# Supplemental Appendix 1

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**Table 1. LOINC codes to measure eGFR**

|  |  |
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| Variable | Definition |
| 33914-3 | Glomerular filtration rate/1.73 sq M.predicted [Volume Rate/Area] in Serum or Plasma by Creatinine-based formula (MDRD) |
| 48642-3 | Glomerular filtration rate/1.73 sq M predicted among non-blacks [Volume Rate/Area] in Serum or Plasma by Creatinine-based formula (MDRD) |
| 48643-1 | Glomerular filtration rate/1.73 sq M predicted among blacks [Volume Rate/Area] in Serum or Plasma by Creatinine-based formula (MDRD) |
| 50044-7 | Glomerular filtration rate/1.73 sq M predicted among females [Volume Rate/Area] in Serum or Plasma by Creatinine-based formula (MDRD) |
| 50210-4 | Glomerular filtration rate/1.73 sq M.predicted [Volume Rate/Area] in Serum or Plasma by Cystatin-based formula |
| 50384-7 | Glomerular filtration rate/1.73 sq M.predicted [Volume Rate/Area] in Serum or Plasma by Creatinine-based formula (Schwartz) |
| 62238-1 | Glomerular filtration rate/1.73 sq M.predicted [Volume Rate/Area] in Serum or Plasma by Creatinine-based formula (CKD-EPI) |
| 69405-9 | Glomerular filtration rate/1.73 sq M.predicted [Volume Rate/Area] in Serum or Plasma |
| 70969-1 | Glomerular filtration rate/1.73 sq M predicted among males [Volume Rate/Area] in Serum or Plasma by Creatinine-based formula (MDRD) |
| 76633-7 | Glomerular filtration rate/1.73 sq M.predicted by Creatinine-based formula (MDRD) in Blood |
| 77147-7 | Glomerular filtration rate/1.73 sq M.predicted [Volume Rate/Area] in Serum, Plasma or Blood by Creatinine-based formula (MDRD) |

**Table 2. LOINC codes to measure UACR**

|  |  |
| --- | --- |
| Variable | Definition |
| 9318-7 | Albumin/Creatinine [Mass Ratio] in Urine |

**Table 3. Definitions of selection criteria variables**

|  |  |
| --- | --- |
| **Variable** | **Definition** |
| Age | Continuous variable of age in years |
| Type 2 Diabetes diagnosis | One inpatient claim for ICD-9 diagnosis code 250.xx (any position) or ICD-10 diagnosis code E11.xx (any position), or  two outpatient claims for ICD 9 diagnosis code 250.xx (any position) or ICD-10 diagnosis code E11.xx (any position) at least 30 days apart but no more than 180 days apart |
| eGFR laboratory result indicating kidney disease | An eGFR result of <60 ml/min/1.73m^2 resulting from LOINC codes 33914-3, 48642-3, 48643-1, 50044-7, 50210-4, 50384-7, 62238-1, 69405-9, 70969-1, 76633-7, or 77147-7 |
| UACR laboratory result indicating kidney disease | A UACR result of ≥30 mg/g resulting from LOINC code 9318-7 |
| ESRD | One claim for ICD-9 inpatient or outpatient diagnosis code 403.91, 404.92, 404.93, 585.5, 585.6, 586, 404.03, 404.13, 403.01, 403.11, 404.02, or 404.12 (any position) or ICD-10 inpatient or outpatient diagnosis code I12.0, I13.11, I13.2, N18.6, N19, Z91.15, Z94.0, or Z99.2 (any position) |
| DKD (general) | One claim for ICD-9 inpatient or outpatient diagnosis code 250.4, 250.40, 250.42, 274.1, 285.21, 403, 403.00, 403.01, 403.10, 403.11, 403.90, 403.91, 404, 404.00, 404.01, 404.02, 404.03, 404.10, 404.11, 404.12, 404.13, 404.90, 404.91, 404.92, 404.93, 581.0, 581, 581.1, 590.0, 593.6, 581.2, 581.3, 581.8, 581.81, 581.89, 581.9, 582, 582.0, 582.1, 582.2, 582.4, 582.8, 582.81, 582.89, 582.9, 583, 583.0, 583.1, 583.2, 583.4, 583.6, 583.7, 583.8, 583.81, 583.89, 583.9, 585, 585.1, 585.2, 585.3, 585.4, 585.5, 585.6, 585.9, 593.9, 753.12, 753.13, or 753.14 (any position) or ICD-10 inpatient or outpatient diagnosis code D63.1, E08.22, E09.22, E10.22, E11.22, E11.2, E11.21, E11.29, E13.22, I12.9, I13.0, I13.1, I13.10, N08, N18, N18.1, N18.2, N18.3, N18.4, N18.5, or N18.9 (any position) |
