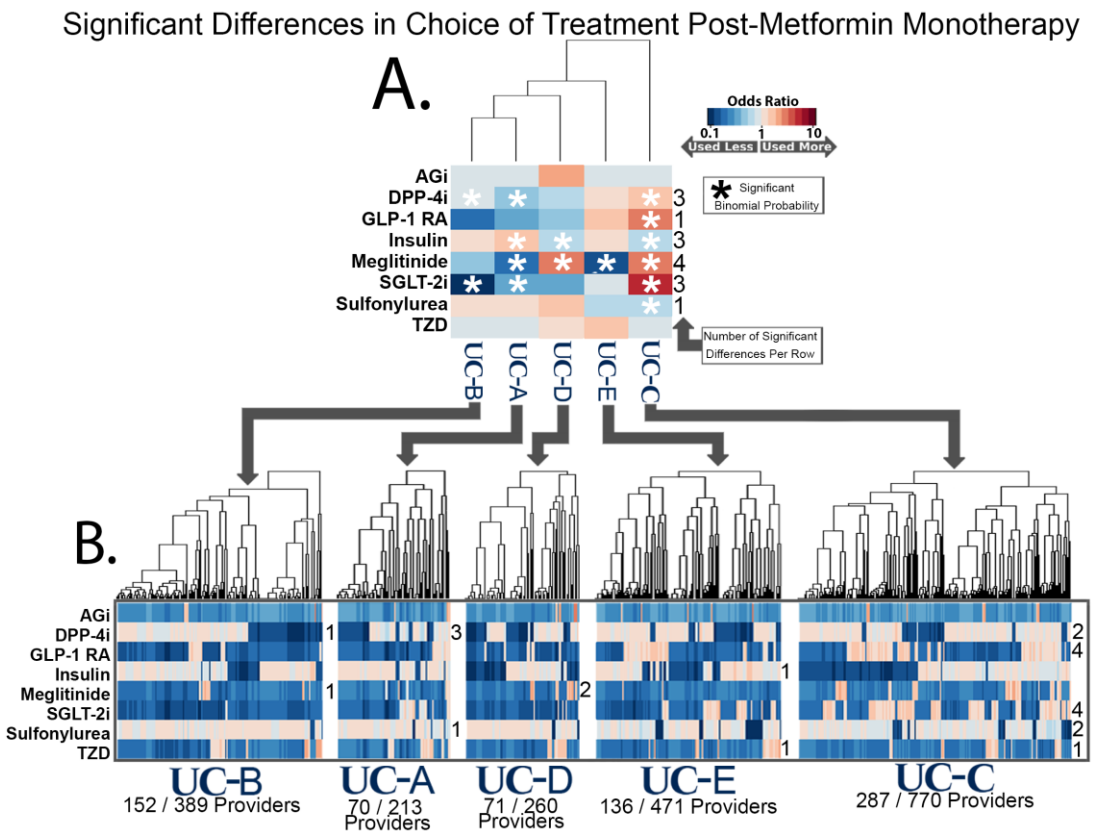
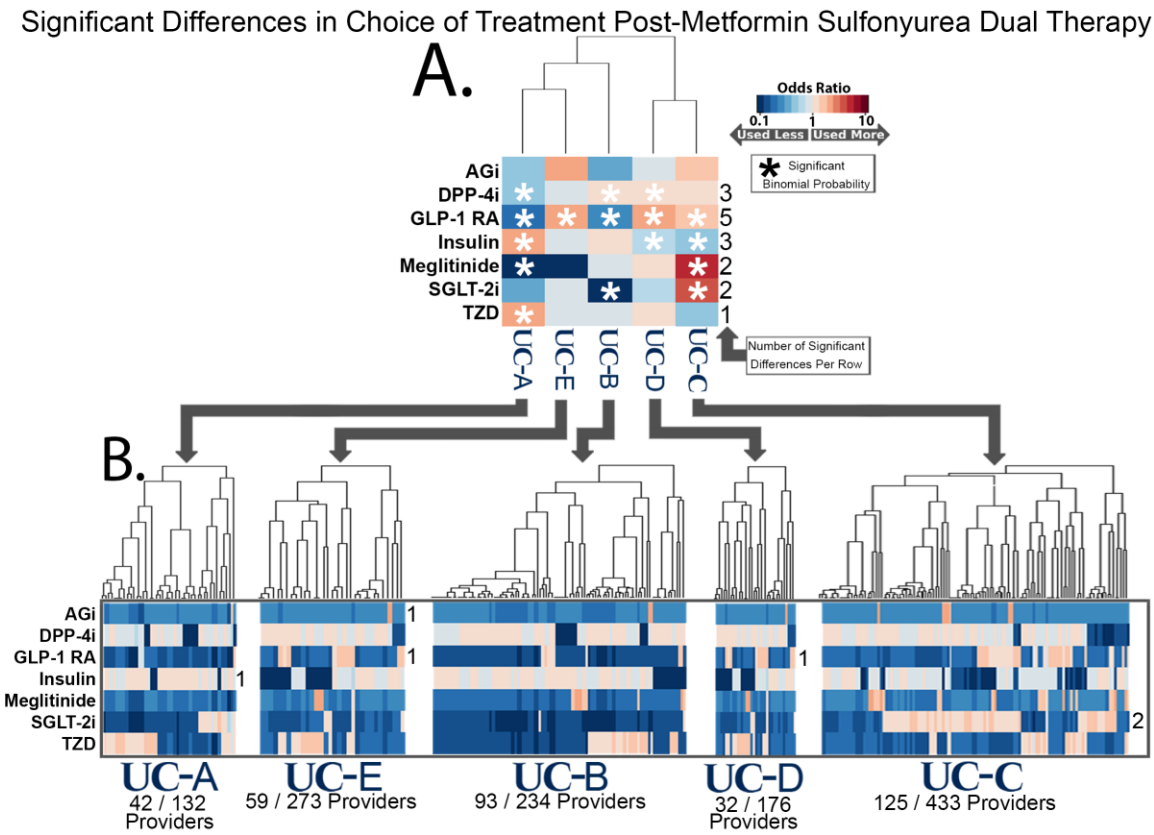
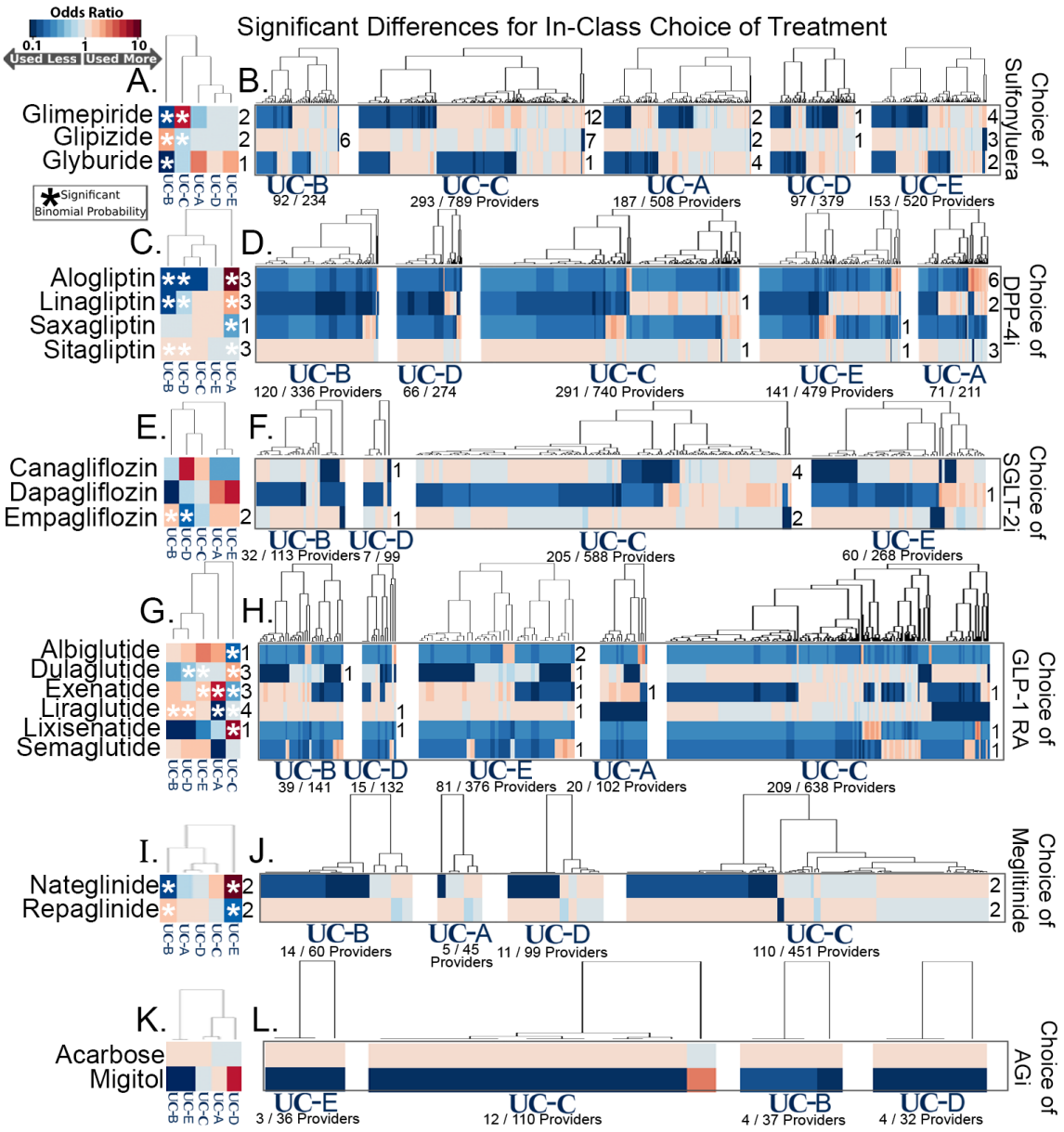
Supporting Material for:
Quantifying Variation in Treatment Utilization for Type 2 Diabetes Across Five Major University of California Health Systems



