

## Online-Only Supplemental Material

**Supplementary Table s1. Diagnosis codes used to ascertain study conditions.**

Health condition	ICD-9-CM	ICD-10-CM
Dementia	046.1x, 290.1x, 290.2x, 290.3, 290.4x, 291.2, 292.82, 294.1x, 294.2x, 331.0, 331.1x, 331.2, 331.6, 331.82, 331.89	A81.0x, F01.5x, F02.8x, F03.9x, F10.27, F10.97, F13.27, F13.97, F18.97, F19.17, F19.27, F19.97, G30.x, G31.0x, G31.1, G31.83, G31.85
	<i>Adapted from cohort definition in NQF-endorsed quality measure "Antipsychotic Use in Persons with Dementia" and American Academy of Neurology's "Diagnosis (active) dementia group" value set (found in VSAC)</i>	
End-stage renal disease	585.5, 585.6, 403.01, 403.11, 403.91, 404.02, 404.03, 404.12, 404.13, 404.92, 404.93, V45.11	N18.5, N18.6, I12.0, I13.11, I13.2
	<i>Investigator developed algorithm based on clinical expertise and literature review</i>	
Chronic kidney disease, stages 3-4	585.3, 585.4	N18.3, N18.4
	<i>Investigator developed algorithm based on clinical expertise and literature review</i>	
Myocardial infarction	410.xx, 412	I21.xx, I22.x, I25.2
	<i>Adapted from AHRQ CCS category 100 (1)</i>	
Heart failure	398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.xx	I09.81, I11.0, I13.0, I13.2, I50.xx
	<i>Adapted from the cohort for the NQF-endorsed CMS "Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following heart failure (HF) hospitalization" measure (ACO-37; NQF #0330)(2; 3)</i>	
Cerebrovascular disease	430, 431, 432.x, 433.xx, 434.xx, 435.x, 436, 437.x, 438.xx, V12.54	G45.0, G45.1, G45.2, G45.8, G45.9, G46.x, I60.xx, I61.x (except I61.0), I62.xx, I63.xxx, I65.xx, I66.xx, I67.8x (except I67.83, I67.84), I67.9, I69.xxx, Z86.73
	<i>Adapted from "Cerebrovascular disease, Stroke, TIA" value set from Quality Insights of Pennsylvania (QIP) from VSAC</i>	
Chronic obstructive pulmonary disease	490, 491.xx, 492.x, 494.x, 496	J40, J41.x, J42, J43.x, J44.x, J47.x
	<i>Definition taken from the chronic obstructive pulmonary disease and asthma chronic disease group in the NQF-endorsed CMS "All-Cause Unplanned Admissions for Patients with Multiple Chronic Conditions" measure (ACO-38)(4)</i>	
Cancer (except non-melanoma skin cancer)	14x.xx, 15x.xx, 160.x-165.x, 170.x-172.x, 174.x-176.x, 179-189.x, 19x.xx, 200.xx-208.xx (except 203.x1, 204.x1, 205.x1, 206.x1, 207.x1, 208.x1)	C00.x-C14.x, C15.x-C26.x, C3x.xx, C40.xx-C41.x, C43.x, C4A.xx, C45.x-C49.xx, C50.xxx, C51.x-C58, C60.x-C63.x, C64.x-C68.x, C69.xx-C72.x, C73-C75.x, C76.x-C80.x, C7A.xx, C81.xx-C96.x (except C90.x1, C91.x1, C92.x1, C93.x1, C94.x1, C95.x1)
	<i>Taken from AHRQ CCS categories 11-22; 24-43 (1)</i>	

