

## **Supplemental Material**

### **Title: Discontinuation of Angiotensin Converting Enzyme Inhibitors and Angiotensin Receptor Blockers in Chronic Kidney Disease**

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Running title: Discontinuation of ACE-I and ARB in CKD

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**Supplemental Table 1. Drug products included in the analysis**

**(a) Angiotensin Converting Enzyme Inhibitors**

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ACCUPRIL  
ACCURETIC  
ACEON  
ALTACE  
AMLODIPINE BESY-BENAZEPRIL HCL  
BENAZEPRIL HCL  
BENAZEPRIL-HYDROCHLOROTHIAZIDE  
CAPOTEN  
CAPOZIDE  
CAPTOPRIL  
CAPTOPRIL-HYDROCHLOROTHIAZIDE  
ENALAPRIL  
ENALAPRIL MAL-DILTIAZEM MALATE  
ENALAPRIL MALEATE  
ENALAPRIL MALEATE-FELODIPINE  
ENALAPRIL-HYDROCHLOROTHIAZIDE  
FOSINOPRIL SODIUM  
FOSINOPRIL SODIUM-HCTZ  
LEXXEL  
LISINOPRIL & DIET MANAGE PROD  
LISINOPRIL  
LISINOPRIL-HCTZ  
LISINOPRIL-HYDROCHLOROTHIAZIDE  
LOTENSIN  
LOTENSIN HCT  
LOTREL  
MAVIK  
MOEXIPRIL HCL  
MOEXIPRIL-HYDROCHLOROTHIAZIDE  
MONOPRIL  
MONOPRIL HCT  
PERINDOPRIL ERBUMINE  
PRINIVIL  
PRINZIDE  
QUINAPRIL  
QUINAPRIL HCL  
QUINAPRIL-HYDROCHLOROTHIAZIDE  
QUINARETIC  
RAMIPRIL  
TARKA  
TRANDOLAPRIL  
TRANDOLAPRIL-VERAPAMIL HCL  
UNIRETIC  
UNIVASC

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VASERETIC  
VASOTEC  
ZESTORETIC  
ZESTRIL

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**(b) Angiotensin Receptor Blockers**

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AMLODIPINE BESYLATE-VALSARTAN  
AMLODIPINE-OLMESARTAN  
AMLODIPINE-VALSARTAN-HCTZ  
ATACAND  
ATACAND HCT  
AVALIDE  
AVAPRO  
AZILSARTAN MEDOXOMIL  
AZILSARTAN-CHLORTHALIDONE  
AZOR  
BENICAR  
BENICAR HCT  
CANDESARTAN CILEXETIL  
CANDESARTAN CILEXETIL-HCTZ  
COZAAR  
DIOVAN  
DIOVAN HCT  
EDARBI  
EDARBYCLOR  
ENTRESTO  
EPROSARTAN MESYLATE  
EPROSARTAN MESYLATE-HCTZ  
EXFORGE  
EXFORGE HCT  
HYZAAR  
IRBESARTAN  
IRBESARTAN-HYDROCHLOROTHIAZIDE  
LOSARTAN  
LOSARTAN POTASSIUM  
LOSARTAN POTASSIUM-HCTZ  
MICARDIS  
MICARDIS HCT  
OLMESARTAN MEDOXOMIL  
OLMESARTAN MEDOXOMIL-HCTZ  
OLMESARTAN-AMLODIPINE-HCTZ  
SACUBITRIL-VALSARTAN  
TELMISARTAN  
TELMISARTAN-AMLODIPINE  
TELMISARTAN-HCTZ  
TEVETEN

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TEVETEN HCT  
TRIBENZOR  
TWINSTA  
VALSARTAN  
VALSARTAN-HYDROCHLOROTHIAZIDE  
VALTURNA

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**(c) Beta Blockers**

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ACEBUTOLOL HCL  
ATENOLOL  
ATENOLOL-CHLORTHALIDONE  
BETAPACE  
BETAPACE AF  
BETAXOLOL HCL  
BISOPROLOL  
BISOPROLOL FUMARATE  
BISOPROLOL FUMARATE-HCTZ  
BISOPROLOL-HYDROCHLOROTHIAZIDE  
BLOCADREN  
BYSTOLIC  
CARVEDILOL & DIET MANAGE PROD  
CARVEDILOL  
CARVEDILOL PHOSPHATE  
COREG  
CORGARD  
CORZIDE  
DUTOPROL  
INDERAL  
INDERIDE  
INNOPRAN  
KERLONE  
LABETALOL  
LABETALOL HCL  
LEVATOL  
LOPRESSOR  
LOPRESSOR HCT  
METOPROLOL & DIET MANAGE PROD  
METOPROLOL  
METOPROLOL SUCCINATE  
METOPROLOL TARTRATE  
METOPROLOL  
METOPROLOL-HCTZ  
METOPROLOL-HYDROCHLOROTHIAZIDE  
NADOLOL  
NADOLOL-BENDROFLUMETHIAZIDE  
NEBIVOLOL HCL