Supplemental Figure S1: Significant Differences in Treatment Choice Post-Metformin Monotherapy. Heatmap depicting the odds ratio of medical institutions (A) and individual providers (B) for frequency of each out-class treatment utilization. Here, each unit of the x-axis columns represents the likelihood of choosing that medication class for a single medical institution compared to the other four medical institutions (A) or a single provider within a medical institution compared to all other providers (B). For (B), only providers with at least three prescriptions were depicted and the number for each site are listed below each plot. The ordering of the columns of institutions or providers is determined by similarity in prescription patterns, depicted in the dendrogram above each plot. The y-axis (rows) represent medication classes available for utilization post-Metformin monotherapy. The number of providers with significant differences for each medication class are enumerated on the right-hand side of each plot. An institution or provider is determined to have a significantly different frequency for a particular medication class using binomial probabilities with three separate cohort matching techniques to account for HbA1c, Framingham Cardiovascular Risk Score, and propensity score trained using relevant data from the EHR.



Supplemental Figure S2: Significant Differences in Choice of Treatment Post-Metformin & Sulfonylurea Dual Therapy. Heatmap depicting the odds ratio of medical institutions (A) and individual providers (B) for frequency of each out-class treatment choice. Here, each unit of the x-axes represents a single medical institution compared to all other medical institutions (A) or a single provider within a medical institution compared to all other providers (B). For (B), only providers with at least three prescriptions were depicted and the number for each site are listed below each plot. The order of the institutions or providers in the x-axes is determined by similarity in prescription patterns, depicted in the dendrogram above each plot. The y-axes represent different medication classes available for choice of out-class treatment and the number of significant differences for each medication class are enumerated on the right-hand side of each plot. An institution or provider is determined to have a significantly different frequency for a particular medication class using binomial probabilities with three separate cohort matching techniques to account for HbA1c, Framingham Cardiovascular Risk Score, and propensity score trained using relevant data from the EHR.



Supplemental Figure S3: Significant Differences for In-Class Choice of Treatment. Heatmap depicting the odds ratio of medical institutions (A, C, E, G, I, & K) and individual providers (B, D, F, H, J, &L) for frequency of each in-class treatment choice. For each site, only providers with at least three prescriptions were depicted and the number for each site are listed below each plot. Here, each unit of the x-axes represents a single medical institution compared to all other medical institutions or a single provider within a medical institution compared to all other providers. The order of the institutions or providers in the x-axes is determined by similarity in prescription patterns, depicted in the dendrogram above each plot. The y-axes represent different medication classes available for choice of in-class treatment and the number of significant differences for each medication class are enumerated on the right-hand side of each plot. An institution or provider is determined to have a significantly different frequency for a particular medication class using binomial probabilities with three separate cohort matching techniques to account for HbA1c, Framingham Cardiovascular Risk Score, and propensity score trained using relevant data from the EHR.

Supplemental Table S1: Demographics of patients in each of the two out-class cohorts. The post-Metformin monotherapy group describes a cohort of patients changing their T2D medication regimen from Metformin monotherapy to either dual therapy or to insulin. The post-Metformin & Sulfonylurea dual therapy group describes a cohort of patients changing their T2D medication regimen from dual therapy Metformin & Sulfonylurea to either a triple therapy or to insulin.