| Kidney transplant | One claim for ICD-9 inpatient or outpatient procedure code  55.51, 55.52, 55.53, 55.54, 55.61, or 55.69 (any position) or  ICD-10 inpatient or outpatient diagnosis code 0TY00Z0, 0TY00Z1, 0TY00Z2, 0TY10Z0, 0TY10Z1, or 0TY10Z2 (any position) or HCPCs code 00862, 00868, 50300, 50320, 50323, 50325, 50327, 50328, 50329, 50340, 50360, 50365, 50370, 50380, or 50547 (Li et al, 2009) |
| Dialysis | One claim for ICD-9 inpatient or outpatient diagnosis code  V45.11, V45.12, V56, V56.0, V56.1, V56.2, V56.3, V56.31, V56.32 or V56.8 (any position) or ICD-9 inpatient or outpatient procedure code 39.95 or 54.98 (any position) or ICD-10 inpatient or outpatient diagnosis code Z91.15 or Z99.2 (any position) or CPT code 90935, 90937, 90945, or 90947 or revenue code 0800, 0801, 0802, 0803, or 0804 (Patel et al, 2013; Young et al, 2004) |
| HIV | One claim for ICD-9 inpatient or outpatient diagnosis code 042.xx-0.44.xx (any position) or ICD-10 diagnosis code inpatient or outpatient B20.x–B22.x, B24.x (any position) (Quan et al, 2005) |
| Sickle cell disease | One claim for ICD-9 inpatient or outpatient diagnosis code  282.6, 282.60, 282.61, 282.62, 282.63, or 282.69 (any position) or ICD-10 inpatient or outpatient diagnosis code D57.00, D57.01, D57.02, D57.20, D57.211, D57.212, D57.219, D57.40, D57.411, D57.412, D57.419, D57.80, D57.811, or D57.819 (any position) (Shankar et al, 2005; Singh et al, 2018) |
| Nephrotic syndrome, including: focal glomerulosclerosis/focal sclerosing glomerulonephritis, membranoproliferative glomerulonephritis type 1/ diffuse membranoproliferative glomerulosclerosis | One claim for inpatient or outpatient ICD-9 diagnosis code 581.xx (any position) or ICD-10 diagnosis code N04 or  N04.xx (any position) |
| Chronic glomerulonephritis, nephritis, nephritic Syndrome, and nephropathy, including: membranous nephropathy, IgA nephropathy/Berger’s disease, rapidly progressive, systemic lupus erythematosus nephritis, interstitial nephritis/pyelonephritis from analgesic abuse, chronic/acute interstitial nephritis | One claim for inpatient or outpatient ICD-9 diagnosis code 582.xx or 583.xx(any position) or ICD-10 diagnosis code N03.xx or N07.xx (any position) |
| Polyarteritis nodosa and allied conditions (Wegener’s granulomatosis) | One claim for inpatient or outpatient ICD-9 diagnosis code 446.xx (any position) or ICD-10 diagnosis code M30, M30.0, or M30.8 (any position) |
| Obstructive and reflux uropathy or urolithiasis | One claim for inpatient or outpatient ICD-9 diagnosis code 592.9, 599.6x (any position) or ICD-10 diagnosis code N20.9, N13.xx (any position) |
| Chronic pyelonephritis/reflux nephropathy | One claim for inpatient or outpatient ICD-9 diagnosis code 590.0xx 593.7x (any position) or ICD-10 diagnosis code N11.1, N13.729 (any position) |
| Renal artery occlusion or renal artery stenosis | One claim for inpatient or outpatient ICD-9 diagnosis code 362.32, 440.1 (any position) or ICD-10 diagnosis code I70.1, H34.239 (any position) |