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NORMODYNE  
PINDOLOL  
PROPRANOLOL HCL  
PROPRANOLOL-HCTZ  
SECTRAL  
SORINE  
SOTALOL  
SOTALOL HCL (AF)  
SOTALOL HCL  
TENORETIC  
TENORMIN  
TIMOLIDE  
TIMOLOL MALEATE  
TIMOLOL-HYDROCHLOROTHIAZIDE  
TOPROL  
TRANDATE  
VISKEN  
ZEBETA  
ZIAC

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**(d) Loop diuretics**

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BUMETANIDE  
BUMEX  
EDECIN  
FUROSEMIDE  
LASIX

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**(e) Thiazide diuretics**

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ACCURETIC  
ALDORIL  
ALISKIREN-AMLODIPINE-HCTZ  
ALISKIREN-HYDROCHLOROTHIAZIDE  
AMLODIPINE-VALSARTAN-HCTZ  
APRESAZIDE  
ATACAND HCT  
ATENOLOL-CHLORTHALIDONE  
AVALIDE  
AZILSARTAN-CHLORTHALIDONE  
BENAZEPRIL-HYDROCHLOROTHIAZIDE  
BENDROFLUMETHIAZIDE  
BENICAR HCT  
BISOPROLOL FUMARATE-HCTZ  
BISOPROLOL-HYDROCHLOROTHIAZIDE  
CANDESARTAN CILEXETIL-HCTZ  
CAPOZIDE  
CAPTOPRIL-HYDROCHLOROTHIAZIDE

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CHLOROTHIAZIDE  
CLONIDINE-CHLORTHALIDONE  
CLORPRES  
CORZIDE  
DIOVAN HCT  
DIURIL  
DUTOPROL  
EDARBYCLOR  
ENALAPRIL-HYDROCHLOROTHIAZIDE  
ENDURON  
ENDURONYL  
ENDURONYL FORTE  
ESIDRIX  
EXFORGE HCT  
FOSINOPRIL SODIUM-HCTZ  
HYDRALAZINE & RESERPINE & HCTZ  
HYDRALAZINE-HCTZ  
HYDROCHLOROTHIAZIDE  
HYZAAR  
INDAPAMIDE  
INDERIDE  
IRBESARTAN-HYDROCHLOROTHIAZIDE  
LISINOPRIL-HCTZ  
LISINOPRIL-HYDROCHLOROTHIAZIDE  
LOPRESSOR HCT  
LOSARTAN POTASSIUM-HCTZ  
LOTENSIN HCT  
LOZOL  
METHYCLOTHIAZIDE  
METHYLDOPA-HYDROCHLOROTHIAZIDE  
METOLAZONE  
METOPROLOL-HCTZ  
METOPROLOL-HYDROCHLOROTHIAZIDE  
MICARDIS HCT  
MICROZIDE  
MOEXIPRIL-HYDROCHLOROTHIAZIDE  
MONOPRIL HCT  
MYKROX  
NADOLOL-BENDROFLUMETHIAZIDE  
OLMESARTAN MEDOXOMIL-HCTZ  
OLMESARTAN-AMLODIPINE-HCTZ  
PRINZIDE  
PROPRANOLOL-HCTZ  
QUINAPRIL-HYDROCHLOROTHIAZIDE  
QUINARETIC  
RESERPINE-HYDRALAZINE-HCTZ

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Discontinuation of ACE-I and ARB in CKD

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SER-AP-ES  
TEKTURNA HCT  
TELMISARTAN-HCTZ  
TENORETIC  
TIMOLIDE  
TRIBENZOR  
UNIRETIC  
VALSARTAN-HYDROCHLOROTHIAZIDE  
VASERETIC  
ZAROXOLYN  
ZESTORETIC  
ZIAC

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**Supplemental Table 2. International classification of disease, 9th and 10th editions, clinical modification (ICD-9-CM, ICD-10-CM) used to define disease conditions**