	Post-Metformin Monotherapy	Post-Metformin & Sulfonylurea Dual Therapy
Total Patients	8,449	3,364
Age ≥ 80	892 (11%)	367 (11%)
Age 70-80	1,511 (18%)	667 (20%)
Age 60-70	2,648 (31%)	1,092 (32%)
Age 50-60	2,199 (26%)	849 (25%)
Age ≤ 50	1,199 (14%)	389 (12%)
BMI: Morbid Obesity	991 (12%)	355 (11%)
BMI: Obese	3,245 (38%)	1,262 (38%)
BMI: Overweight	2,348 (28%)	943 (28%)
HbA1c: ≥9%	2,906 (34%)	1,559 (46%)
HbA1c: 7-9%	3,792 (45%)	1,464 (44%)
High LDL	553 (6.5%)	177 (5.3%)
Low HDL	3,227 (38%)	1,348 (40%)
High SBP	4,184 (50%)	1,739 (52%)
High Triglycerides	6,354 (75%)	2,602 (77%)
Asian	1,029 (12%)	420 (12%)
Black or African American	404 (4.8%)	161 (4.8%)
White or Caucasian	4,672 (55%)	1,833 (54%)
Hispanic or Latino	2,135 (25%)	1,019 (30%)
Asthma	911 (11%)	314 (9.3%)
COPD	332 (3.9%)	154 (4.6%)
Osteoporosis	479 (5.7%)	196 (5.8%)
GERD	1,793 (21%)	758 (23%)
Insomnia or Sleep Apnea	1,926 (23%)	726 (22%)
Rheumatic Disease	115 (1.4%)	31 (0.92%)
Depression	1,423 (17%)	559 (17%)
Hypertension	7,452 (88%)	3,007 (89%)
CKD	1,264 (15%)	648 (19%)
Liver Damage	997 (12%)	400 (12%)
Heart Attack	295 (3.5%)	121 (3.6%)
Heart Failure	529 (6.3%)	228 (6.8%)
PAD	287 (3.4%)	133 (4%)
Heart Block	187 (2.2%)	80 (2.4%)
Stroke	274 (3.2%)	129 (3.8%)
Cardiomyopathy	212 (2.5%)	86 (2.6%)
Arrhythmias	1351 (16%)	519 (15%)
Myocarditis	524 (6.2%)	226 (6.7%)

Supplemental Table S2: Demographics of patients in each in-class cohort.
Each cohort represents the first time each patient was prescribed a medication initiated by the University of California within the Sulfonylurea, DPP-4i, SGLT-2i, GLP-1RA, AGi, or Meglitinide medication classes.

	Sulfonylurea	DPP-4i	GLP-1RA	SGLT-2i	Meglitinide	AGi
Total Patients	10,548	7,709	3,932	3,461	1,515	361
Age ≥ 80	1,587 (15%)	1,339 (17%)	229 (5.8%)	210 (6.1%)	402 (27%)	91 (25%)
Age 70-80	2,101 (20%)	1,750 (23%)	695 (18%)	694 (20%)	404 (27%)	93 (26%)
Age 60-70	3,219 (31%)	2,351 (30%)	1,351 (34%)	1,222 (35%)	387 (26%)	106 (29%)
Age 50-60	2,449 (23%)	1,569 (20%)	1,074 (27%)	901 (26%)	236 (16%)	50 (14%)
Age ≤ 50	1,192 (11%)	700 (9.1%)	583 (15%)	434 (13%)	86 (5.7%)	21 (5.8%)
BMI: Morbid Obesity	1,023 (9.7%)	714 (9.3%)	756 (19%)	411 (12%)	96 (6.3%)	23 (6.4%)
BMI: Obese	3,863 (37%)	2,820 (37%)	1,928 (49%)	1,517 (44%)	433 (29%)	115 (32%)
BMI: Overweight	3,014 (29%)	2,214 (29%)	803 (20%)	994 (29%)	463 (31%)	112 (31%)
HbA1c: ≥9%	3,596 (34%)	2,018 (26%)	1,357 (35%)	1,156 (33%)	339 (22%)	78 (22%)
HbA1c: 7-9%	4,656 (44%)	3,863 (50%)	1,775 (45%)	1,757 (51%)	779 (51%)	176 (49%)
High LDL	711 (6.7%)	372 (4.8%)	156 (4%)	146 (4.2%)	49 (3.2%)	7 (1.9%)
Low HDL	4,102 (39%)	2,835 (37%)	1,547 (39%)	1,308 (38%)	502 (33%)	128 (35%)
High SBP	5,142 (49%)	3,599 (47%)	2,051 (52%)	1,761 (51%)	639 (42%)	136 (38%)
High Triglycerides	8,037 (76%)	5,835 (76%)	3,016 (77%)	2,729 (79%)	1,130 (75%)	272 (75%)
Asian	1,352 (13%)	1,216 (16%)	296 (7.5%)	375 (11%)	188 (12%)	74 (20%)
Black or African	567 (5.4%)	341 (4.4%)	148 (3.8%)	67 (1.9%)	32 (2.1%)	8 (2.2%)
White or Caucasian	5,657 (54%)	3,937 (51%)	2,250 (57%)	1,769 (51%)	748 (49%)	189 (52%)
Hispanic or Latino	2,685 (25%)	1,558 (20%)	789 (20%)	636 (18%)	251 (17%)	59 (16%)
Asthma	893 (8.5%)	817 (11%)	535 (14%)	359 (10%)	144 (9.5%)	37 (10%)
COPD	419 (4%)	361 (4.7%)	209 (5.3%)	112 (3.2%)	97 (6.4%)	19 (5.3%)
Osteoporosis	514 (4.9%)	586 (7.6%)	210 (5.3%)	186 (5.4%)	152 (10%)	37 (10%)
GERD	1,916 (18%)	1,870 (24%)	1,021 (26%)	786 (23%)	375 (25%)	90 (25%)
Insomnia / Sleep	1,926 (18%)	1,780 (23%)	1,262 (32%)	901 (26%)	321 (21%)	91 (25%)
Rheumatic Disease	123 (1.2%)	114 (1.5%)	92 (2.3%)	61 (1.8%)	26 (1.7%)	7 (1.9%)
Depression	1,522 (14%)	1,318 (17%)	900 (23%)	562 (16%)	229 (15%)	61 (17%)
Hypertension	9,304 (88%)	6,956 (90%)	3,633 (92%)	3,198 (92%)	1,378 (91%)	329 (91%)
CKD	2,002 (19%)	2,121 (28%)	1,032 (26%)	672 (19%)	599 (40%)	99 (27%)
Liver Damage	970 (9.2%)	936 (12%)	631 (16%)	514 (15%)	190 (13%)	32 (8.9%)
Heart Attack	343 (3.3%)	355 (4.6%)	192 (4.9%)	145 (4.2%)	81 (5.3%)	12 (3.3%)
Heart Failure	749 (7.1%)	769 (10%)	372 (9.5%)	241 (7%)	194 (13%)	33 (9.1%)
PAD	380 (3.6%)	412 (5.3%)	182 (4.6%)	151 (4.4%)	113 (7.5%)	24 (6.6%)
Heart Block	229 (2.2%)	243 (3.2%)	132 (3.4%)	98 (2.8%)	59 (3.9%)	9 (2.5%)
Stroke	381 (3.6%)	324 (4.2%)	162 (4.1%)	110 (3.2%)	56 (3.7%)	24 (6.6%)
Cardiomyopathy	306 (2.9%)	269 (3.5%)	149 (3.8%)	110 (3.2%)	66 (4.4%)	9 (2.5%)
Arrhythmias	1,552 (15%)	1,494 (19%)	779 (20%)	601 (17%)	330 (22%)	71 (20%)
Myocarditis	619 (5.9%)	720 (9.3%)	396 (10%)	268 (7.7%)	100 (6.6%)	23 (6.4%)

Supplemental Table S3: Demographics of patients with high cardiovascular risk. Demographic information for the most recent medication change for patients in the highest quintile of cardiovascular risk at each site.