Cirrhosis	571.2, 571.5, 571.6	K70.3x, K74.3, K74.4, K74.5, K74.6x
	<i>Taken from "Cirrhosis" value set from MITRE (found on VSAC)</i>	
Proliferative retinopathy	361.xx, 362.02, 362.53, 369.xx, 379.23	H33.xxx, E11.359x, H35.359, H54.xx, H43.1x
	<i>Adapted from Glasheen, et al(5) and the NQF-endorsed CMS "Risk-Standardized Acute Admission Rates for Patients with Diabetes" measure (ACO-36) (6)</i>	
Peripheral neuropathy	250.6x, 354.x, 355.x, 356.9, 357.2, 713.5	E10.40, E10.42, E11.40, E11.42, E13.42, G56.x, G57.x, G58.x, G60.9, M14.6x
	<i>Adapted from Glasheen, et al(5) and the NQF-endorsed CMS "Risk-Standardized Acute Admission Rates for Patients with Diabetes" measure (ACO-36) (6)</i>	
Hypertension	401.x, 402.xx, 403.xx, 404.xx, 405.xx	I10, I11.x, I12.x, I13.xx, I15.x, I16.x
	<i>Adapted from "Hypertension" value sets from MITRE and Quality Insights of Pennsylvania (found on VSAC)</i>	
Arthritis	711.2x, 714.xx (except 714.81), 715.xx, 720.x, 725	M05.xxx, M06.xxx, M12.0xx, M35.2, M45.x, M46.1, M46.8x, M46.9x, M49.8x, M35.3
	<i>Taken from AHRQ CCS categories 202-203, 205 (1)</i>	
Urinary incontinence	625.6, 788.30, 788.31, 788.32, 788.33, 788.34, 788.38, 788.39, 788.91	N39.3, N39.41, N39.42, N39.46, N39.490, N39.492, N39.498, R32, R39.81
	<i>Investigator developed algorithm based on clinical expertise and literature review</i>	
Depression	311, 290.13, 290.21, 290.43, 296.2x, 296.3x, 296.82, 298.0, 301.12, 309.0, 309.1, 309.28	F01.51, F32.xx (except F32.81), F33.xx, F34.8x, F43.21, F43.23
	<i>Adapted from "Depression" value set from Quality Insights of Pennsylvania (found on VSAC)</i>	
Falls	E88x.x, E987.x	W00.xxxx, W01.xxxx, W03.xxxx, W04.xxxx, W05.xxxx, W06.xxxx, W07.xxxx, W08.xxxx, W09.xxxx, W10.xxxx, W11.xxxx, W12.xxxx, W13.xxxx, W14.xxxx, W15.xxxx, W16.xxxx, W17.xxxx, W18.xxxx, W19.xxxx, Y30.XXXA
	<i>Investigator developed algorithm based on clinical expertise and literature review</i>	

*Abbreviations:* ACO, Accountable Care Organization; CCS, Clinical Classification Software ; MI, myocardial infarction; VSAC, United States National Library of Medicine Value Set Authority Center

**Supplementary Table S2. Factors associated with insulin and sulfonylurea use among U.S. adults with diabetes (secondary analysis 1).** Two multivariable logistic regression analyses examined the odds of (1) sulfonylurea without insulin and (2) insulin with or without sulfonylurea use controlling for patient age, sex, race/ethnicity, annual household income, glycosylated hemoglobin (HbA<sub>1c</sub>) level, and type of comorbidity profile. In each model, comorbidity burden was reflected by the Charlson comorbidity index.

	Sulfonylurea (no insulin)		Insulin ( $\pm$ sulfonylurea)	
	OR (95% CI)	p-value	OR (95% CI)	p-value
<b>Age groups</b>				
18-44 years	Ref		Ref	
45-64 years	1.07 (1.01, 1.12)	0.01	0.98 (0.92, 1.03)	0.42
65-74 years	1.24 (1.18, 1.31)	<0.001	0.73 (0.69, 0.77)	<0.001
$\geq$ 75 years	1.31 (1.24, 1.38)	<0.001	0.53 (0.50, 0.56)	<0.001
<b>Gender</b>				
Male	Ref		Ref	
Female	0.79 (0.77, 0.80)	<0.001	1.12 (1.09, 1.14)	<0.001
<b>Race</b>				
White	Ref		Ref	
Black	1.01 (0.98, 1.04)	0.37	1.00 (0.97, 1.03)	0.89
Hispanic	1.20 (1.16, 1.23)	<0.001	0.80 (0.77, 0.83)	<0.001
Asian	1.26 (1.21, 1.32)	<0.001	0.54 (0.51, 0.58)	<0.001
Unknown	0.96 (0.91, 1.01)	0.14	0.74 (0.70, 0.79)	<0.001
<b>Household income</b>				
<\$40,000	Ref		Ref	
\$40,000-\$49,999	1.00 (0.97, 1.04)	0.84	0.87 (0.83, 0.91)	<0.001
\$50,000-\$59,999	0.98 (0.94, 1.02)	0.38	0.87 (0.83, 0.91)	<0.001
\$60,000-\$74,999	0.94 (0.91, 0.98)	0.001	0.88 (0.84, 0.92)	<0.001
\$75,000-\$99,999	0.95 (0.91, 0.98)	0.003	0.82 (0.79, 0.86)	<0.001
$\geq$ \$100,000	0.87 (0.84, 0.90)	<0.001	0.80 (0.77, 0.83)	<0.001
Unknown	0.90 (0.86, 0.94)	<0.001	0.96 (0.91, 1.01)	0.16
<b>HbA<sub>1c</sub> range</b>				
$\leq$ 5.6%	0.51 (0.48, 0.54)	<0.001	0.45 (0.42, 0.49)	<0.001
5.7 - 6.4%	0.59 (0.57, 0.61)	<0.001	0.49 (0.47, 0.51)	<0.001
6.5 - 6.9%	Ref		Ref	
7.0 - 7.9%	1.46 (1.42, 1.51)	<0.001	2.38 (2.30, 2.47)	<0.001
8.0 - 8.9%	1.36 (1.31, 1.41)	<0.001	5.18 (4.97, 5.40)	<0.001
9.0 - 9.9%	1.13 (1.07, 1.19)	<0.001	7.79 (7.40, 8.20)	<0.001
$\geq$ 10.0%	0.99 (0.94, 1.04)	0.70	9.38 (8.93, 9.85)	<0.001