<b>Disease Conditions</b>	<b>ICD-9-CM codes</b>	<b>ICD-10-CM codes</b>
Diabetes	250.x	E10.x, E11.x, E13.x
Congestive heart failure	428.x	I50.x
Coronary artery disease	410.x, 411.0, 411.8x, 412, 414.x, 36.1x	I21.x, I22.x, I23.x, I24.x, I25.x
Acute kidney injury	584.x	N17.x

**Supplemental Table 3. Associations between clinical and demographic factors and restarting ACE-I/ARB within six months of therapy discontinuation<sup>a</sup>**

<b>Demographic and Clinical Factors</b>	<b>Odds Ratio (95% CI)</b>
CKD Stage (referent: G1)	
G2	1.04 (0.96, 1.12)
G3a	1.18 (1.07, 1.31)
G3b	1.11 (0.97, 1.26)
G4 or G5	0.83 (0.69, 0.99)
Hospitalization (referent: no hospitalization)	
Non-AKI-related	1.22 (1.09, 1.37)
AKI-related	1.15 (0.97, 1.36)
Hypotension	0.80 (0.62, 1.03)
Low bicarbonate level	0.98 (0.83, 1.16)
Progression	1.09 (0.92, 1.29)
Hyperkalemia	1.07 (0.96, 1.20)
Age group (referent: 18-44)	
45-64	1.20 (1.10, 1.31)
65+	1.13 (1.02, 1.25)
Female	0.92 (0.87, 0.97)
Black race	1.20 (1.00, 1.44)

<sup>a</sup>ACE-I/ARB = angiotensin converting enzyme inhibitors, angiotensin receptor blockers, or their combination; CKD = chronic kidney disease

## **Figures and legends**

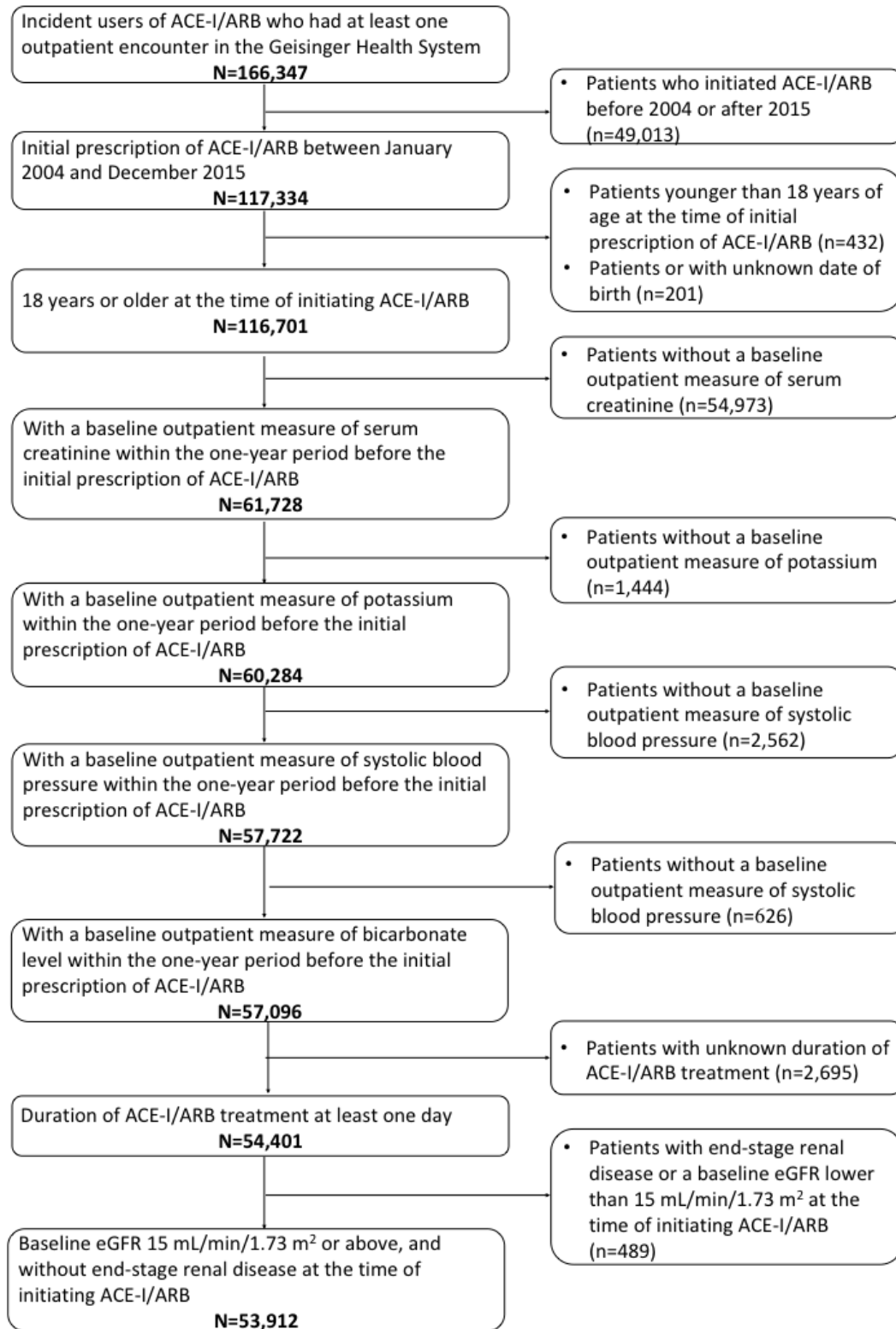
### **Supplemental Figure 1. Derivation of study cohort**