	UC-A	UC-B	UC-C	UC-D	UC-E
Total Patients	6,721	5,896	14,743	3,080	6,131
Age ≥ 80	1,892 (28%)	1,434 (24%)	4,379 (30%)	1,396 (45%)	1,654 (27%)
Age 70-80	2,008 (30%)	1,944 (33%)	5,791 (39%)	956 (31%)	2,452 (40%)
Age 60-70	2,075 (31%)	2,065 (35%)	3,974 (27%)	599 (19%)	1,818 (30%)
Age 50-60	699 (10%)	436 (7.4%)	589 (4%)	103 (3.3%)	206 (3.4%)
BMI: Morbid Obesity	518 (7.7%)	879 (15%)	1,229 (8.3%)	50 (1.6%)	487 (7.9%)
BMI: Obese	2,699 (40%)	2,836 (48%)	5,871 (40%)	130 (4.2%)	2,492 (41%)
BMI: Overweight	2,306 (34%)	1,606 (27%)	5,067 (34%)	154 (5%)	2,211 (36%)
HbA1c: ≥9%	1,660 (25%)	1,316 (22%)	2,800 (19%)	727 (24%)	1,003 (16%)
HbA1c: 7-9%	4,347 (65%)	3,832 (65%)	9,194 (62%)	2,019 (66%)	3,895 (64%)
High LDL	243 (3.6%)	169 (2.9%)	437 (3%)	179 (5.8%)	124 (2%)
Low HDL	3,649 (54%)	3,328 (56%)	5,901 (40%)	664 (22%)	2,894 (47%)
High SBP	5,916 (88%)	5,044 (86%)	12,835 (87%)	2,881 (94%)	5,357 (87%)
High Triglycerides	2,503 (37%)	2,411 (41%)	6,216 (42%)	1,167 (38%)	2,563 (42%)
Asian	915 (14%)	436 (7.4%)	961 (6.5%)	1,028 (33%)	778 (13%)
Black or African American	209 (3.1%)	490 (8.3%)	1,283 (9%)	497 (16%)	412 (6.7%)
White or Caucasian	4,590 (68%)	3,889 (66%)	8,578 (58%)	904 (29%)	3,631 (59%)
Hispanic or Latino	2,551 (38%)	644 (11%)	2,078 (14%)	262 (8.5%)	1,047 (17%)
Asthma	269 (4%)	630 (11%)	1,314 (8.9%)	459 (15%)	574 (9.4%)
COPD	368 (5.5%)	473 (8%)	1,246 (8.5%)	281 (9.1%)	679 (11%)
Osteoporosis	175 (2.6%)	153 (2.6%)	589 (4%)	611 (20%)	448 (7.3%)
GERD	852 (13%)	1,483 (25%)	3,641 (25%)	898 (29%)	2,155 (35%)
Insomnia or Sleep Apnea	650 (9.7%)	1,265 (21%)	3,426 (23%)	418 (14%)	1,524 (25%)
Rheumatic Disease	65 (0.97%)	77 (1.3%)	160 (1.1%)	78 (2.5%)	51 (0.83%)
Depression	487 (7.2%)	917 (16%)	2,303 (16%)	776 (25%)	1,423 (23%)
Hypertension	6,316 (94%)	5,734 (97%)	14,426 (98%)	3,029 (98%)	6,049 (99%)
CKD	1,851 (28%)	1,880 (32%)	6,893 (47%)	1,185 (38%)	2,874 (47%)
Liver Damage	521 (7.8%)	357 (6.1%)	1,364 (9.3%)	399 (13%)	1,137 (19%)
Heart Attack	200 (3%)	354 (6%)	927 (6.3%)	150 (4.9%)	1,030 (17%)
Heart Failure	748 (11%)	857 (15%)	2,086 (14%)	526 (17%)	1,555 (25%)
PAD	390 (5.8%)	449 (7.6%)	1,832 (12%)	186 (6%)	730 (12%)
Heart Block	149 (2.2%)	261 (4.4%)	668 (4.5%)	104 (3.4%)	887 (14%)
Stroke	396 (5.9%)	287 (4.9%)	1,011 (6.9%)	255 (8.3%)	604 (9.9%)
Cardiomyopathy	172 (2.6%)	222 (3.8%)	737 (5%)	90 (2.9%)	516 (8.4%)
Arrhythmias	1,296 (19%)	1,374 (23%)	3,937 (27%)	1,086 (35%)	2,952 (48%)
Myocarditis	546 (8.1%)	434 (7.4%)	958 (6.5%)	323 (10%)	2,124 (35%)

Supplemental Table S4: Significant differences across the UC sites in out-class choice of treatment post-Metformin monotherapy. P-Values for the medication class for each UC site are given for binomial probability significance compared to all other UC sites (Binomial P-Value) as well as significance compared to cohorts of equal size matched by A1c, Framingham Cardiovascular Risk Score (FCRS), or propensity score. The order of this table is determined by the most significantly different, i.e. first by the lowest summation of the four p-values then by the largest odds ratio.