| Polycystic kidneys (adult type) | One claim for inpatient or outpatient ICD-9 diagnosis code 753.1x (any position) or ICD-10 diagnosis code Q61.2 (any position) |
| Renal tumour (malignant) | One claim for inpatient or outpatient ICD-9 diagnosis code 189.0 (any position) or ICD-10 diagnosis code C64.9 (any position) |
| Gouty nephropathy | One claim for inpatient or outpatient ICD-9 diagnosis code 274.1x (any position) or ICD-10 diagnosis code M10.3x (any position) |
| Vasculitis | One claim for inpatient or outpatient ICD-9 diagnosis code 447.6 (any position) or ICD-10 diagnosis code I77.6 (any position) |
| Renal agenesis, dysgenesis, and hypoplasia | One claim for inpatient or outpatient ICD-9 diagnosis code 753.xx (any position) or ICD-10 diagnosis code Q60.x (any position) |
| Multiple myeloma | One claim for inpatient or outpatient ICD-9 diagnosis code 203.xx (any position) or ICD-10 diagnosis code C90.xx (any position) |
| Tubular necrosis | One claim for inpatient or outpatient ICD-9 diagnosis code 584.5 (any position) or ICD-10 diagnosis code N17.0x (any position) |

**Table 4. Patient Characteristics during baseline**

|  |  |
| --- | --- |
| Variable | Definition |
| Age | 18-24, 25-39, 40-54,55-69, 70-89, ≥90 |
| Gender | Male, Female |
| Race | White, Asian, Black, Hispanic, Unknown |
| Region | Northeast: { CT, MA, ME, NH, NJ, NY, VT, RI, PA }  Midwest: { IL, IN, MI, IA, KS, MN, MO, NE, ND, SD, OH, WI }  South: { DE, DC, FL, GA, MD, NC, AL, SC, VA, KY, MS, TN, WV, AR, LA, OK, TX }  West: { AZ, CO, ID, NM, MT, NV, AK, UT, WY, CA, HI, OR, WA } |
| Provider Specialty | Endocrinologist, Nephrologist, Cardiologist, Urologist, (Internal Medicine Specialist or Family Medicine/General, or Internist/General Internist or General Practitioner or General Practice Specialist) |
| Charlson Deyo comorbidity score | Continuous variable indicating index, which includes the following comorbidity categories defined using ICD codes: AIDS, congestive heart failure, COPD, dementia, hemiplegia and paraplegia, myocardial infarction, peripheral vascular disease, rheumatologic disease, stroke, peptic ulcer disease, renal disease, cancer, liver disease, diabetes (Deyo, Cherkin, Ciol, 1992) |
| Hypertension | ICD-9 inpatient or outpatient diagnosis code 401.x-405.x (any position) or ICD-10 inpatient or outpatient diagnosis code I10.x-I13.x or I15.x (any position) (Tonelli et al, 2015) |
| Resistant hypertension | Prescription claims for four or more unique antihypertensive medications or combination medications with the following NDC generic names:  benazepril hydrochloride, captopril, enalapril, maleate, fosinopril sodium, lisinopril, moexipril, perindopril, quinapril hydrochloride, ramipril, trandolapril, candesartan, eprosarta, mesylate, irbesarten, losartan potassium, telmisartan, valsartan, acebutolol, atenolol, betaxolol, bisoprolol fumarate, carteolo, hydrochloride, metoprolol tartrate, metoprolol, succinate, nadolol, penbutolol sulfate, pindolol, propranolol hydrochloride, solotol hydrochloride, timolol maleate, chlorthalidone, chlorothiazide, hydrochlorothiazide, indapamide, metolazone, amiloride hydrochloride, triamterene, furosemide, bumetanide, amlodipine besylate, bepridil, diltiazem hydrochloride, felodipine, isradipine, nicardipine, nifedipine, nisoldipine, verapamil hydrochloride, Spironolactone, Eplerenone, doxazosin mesylate, prazosin hydrochloride, terazosin hydrochloride, methyldopa, alpha methyldopa, clonidine hydrochloride, guanabenz acetate, guanfacine hydrochloride, guanadrel, guanethidine, monosulfate, Reserpine, hydralazine hydrochloride, minoxidil, nadolol/bendroflumethiazide  (American College of Cardiology, 2017; Braam et al, 2012) |