Charlson index	Ref		Ref	
0-1				
2	0.90 (0.87, 0.93)	<0.001	1.39 (1.33, 1.45)	<0.001
3	0.93 (0.90, 0.96)	<0.001	2.16 (2.08, 2.24)	<0.001
≥4	0.82 (0.79, 0.84)	<0.001	3.92 (3.80, 4.05)	<0.001

**Supplementary Table S3. Factors associated with insulin and sulfonylurea use among U.S. adults with diabetes (secondary analysis 2).** Three multivariable logistic regression analyses examined the odds of (1) sulfonylurea without insulin and (2) insulin with or without sulfonylurea use controlling for patient age, sex, race/ethnicity, annual household income, glycosylated hemoglobin (HbA<sub>1c</sub>) level, and type of comorbidity profile. In each model, patients were categorized as having only diabetes-concordant, only diabetes-discordant, both concordant and discordant, or any advanced comorbidities. SU, sulfonylurea.

	SU (no insulin)		Insulin ( $\pm$ SU)	
	OR (95% CI)	p-value	OR (95% CI)	p-value
<b>Age groups</b>				
18-44 years	Ref		Ref	
45-64 years	1.07 (1.02, 1.13)	0.008	1.02 (0.97, 1.08)	0.43
65-74 years	1.24 (1.17, 1.30)	<0.001	0.87 (0.82, 0.92)	<0.001
$\geq$ 75 years	1.30 (1.23, 1.37)	<0.001	0.70 (0.66, 0.74)	<0.001
<b>Gender</b>				
Male	Ref		Ref	
Female	0.80 (0.78, 0.82)	<0.001	1.06 (1.03, 1.09)	<0.001
<b>Race</b>				
White	Ref		Ref	
Black	1.01 (0.98, 1.04)	0.63	1.02 (0.98, 1.05)	0.33
Hispanic	1.18 (1.15, 1.22)	<0.001	0.87 (0.84, 0.90)	<0.001
Asian	1.24 (1.19, 1.30)	<0.001	0.56 (0.53, 0.60)	<0.001
Unknown	0.96 (0.90, 1.01)	0.11	0.75 (0.71, 0.80)	<0.001
<b>Household income</b>				
<\$40,000	Ref		Ref	
\$40,000-\$49,999	1.01 (0.97, 1.04)	0.77	0.85 (0.82, 0.89)	<0.001
\$50,000-\$59,999	0.98 (0.95, 1.02)	0.44	0.85 (0.81, 0.89)	<0.001
\$60,000-\$74,999	0.94 (0.91, 0.98)	0.001	0.84 (0.81, 0.88)	<0.001
\$75,000-\$99,999	0.95 (0.92, 0.98)	0.004	0.78 (0.75, 0.81)	<0.001
$\geq$ \$100,000	0.87 (0.84, 0.90)	<0.001	0.74 (0.72, 0.77)	<0.001
Unknown	0.90 (0.86, 0.94)	<0.001	0.94 (0.89, 0.99)	0.02
<b>HbA<sub>1c</sub> range</b>				
$\leq$ 5.6%	0.51 (0.48, 0.55)	<0.001	0.47 (0.44, 0.51)	<0.001
5.7 - 6.4%	0.60 (0.58, 0.61)	<0.001	0.49 (0.47, 0.51)	<0.001
6.5 - 6.9%	Ref		Ref	
7.0 - 7.9%	1.45 (1.41, 1.50)	<0.001	2.40 (2.32, 2.49)	<0.001
8.0 - 8.9%	1.34 (1.29, 1.39)	<0.001	5.29 (5.08, 5.51)	<0.001

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9.0 - 9.9%	1.11 (1.06, 1.17)	<0.001	7.81 (7.42, 8.21)	<0.001
≥10.0%	0.98 (0.93, 1.02)	0.33	9.33 (8.88, 9.79)	<0.001
<b>Type and degree of multi-morbidity</b>				
No comorbidities	Ref		Ref	
Concordant only	0.98 (0.95, 1.02)	0.40	1.97 (1.87, 2.07)	<0.001
Discordant only	0.89 (0.83, 0.96)	0.002	1.33 (1.21, 1.47)	<0.001
Concordant & discordant	0.81 (0.78, 0.85)	<0.001	2.87 (2.72, 3.03)	<0.001
Advanced ± concordant/discordant	0.78 (0.74, 0.82)	<0.001	3.33 (3.14, 3.53)	<0.001

**References for the Online-Only Supplemental Material**

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