	Total Increased To This Class	Odds Ratio Compared to Other UC Sites	FDR-Adj. Binomial P-Value	FDR-Adj. A1c-Matched Binomial P-Value	FDR-Adj. FCRS-Matched Binomial P-Value	FDR-Adj. Propensity-Matched Binomial P-Value
UC-C SGLT-2i	334 / 2,984	4.78	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-C Meglitinide	96 / 2,984	3.04	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-C GLP-1RA	267 / 2,984	2.72	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-A SGLT-2i	39 / 1,557	0.41	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-C Insulin	416 / 2,984	0.61	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-C DPP-4i	833 / 2,984	1.53	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-C Sulfonylurea	969 / 2,984	0.66	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-E Meglitinide	5 / 1,389	0.17	< 2e-16	0.0024	0.0001	< 2e-16
UC-B SGLT-2i	3 / 1,829	0.02	< 2e-16	0.0030	< 2e-16	< 2e-16
UC-A Meglitinide	7 / 1,557	0.21	< 2e-16	0.0032	< 2e-16	< 2e-16
UC-A DPP-4i	192 / 1,557	0.52	< 2e-16	0.0040	< 2e-16	< 2e-16
UC-D Meglitinide	27 / 690	2.39	0.0021	< 2e-16	0.0002	0.0017
UC-A Insulin	406 / 1,557	1.42	< 2e-16	0.0051	< 2e-16	< 2e-16
UC-D Insulin	103 / 690	0.74	0.0176	< 2e-16	< 2e-16	< 2e-16
UC-B DPP-4i	350 / 1,829	0.86	0.0334	< 2e-16	0.0010	0.0001
UC-E Sulfonylurea	469 / 1,389	0.75	< 2e-16	< 2e-16	< 2e-16	0.4951
UC-B Sulfonylurea	986 / 1,829	1.33	< 2e-16	1.0	< 2e-16	< 2e-16
UC-A Sulfonylurea	843 / 1,557	1.32	< 2e-16	1.0	< 2e-16	< 2e-16
UC-B GLP-1RA	26 / 1,829	0.22	< 2e-16	1.0	< 2e-16	< 2e-16
UC-D Sulfonylurea	398 / 690	1.37	< 2e-16	1.0	< 2e-16	< 2e-16
UC-A GLP-1RA	33 / 1,557	0.35	< 2e-16	1.0	< 2e-16	< 2e-16
UC-E Insulin	345 / 1,389	1.32	< 2e-16	1.0	< 2e-16	< 2e-16
UC-D SGLT-2i	13 / 690	0.33	< 2e-16	< 2e-16	< 2e-16	1.0
UC-E GLP-1RA	104 / 1,389	1.54	0.0008	< 2e-16	< 2e-16	1.0
UC-B Insulin	401 / 1,829	1.14	0.1312	1.0	0.1440	0.0064
UC-B Meglitinide	19 / 1,829	0.51	0.0486	1.0	0.1858	0.2823
UC-E DPP-4i	349 / 1,389	1.20	0.0088	< 2e-16	0.6301	1.0
UC-D DPP-4i	107 / 690	0.70	0.0005	1.0	1.0	< 2e-16
UC-D GLP-1RA	17 / 690	0.45	0.0048	1.0	< 2e-16	1.0
UC-E SGLT-2i	73 / 1,829	0.95	1.0	< 2e-16	1.0	1.0
UC-C TZD	56 / 2,984	0.82	1.0	0.1595	1.0	1.0
UC-E TZD	38 / 1,389	1.35	1.0	1.0	1.0	0.2807
UC-D AGi	6 / 690	2.12	1.0	0.6563	1.0	1.0
UC-D TZD	19 / 690	1.32	1.0	1.0	0.8625	1.0
UC-A TZD	31 / 1,557	0.91	1.0	1.0	1.0	1.0
UC-A AGi	6 / 1,557	0.84	1.0	1.0	1.0	1.0
UC-E AGi	6 / 1,829	0.96	1.0	1.0	1.0	1.0
UC-B TZD	37 / 1,829	0.93	1.0	1.0	1.0	1.0
UC-B AGi	7 / 1,829	0.81	1.0	1.0	1.0	1.0
UC-C AGi	13 / 2,984	0.95	1.0	1.0	1.0	1.0

Supplemental Table S5: Number of providers with significant differences in choice of treatment post-Metformin monotherapy. Providers with at least 3 post-Metformin monotherapy prescriptions were compared to post-Metformin monotherapy prescription patterns for providers at other UC sites. The number of providers with significant differences are listed for each UC site compared to all other UC providers.

	Total Providers	Providers With At Least 3 Prescriptions	AGi	DPP-4i	GLP-1RA	Insulin	Meglitinide	SGLT-2i	Sulfonylurea	TZD
UC-A	213	70	0	3	0	0	0	0	1	0
UC-B	389	152	0	1	0	0	1	0	0	0
UC-C	770	287	0	2	4	0	0	4	2	1
UC-D	260	71	0	0	0	0	2	0	0	0
UC-E	471	136	0	0	0	1	0	0	0	1

Supplemental Table S6: Significant differences across the UC sites in out-class choice of post-Metformin & Sulfonylurea dual therapy. P-Values for the medication class for each UC site are given for binomial probability significance compared to all other UC sites (Binomial P-Value) as well as significance compared to cohorts of equal size matched by A1c, Framingham Cardiovascular Risk Score (FCRS), or propensity score. The order of this table is determined by the most significantly different, i.e. first by the lowest summation of the four p-values then by the largest odds ratio.

	Total Increased To This Class	Odds Ratio Compared to Other UC Sites	FDR-Adj. Binomial P-Value	FDR-Adj. A1c-Matched Binomial P-Value	FDR-Adj. FCRS-Matched Binomial P-Value	FDR-Adj. Propensity-Matched Binomial P-Value
UC-C Meglitinide	39 / 1,045	4.34	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-C SGLT-2i	205 / 1,045	4.10	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-A TZD	85 / 727	1.98	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-A DPP-4i	145 / 727	0.51	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-C Insulin	257 / 1,045	0.53	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-A Insulin	450 / 727	1.84	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-D Insulin	92 / 341	0.65	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-D GLP-1RA	42 / 341	2.29	< 2e-16	< 2e-16	0.0001	< 2e-16
UC-B GLP-1RA	12 / 690	0.24	< 2e-16	0.0003	< 2e-16	< 2e-16
UC-B SGLT-2i	3 / 690	0.04	< 2e-16	0.0023	< 2e-16	< 2e-16
UC-B DPP-4i	293 / 690	1.28	< 2e-16	< 2e-16	< 2e-16	0.0063
UC-A Meglitinide	1 / 727	0.06	0.0001	0.0066	< 2e-16	0.0001
UC-E GLP-1RA	54 / 561	1.79	0.0017	< 2e-16	0.0002	0.0151
UC-C GLP-1RA	86 / 1,045	1.60	0.0008	< 2e-16	< 2e-16	0.0211
UC-D DPP-4i	147 / 341	1.26	0.0209	0.0001	< 2e-16	0.0049
UC-A GLP-1RA	11 / 727	0.21	< 2e-16	0.0453	< 2e-16	< 2e-16
UC-C TZD	48 / 1,045	0.55	0.0001	< 2e-16	0.0003	0.0553
UC-A SGLT-2i	32 / 727	0.41	< 2e-16	0.0881	< 2e-16	< 2e-16
UC-B Insulin	328 / 690	1.26	< 2e-16	0.2969	0.0009	< 2e-16
UC-E Meglitinide	1 / 561	0.09	0.0091	0.0063	0.4364	0.0003
UC-C DPP-4i	399 / 1,045	1.14	0.0727	0.4258	0.0025	1.0
UC-D Meglitinide	7 / 341	1.19	1.0	1.0	< 2e-16	1.0
UC-D SGLT-2i	24 / 341	0.73	1.0	< 2e-16	1.0	1.0
UC-E Insulin	212 / 561	0.94	1.0	< 2e-16	1.0	1.0
UC-E SGLT-2i	52 / 561	0.99	1.0	< 2e-16	1.0	1.0
UC-E AGi	7 / 561	1.95	1.0	1.0	1.0	0.0028
UC-B TZD	41 / 690	0.79	1.0	0.0689	1.0	1.0
UC-A AGi	3 / 727	0.50	1.0	1.0	1.0	1.0
UC-D TZD	27 / 341	1.12	1.0	1.0	1.0	1.0
UC-D AGi	2 / 341	0.77	1.0	1.0	1.0	1.0
UC-B Meglitinide	11 / 690	0.89	1.0	1.0	1.0	1.0
UC-B AGi	2 / 690	0.34	1.0	1.0	1.0	1.0
UC-E TZD	40 / 561	0.99	1.0	1.0	1.0	1.0
UC-E DPP-4i	195 / 561	0.99	1.0	1.0	1.0	1.0
UC-C AGi	11 / 1,045	1.76	1.0	1.0	1.0	1.0

Supplemental Table S7: Number of providers with significant differences in choice of treatment post-Metformin & Sulfonylurea dual therapy. Providers with at least 3 post-Metformin & Sulfonylurea dual therapy prescriptions were compared to post-Metformin & Sulfonylurea dual therapy prescription patterns for providers at other UC sites. The number of providers with significant differences are listed for each UC site compared to all other UC providers.