| Hyperlipidemia | ICD-9 inpatient or outpatient diagnosis code 272.0-272.4 (any position) or ICD-10 inpatient or outpatient diagnosis code E78.0-E78.5 (any position) (Bellows et al, 2017) |
| Obesity (as identified via ICD codes and procedure codes) | ICD-9 inpatient or outpatient diagnosis code 278.xx (any position), ICD-10 inpatient or outpatient diagnosis code E66.xx, Z68.3x or Z68.4x (any position), or HCPCS procedure code G0447 or G0473 (ACOG, 2017) |
| Microvascular complications disease | Diabetic neuropathy : ICD 9 inpatient or outpatient diagnosis code 250.6x and/or 357.2 (any position) (Boulanger, 2009) or ICD-10 inpatient or outpatient diagnosis code E11.4x  Diabetic retinopathy: ICD-9 inpatient or outpatient diagnosis code 362.xx (any position) or ICD-10 inpatient or outpatient diagnosis code E08.3x, E11.3x, or E13.3x (any position)  Diabetic nephropathy: ICD-9 diagnosis code (inpatient or outpatient, any position) 250.40, 250.42, or 583.xx or ICD-10 diagnosis code (inpatient or outpatient, any position) E11.21, E13.21, E08.21, N07.xx, or N08 (Fleet et al, 2013) |
| Atrial fibrillation | ICD-9 inpatient diagnosis code 427.31 (primary or secondary position) or ICD-10 inpatient diagnosis code I48.0, I48.1, I48.2 or I48.91 (primary or secondary position) (Chronic Conditions Data Warehouse, 2017) |
| Coronary artery disease | ICD-9 inpatient or outpatient diagnosis code 410.x, 411.1, 412, 413.9 (any position) or ICD-10 inpatient or outpatient diagnosis code I20.0, I21.x, I22.x, I24.x, I25.1x-I25.2, I25.8x-I25.9 (any position) |
| Peripheral vascular disease | ICD-9 inpatient or outpatient diagnosis code 093.0, 437.3, 440.x, 441.x, 443.x, 447.1, 557.1, 557.9, or V43.4 (any position) or ICD-10 inpatient or outpatient diagnosis code 70.x, I71.x, I73.xx, I77.1, I79.0, I79.2, K55.1, K55.8, K55.9, Z95.8, or Z95.9 (Quan et al, 2005) |
| Acute Coronary Syndrome | Myocardial infarction:  ICD-9 inpatient or outpatient diagnosis code 410.xx (any position) or ICD-10 inpatient or outpatient diagnosis code I21.xx or I22.xx (any position)  Unstable Angina:  ICD-10 inpatient or outpatient diagnosis code I20.xx (any position) |
| Anemia | ICD-9 inpatient or outpatient diagnosis code 280.x-281.x, 285.21 or 285.9 (any position) or ICD-10 inpatient or outpatient diagnosis code D50.x-D53.x, D63.1, or D64.9 (any position) (Sun et al, 2017) |
| Hyperkalemia | ICD-9 inpatient or outpatient diagnosis code 276.7 (any position) or ICD-10 inpatient or outpatient diagnosis code E87.5 (any position) or potassium test result of >5.5 mEq/L resulting from LOINC codes 12812-4, 12813-2, 22760-3, 2823-3, 2824-1, 29349-8, 42569-4, 51618-7, 6298-4, 75940-7, 77142-8 or CPT procedure code 84132 |
| Hypokalemia | ICD-9 inpatient or outpatient diagnosis code 276.8 (any position) or ICD-10 inpatient or outpatient diagnosis code E87.6 (any position) or potassium test result of <3.5 mEq/L resulting from LOINC codes 12812-4, 12813-2, 22760-3, 2823-3, 2824-1, 29349-8, 42569-4, 51618-7, 6298-4, 75940-7, 77142-8 or CPT procedure code 84132 |
| Hyponatremia | ICD-9 inpatient or outpatient diagnosis code 276.1 (any position) (Shea et al., 2008; Movig et al., 2003) or ICD-10 inpatient or outpatient diagnosis code E87.1 (Gandhi et al., 2017) |