Abbreviations: CKD, chronic kidney disease; ACE-I/ARB, angiotensin converting enzyme inhibitors, angiotensin receptor blockers, or their combination; eGFR, estimated glomerular filtration rate

### **Supplemental Figure 2. Time to discontinuation of beta-blockers since therapy initiation, by baseline CKD stage**

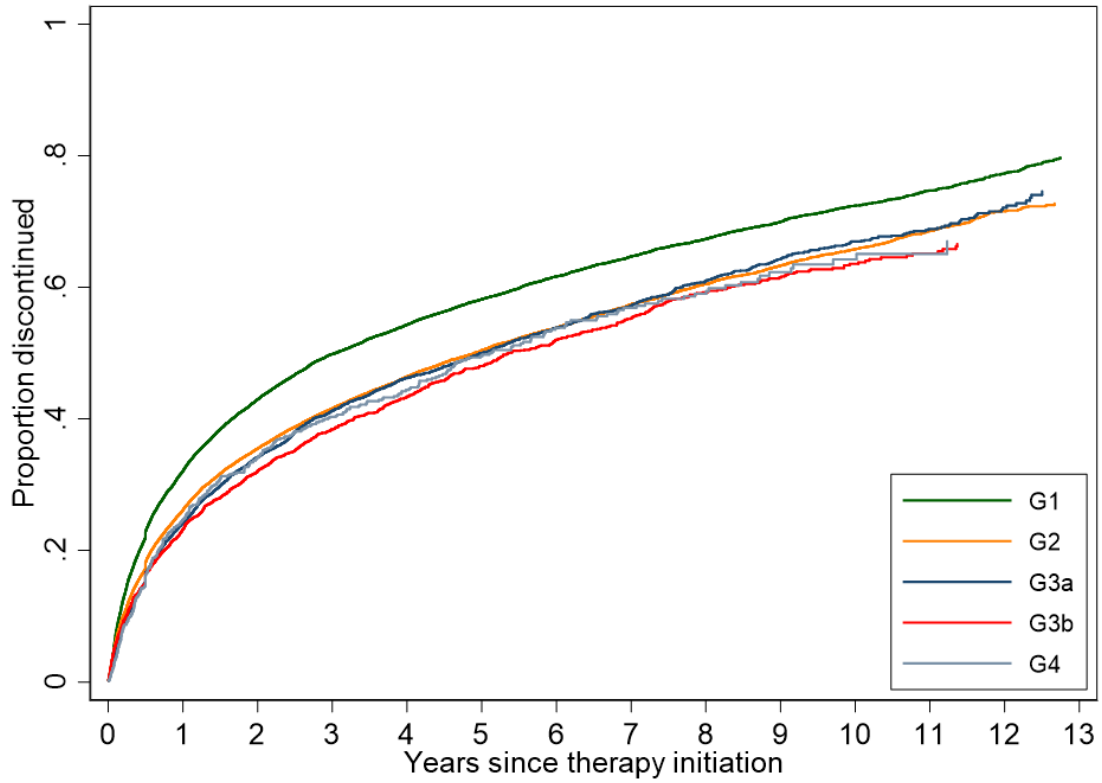
Abbreviations: CKD, chronic kidney disease

## Supplemental Figure 1. Derivation of study cohort



Abbreviations: ACE-I/ARB, angiotensin converting enzyme inhibitors, angiotensin receptor blockers, or their combination; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate

**Supplemental Figure 2. Time to discontinuation of beta-blockers since therapy initiation, by baseline CKD stage**



Abbreviations: CKD, chronic kidney disease