	Total Providers	Providers With At Least 3 Prescriptions	AGi	DPP-4i	GLP-1RA	Insulin	Meglitinides	SGLT-2i	TZD
UC-A	132	42	0	0	0	1	0	0	0
UC-B	234	93	0	0	0	0	0	0	0
UC-C	433	125	0	0	0	0	0	2	0
UC-D	176	32	0	0	1	0	0	0	0
UC-E	273	59	1	0	1	0	0	0	0

Supplemental Table S8: Significant differences across the UC sites in first choice of Sulfonylurea. P-Values for the medication class for each UC site are given for binomial probability significance compared to all other UC sites (Binomial P-Value) as well as significance compared to cohorts of equal size matched by A1c, Framingham Cardiovascular Risk Score (FCRS), or propensity score. The order of this table is determined by the most significantly different, i.e. first by the lowest summation of the four p-values then by the largest odds ratio.

	Total Increased To This Class	Odds Ratio Compared to Other UC Sites	FDR-Adj. Binomial P-Value	FDR-Adj. A1c-Matched Binomial P-Value	FDR-Adj. FCRS-Matched Binomial P-Value	FDR-Adj. Propensity-Matched Binomial P-Value
UC-A Glipizide	1,628 / 1,936	1.24	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-C Glimepiride	704 / 3,065	1.77	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-A Glyburide	130 / 1,936	0.46	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-C Glipizide	1,998 / 3,065	0.89	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-A Glimepiride	178 / 1,936	0.53	< 2e-16	0.0002	< 2e-16	< 2e-16
UC-B Glyburide	467 / 2,769	1.42	< 2e-16	1.0	< 2e-16	< 2e-16
UC-B Glimepiride	361 / 2,769	0.77	< 2e-16	1.0	< 2e-16	< 2e-16
UC-E Glyburide	273 / 1,652	1.31	0.0001	0.0092	0.0009	< 2e-16
UC-C Glyburide	363 / 3,065	0.86	0.0294	< 2e-16	0.3287	< 2e-16
UC-E Glipizide	1,126 / 1,652	0.95	0.0532	1.0	0.0153	< 2e-16
UC-B Glipizide	1,941 / 2,769	0.98	1.0	0.8210	0.8210	0.0002
UC-D Glyburide	159 / 1,126	1.08	1.0	< 2e-16	0.0258	1.0
UC-D Glipizide	789 / 1,126	0.99	1.0	0.0569	0.0119	1.0
UC-D Glimepiride	178 / 1,126	1.00	1.0	0.0003	1.0	1.0
UC-E Glimepiride	253 / 1,652	0.96	1.0	0.0012	1.0	1.0

Supplemental Table S9: Number of providers with significant differences in first choice of Sulfonylurea. Providers with at least 3 Sulfonylurea prescriptions were compared to Sulfonylurea prescription patterns for providers at other UC sites. The number of providers with significant differences are listed for each UC site compared to all other UC providers.

	Total Providers	Providers With At Least 3 Prescriptions	Glimepiride	Glipizide	Glyburide
UC-A	234	92	3	6	0
UC-B	508	187	2	2	4
UC-C	789	293	12	7	1
UC-D	379	97	1	1	0
UC-E	520	153	4	3	2

Supplemental Table S10: Significant differences across the UC sites in first choice of DPP-4i. P-Values for the medication class for each UC site are given for binomial probability significance compared to all other UC sites (Binomial P-Value) as well as significance compared to cohorts of equal size matched by A1c, Framingham Cardiovascular Risk Score (FCRS), or propensity score. The order of this table is determined by the most significantly different, i.e. first by the lowest summation of the four p-values then by the largest odds ratio.

	Total Increased To This Class	Odds Ratio Compared to Other UC Sites	FDR-Adj. Binomial P-Value	FDR-Adj. A1c-Matched Binomial P-Value	FDR-Adj. FCRS-Matched Binomial P-Value	FDR-Adj. Propensity-Matched Binomial P-Value
UC-A Alogliptin	117 / 1,110	17.28	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-B Linagliptin	1 / 1,517	0.01	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-B Sitagliptin	1,486 / 1,517	1.18	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-A Sitagliptin	764 / 1,110	0.78	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-A Linagliptin	223 / 1,110	2.32	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-D Alogliptin	1 / 652	0.07	0.0003	< 2e-16	< 2e-16	< 2e-16
UC-A Saxagliptin	6 / 1,110	0.26	0.0010	0.0002	< 2e-16	0.0002
UC-D Sitagliptin	605 / 652	1.09	< 2e-16	0.0025	< 2e-16	< 2e-16
UC-B Alogliptin	3 / 1,517	0.08	< 2e-16	0.0077	< 2e-16	< 2e-16
UC-D Linagliptin	36 / 652	0.51	0.0001	0.0002	0.0204	< 2e-16
UC-C Linagliptin	337 / 2,913	1.21	0.0050	< 2e-16	0.1321	< 2e-16
UC-C Alogliptin	10 / 2,913	0.11	< 2e-16	0.1417	< 2e-16	< 2e-16
UC-E Sitagliptin	1260 / 1,517	0.96	0.0029	< 2e-16	0.0008	< 2e-16
UC-E Linagliptin	197 / 1,517	1.35	0.0005	< 2e-16	0.0003	0.9423
UC-C Saxagliptin	66 / 2,913	1.41	0.1263	1.0	0.0521	0.3458
UC-E Saxagliptin	34 / 1,517	1.27	1.0	1.0	0.1568	0.0322
UC-C Sitagliptin	2500 / 2,913	1.00	1.0	< 2e-16	1.0	0.8726
UC-E Alogliptin	26 / 1,517	0.81	1.0	< 2e-16	1.0	1.0
UC-D Saxagliptin	10 / 652	0.82	1.0	1.0	1.0	1.0
UC-B Saxagliptin	27 / 1,517	0.95	1.0	1.0	1.0	1.0

Supplemental Table S11: Number of providers with significant differences in first choice of DPP-4i. Providers with at least 3 DPP-4i prescriptions were compared to DPP-4i prescription patterns for providers at other UC sites. The number of providers with significant differences are listed for each UC site compared to all other UC providers.