| Angina Pectoris | ICD-9 inpatient or outpatient diagnosis code 413 or 414.0x (any position) or ICD-10 inpatient or outpatient diagnosis code I20.9 or I25.1x or I25.7x (any position) |
| Stroke | ICD-9 inpatient diagnosis code 430.x-431.x, 433.x1, 434.x1 or 436.x (any position) or ICD-10 inpatient diagnosis code I60.x, I61.x-I63.x or I67.89 (any position) (Andrade et al, 2012; Sacco et al, 2013) |
| Myocardial infarction | ICD-9 inpatient or outpatient diagnosis code 410.xx (any position) or ICD-10 inpatient or outpatient diagnosis code I21.xx or I22.xx (any position) (Sun et al, 2017; American Diabetes Association 2018) |
| Sleep apnea | ICD-9 inpatient or outpatient diagnosis code 327.23, 780.51, 780.53 or 780.57 (any position) or ICD-10 inpatient or outpatient diagnosis code G47.30, G47.33 or G47.39 (any position) (AFHSC, 2015) |
| Depression | ICD-9 inpatient or outpatient diagnosis code 296.2, 296.3, 298.0, 300.4, 309.0, 309.1, 309.28 or 311 (any position) or ICD-10 inpatient or outpatient diagnosis code F20.4, F31.3–F31.5, F32.x, F33.x, F34.1, F43.21 or F43.23 (any position) (Quan et al, 2005; Townsend, Walkup, Crystal, 2012) |
| Fatigue & sleep related disorders | ICD-9 inpatient or outpatient diagnosis code 780.7x, 300.5x, 780.50, 780.52, 780.54-780.56, 780.58-.59, 307.4x, 327.0x, 327.1x,(any position) or ICD-10 inpatient or outpatient diagnosis code R53.1, R53.8x, F48.8, F51.02, F51.09, F51.01, F51.03, F51.04, F51.05, F51.19, F51.11, F51.12, F51.13, F51.8, G47.0x, G47.1x, G47.2x, G47.4x, G47.5x, G47.6x, G47.8, G47.9, G93.3 (any position) |
| Pain disorders | ICD-9 inpatient or outpatient diagnosis code 720.xx, 721.2x to 721.9x, 722.1x to 722.3x, 722.5x, 722.6x, 722.70, 722.72, 722.73, 722.80, 722.82, 722.83, 722.90, 722.92, 722.93, 724.xx, 729.1x, 780.96, 338.xx, 307.80, 053.1x, 250.6x, 307.8x, 323.xx, 335.20, 335.34, 336.9x, 337.1x, 337.2x, 338.3x, 339.xx, 340.xx, 341.xx, 346.0x to 346.9x, 350.xx, 351.xx, 353.xx to 356.xx, 357.2x, 358.xx, 524.6x, 577.1x, 696.xx, 714.xx, 715.xx, 719.xx, 720.xx, 721.0x to 722.4x, 722.71, 722.81, 722.91, 723.1x, 724.4x, 728.0x, 729.0x, 729.2x, 729.5x, 784.0x, 786.5x, 789.xx, 733.99, 733.14, 780.71, 820.8x, 820.9x, 951.4x, 952.xx, 953.4x, or 955.5x to 955.7x (any position) or ICD-10 inpatient or outpatient diagnosis code E08.42, E09.42, E11.42, E13.42, G04.xx, G05.xx, G35, G36.xx, G37.xx, G43.xx, G44.xx, G50.xx, G51.xx, G54.xx, G56.xx, G57.xx, G58.7, G60.xx, G89.xx, G90.xx, G95.xx, G99.xx, M05.xx, M06.xx, M12.xx, M26.6xx, M43.xx, M45.xx, M46.xx, M47.xx, M48.xx, M50.xx, M51.xx, M53.xx, M54.xx, M60.xx, M79.xx, M96.1, R07.xx, R10.xx, R16.xx, R19.xx, R51, R52, F45.4x, B02.2x, S04.1x, S14.1x, S24.1x, S34.1x, S34.3x, S44.xx, S54.xx, S64.xx, or S74.xx (any position) |
| Edema | ICD-9 inpatient or outpatient diagnosis code 782.3 (any position) or ICD-10 inpatient or outpatient diagnosis code R60.x (any position) (Chinali et al, 2010) |
| Chronic lung/pulmonary disease | ICD-9 inpatient or outpatient diagnosis code 416.8, 416.9, 490.x–505.x, 506.4, 508.1, or 508.8 (any position) or ICD-10 inpatient or outpatient diagnosis code I27.8, I27.9, J40.x–J47.x, J60.x–J67.x, J68.4, J70.1, or J70.3 (any position) |
| Respiratory failure | ICD-9 inpatient diagnosis code 518.5x, 518.81, 518.83 or 518.84 (any position) or ICD-10 inpatient diagnosis code J96.xx (any position) (Behrendt, 2000) |