	Total Providers	Providers With At Least 3 Prescriptions	Alogliptin	Linagliptin	Saxagliptin	Sitagliptin
UC-A	211	71	6	2	0	3
UC-B	336	120	0	0	0	0
UC-C	740	291	0	1	0	1
UC-D	274	66	0	0	0	0
UC-E	479	141	0	0	1	1

Supplemental Table S12: Significant differences across the UC sites in first choice of SGLT-2i. P-Values for the medication class for each UC site are given for binomial probability significance compared to all other UC sites (Binomial P-Value) as well as significance compared to cohorts of equal size matched by A1c, Framingham Cardiovascular Risk Score (FCRS), or propensity score. The order of this table is determined by the most significantly different, i.e. first by the lowest summation of the four p-values then by the largest odds ratio.

	Total Increased To This Class	Odds Ratio Compared to Other UC Sites	FDR-Adj. Binomial P-Value	FDR-Adj. A1c-Matched Binomial P-Value	FDR-Adj. FCRS-Matched Binomial P-Value	FDR-Adj. Propensity-Matched Binomial P-Value
UC-A Empagliflozin	279 / 444	1.15	0.0062	< 2e-16	0.0006	< 2e-16
UC-D Empagliflozin	65 / 175	0.66	< 2e-16	0.0418	< 2e-16	< 2e-16
UC-D Canagliflozin	101 / 175	1.53	< 2e-16	0.1142	< 2e-16	< 2e-16
UC-C Canagliflozin	914 / 2,262	1.14	< 2e-16	< 2e-16	0.0002	0.1539
UC-A Dapagliflozin	14 / 444	0.51	0.0836	0.0066	0.0660	0.1708
UC-A Canagliflozin	151 / 444	0.86	0.3351	< 2e-16	0.0754	0.0012
UC-C Empagliflozin	1219 / 2,262	0.92	0.0001	< 2e-16	0.0002	0.4842
UC-E Dapagliflozin	46 / 555	1.56	0.0470	< 2e-16	0.6163	0.0329
UC-E Canagliflozin	166 / 555	0.74	< 2e-16	< 2e-16	< 2e-16	1.0
UC-E Empagliflozin	343 / 555	1.14	0.0060	< 2e-16	0.0001	1.0
UC-B Canagliflozin	7 / 25	0.72	1.0	< 2e-16	1.0	1.0
UC-B Dapagliflozin	2 / 25	1.39	1.0	< 2e-16	1.0	1.0
UC-B Empagliflozin	16 / 25	1.15	1.0	< 2e-16	1.0	1.0
UC-C Dapagliflozin	129 / 2,262	0.96	1.0	0.2975	1.0	1.0
UC-D Dapagliflozin	9 / 175	0.89	1.0	1.0	0.9946	1.0

Supplemental Table S13: Number of providers with significant differences in first choice of SGLT-2i. Providers with at least 3 SGLT-2i prescriptions were compared to SGLT-2i prescription patterns for providers at other UC sites. The number of providers with significant differences are listed for each UC site compared to all other UC providers.

	Total Providers	Providers With At Least 3 Prescriptions	Canagliflozin	Dapagliflozin	Empagliflozin
UC-A	113	32	0	0	0
UC-B	60	1	0	0	0
UC-C	588	205	4	0	2
UC-D	99	7	1	0	1
UC-E	268	60	0	1	0

Supplemental Table S14: Significant differences across the UC sites in first choice of GLP-1RA. P-Values for the medication class for each UC site are given for binomial probability significance compared to all other UC sites (Binomial P-Value) as well as significance compared to cohorts of equal size matched by A1c, Framingham Cardiovascular Risk Score (FCRS), or propensity score. The order of this table is determined by the most significantly different, i.e. first by the lowest summation of the four p-values then by the largest odds ratio.

	Total Increased To This Class	Odds Ratio Compared to Other UC Sites	FDR-Adj. Binomial P-Value	FDR-Adj. A1c-Matched Binomial P-Value	FDR-Adj. FCRS-Matched Binomial P-Value	FDR-Adj. Propensity-Matched Binomial P-Value
UC-C Dulaglutide	1,091 / 2,129	1.92	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-C Exenatide	167 / 2,129	0.33	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-B Exenatide	114 / 187	4.70	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-B Liraglutide	0 / 187	< 0.01	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-A Liraglutide	282 / 472	1.64	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-C Lixisenatide	32 / 2,129	6.83	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-C Liraglutide	760 / 2,129	0.82	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-D Dulaglutide	53 / 258	0.50	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-C Albiglutide	8 / 2,129	0.21	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-E Exenatide	182 / 886	1.50	< 2e-16	0.0001	< 2e-16	< 2e-16
UC-E Dulaglutide	293 / 886	0.79	< 2e-16	< 2e-16	< 2e-16	0.0001
UC-D Liraglutide	152 / 258	1.56	< 2e-16	0.0040	< 2e-16	< 2e-16
UC-E Albiglutide	19 / 886	2.98	0.0011	0.1046	< 2e-16	0.0005
UC-A Exenatide	100 / 472	1.47	0.0024	< 2e-16	0.0734	0.0453
UC-A Dulaglutide	67 / 472	0.33	< 2e-16	1.0	< 2e-16	< 2e-16
UC-E Semaglutide	40 / 886	1.38	1.0	< 2e-16	0.0737	1.0
UC-B Semaglutide	0 / 187	< 0.01	0.0458	1.0	0.0459	1.0
UC-B Albiglutide	4 / 187	2.16	1.0	< 2e-16	1.0	0.5598
UC-B Dulaglutide	68 / 187	0.91	1.0	< 2e-16	0.5605	1.0
UC-A Semaglutide	17 / 472	1.05	1.0	< 2e-16	1.0	1.0
UC-B Lixisenatide	1 / 187	0.58	1.0	< 2e-16	1.0	1.0
UC-D Exenatide	37 / 258	0.94	1.0	< 2e-16	1.0	1.0
UC-D Semaglutide	12 / 258	1.34	1.0	< 2e-16	1.0	1.0
UC-E Liraglutide	349 / 886	1.01	1.0	< 2e-16	1.0	1.0
UC-A Albiglutide	6 / 472	1.26	1.0	1.0	0.0174	1.0
UC-E Lixisenatide	3 / 886	0.31	0.9671	1.0	0.0561	1.0
UC-C Semaglutide	71 / 2,129	0.87	1.0	0.0266	1.0	1.0
UC-D Lixisenatide	0 / 258	< 0.01	1.0	1.0	0.1658	1.0
UC-A Lixisenatide	0 / 472	< 0.01	0.3511	1.0	1.0	1.0
UC-D Albiglutide	4 / 258	1.54	1.0	1.0	0.5625	1.0

Supplemental Table S15 Number of providers with significant differences in first choice of GLP-1RA. Providers with at least 3 GLP-1RA prescriptions were compared to GLP-1RA prescription patterns for providers at other UC sites. The number of providers with significant differences are listed for each UC site compared to all other UC providers.

	Total Providers	Providers With At Least 3 Prescriptions	Albi-glutide	Dula-glutide	Exe-natide	Lira-glutide	Lixise-natide	Sema-glutide
UC-A	141	39	0	1	0	0	0	0
UC-B	102	20	0	0	1	0	0	0
UC-C	638	209	0	0	1	0	1	1
UC-D	132	15	0	0	0	0	0	0
UC-E	376	81	2	1	1	1	0	1

Supplemental Table S16: Significant differences across the UC sites in first choice of Meglitinides. P-Values for the medication class for each UC site are given for binomial probability significance compared to all other UC sites (Binomial P-Value) as well as significance compared to cohorts of equal size matched by A1c, Framingham Cardiovascular Risk Score (FCRS), or propensity score. The order of this table is determined by the most significantly different, i.e. first by the lowest summation of the four p-values then by the largest odds ratio.

	Total Increased To This Class	Odds Ratio Compared to Other UC Sites	FDR-Adj. Binomial P-Value	FDR-Adj. A1c-Matched Binomial P-Value	FDR-Adj. FCRS-Matched Binomial P-Value	FDR-Adj. Propensity-Matched Binomial P-Value
UC-E Nateglinide	25 / 44	2.13	0.0002	< 2e-16	0.0001	0.0001
UC-E Repaglinide	19 / 44	0.59	0.0002	< 2e-16	0.0001	0.0001
UC-B Repaglinide	114 / 134	1.19	0.0025	0.0224	0.0005	0.0067
UC-B Nateglinide	20 / 134	0.52	0.0025	0.0224	0.0005	0.0067
UC-C Repaglinide	761 / 1,065	0.95	0.1092	0.0001	1.0	0.193
UC-C Nateglinide	304 / 1,065	1.14	0.1092	0.0001	1.0	0.193
UC-A Repaglinide	71 / 93	1.06	1.0	1.0	1.0	0.1694
UC-A Nateglinide	22 / 93	0.85	1.0	1.0	1.0	0.1694
UC-D Repaglinide	133 / 179	1.03	1.0	1.0	1.0	0.388
UC-D Nateglinide	46 / 179	0.93	1.0	1.0	1.0	0.388

Supplemental Table S17: Number of providers with significant differences in first choice of Meglitinide. Providers with at least 3 Meglitinide prescriptions were compared to Meglitinide prescription patterns for providers at other UC sites. The number of providers with significant differences are listed for each UC site compared to all other UC providers.

	Total Providers	Providers With At Least 3 Prescriptions	Nateglinide	Repaglinide
UC-A	45	5	0	0
UC-B	60	14	0	0
UC-C	451	110	2	2
UC-D	99	11	0	0
UC-E	40	1	0	0

Supplemental Table S18: Significant differences across the UC sites in first choice of AGi. P-Values for the medication class for each UC site are given for binomial probability significance compared to all other UC sites (Binomial P-Value) as well as significance compared to cohorts of equal size matched by A1c, Framingham Cardiovascular Risk Score (FCRS), or propensity score. The order of this table is determined by the most significantly different, i.e. first by the lowest summation of the four p-values then by the largest odds ratio.

	Total Increased To This Class	Odds Ratio Compared to Other UC Sites	FDR-Adj. Binomial P-Value	FDR-Adj. A1c-Matched Binomial P-Value	FDR-Adj. FCRS-Matched Binomial P-Value	FDR-Adj. Propensity-Matched Binomial P-Value
UC-D Miglitol	2 / 45	4.68	0.6823	< 2e-16	1.0	< 2e-16
UC-D Acarbose	43 / 45	0.97	0.6823	< 2e-16	1.0	< 2e-16
UC-A Acarbose	67 / 68	1.00	1.0	1.0	< 2e-16	< 2e-16
UC-A Miglitol	1 / 68	1.07	1.0	1.0	< 2e-16	< 2e-16
UC-E Acarbose	61 / 61	1.02	1.0	1.0	1.0	1.0
UC-E Miglitol	0 / 61	< 0.01	1.0	1.0	1.0	1.0
UC-B Acarbose	29 / 29	1.02	1.0	1.0	1.0	1.0
UC-B Miglitol	0 / 29	< 0.01	1.0	1.0	1.0	1.0
UC-C Acarbose	156 / 158	1.00	1.0	1.0	1.0	1.0
UC-C Miglitol	2 / 158	0.86	1.0	1.0	1.0	1.0

Supplemental Table S19: Number of providers with significant differences in first choice of AGi. Providers with at least 3 AGi prescriptions were compared to AGi prescription patterns for providers at other UC sites. The number of providers with significant differences are listed for each UC site compared to all other UC providers. No significant differences were found.

	Total Providers	Providers With At Least 3 Prescriptions	Acarbose	Miglitol
UC-A	37	4	0	0
UC-B	27	1	0	0
UC-C	110	12	0	0
UC-D	32	4	0	0
UC-E	36	3	0	0

Supplemental Table S20: Significant differences across the UC sites cardioprotective medication utilization. P-Values for the utilization of cardioprotective medications for each UC site are given for binomial probability significance compared to all other UC sites (Binomial P-Value) as well as significance compared to cohorts of equal size matched by A1c, Framingham Cardiovascular Risk Score (FCRS), or propensity score. The order of this table is determined by the most significantly different, i.e. first by the lowest summation of the four p-values then by the largest odds ratio.

	Number of High-Risk Patients Utilizing Cardioprotective Medications	Odds Ratio Compared to Other UC Sites	FDR-Adj. Binomial P-Value	FDR-Adj. A1c-Matched Binomial P-Value	FDR-Adj. FCRS-Matched Binomial P-Value	FDR-Adj. Propensity-Matched Binomial P-Value
UC-B	2 / 1,919	0.0109	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-C	492 / 4,517	1.9075	< 2e-16	< 2e-16	< 2e-16	< 2e-16
UC-A	151 / 1,548	1.2862	0.0018	< 2e-16	0.0377	< 2e-16
UC-E	44 / 897	1.106	0.1884	< 2e-16	0.0425	< 2e-16
UC-D	156 / 1,818	0.6003	0.0002	< 2e-16	< 2e-16	0.7515

Supplemental Table S21: Number of providers with significant differences in cardioprotective medication utilization. Providers with at least 3 prescriptions for high-risk patients were compared to prescription patterns for providers at other UC sites. The number of providers with significant differences are listed for each UC site compared to all other UC providers.

	Total Providers	Providers With At Least 3 Prescriptions for High-Risk Patients	Number of Providers with Significantly Increased Cardioprotective Utilization	Number of Providers with Significantly Decreased Cardioprotective Utilization
UC-A	44	4	0	4
UC-B	32	1	7	3
UC-C	133	12	36	1
UC-D	56	4	10	0
UC-E	48	3	2	0