| Heart Failure | ICD-9 inpatient or outpatient diagnosis code 398.91, 402, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, or 428.xx or ICD-10 inpatient or outpatient diagnosis code I09.81, I11.0, I13.0, I13.2, I50.1. I50.20, I50.21, I50.22, I50.23, I50.30, I50.31, I50.32, I50.33, I50.40, I50.41, I50.42, I50.43, or I50.9 in the primary or secondary position |

**Table 8. Concomitant medications at baseline for Cohorts 1 and 2**

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| Variable | Definition |
| Statins | A pharmacy claim for at least one of the following NDC generic names and any combination medications: Atorvastatin, Fluvastatin, Lovastatin, Pitavastatin, Pravastatin, Rosuvastatin, Simvastatin |
| Antihypertensive agents | A pharmacy claim for at least one of the following medications or combinations with NDC generic names within the following classes (American Heart Association, 2017):   * ACE inhibitors:   benazepril hydrochloride, captopril, enalapril maleate, fosinopril sodium, lisinopril, moexipril, perindopril, quinapril hydrochloride, ramipril, trandolapril   * ARBs:   Candesartan, eprosartan mesylate, irbesarten, losartan potassium, telmisartan, valsartan   * Beta-blockers:   acebutolol, atenolol, betaxolol, bisoprolol fumarate, carteolol, hydrochloride, metoprolol tartrate, metoprolol succinate, nadolol, penbutolol sulfate, pindolol, propranolol hydrochloride, solotol hydrochloride, timolol maleate   * Thiazide, potassium-sparing, and loop diuretics:   chlorthalidone, chlorothiazide, hydrochlorothiazide, indapamide, metolazone, amiloride hydrochloride, triamterene, furosemide, bumetanide   * Calcium-channel blockers   amlodipine besylate, bepridil, diltiazem, hydrochloride, felodipine, isradipine, nicardipine, nifedipine, nisoldipine, verapamil hydrochloride   * MRAs:   Spironolactone, Eplerenone   * Alpha Blockers:   doxazosin mesylate, prazosin hydrochloride, terazosin hydrochloride   * Alpha-2 Receptor Agonists:   methyldopa   * Combined alpha and beta blockers:   alpha methyldopa, clonidine hydrochloride, guanabenz acetate, guanfacine hydrochloride   * Central agonists:   Guanadrel, guanethidine monosulfate, Reserpine   * Peripheral Adrenergic Inhibitors:   hydralazine hydrochloride, minoxidil |
| Glucose lowering agents | A pharmacy claim for at least one of the following medications (American Diabetes Association, 2015):   * Biguanides: metformin * Sulfonylureas:  Chlorpropamide, glipizide, glyburide, or glimepiride * Thiazolidinediones: Rosiglitazone or pioglitazone * Meglitinides: Repaglinide or nateglinide * DPP-4 inhibitors: Sitagliptin, saxagliptin, linagliptin, alogliptin * SGLT2 Inhibitors: Canagliflozin or dapagliflozin * Alpha- glucosidase inhibitors: Acarbose or miglitol * Bile Acid Sequestrants: colesevelam |
| Basal Insulin use | At least one pharmacy claim for the following NDC generic names: “insulin aspart”, “insulin aspart protamine human/insulin aspart”, “insulin detemir”, “insulin glargine, human recombinant analog”, “insulin glulisine”, “insulin isophane nph,bf-pk”, “insulin isophane, beef”, “insulin isophane, beef pure”, “insulin isophane, pork pure”, “insulin lispro”, “insulin lispro protamine & insulin lispro”, “insulin nph human semi-syn”, “insulin nph human semi-syn/insulin reg human semi-syn”, “insulin protamine zinc, beef”, “insulin protamine zn, beef (p)“, “insulin protamine zn, bf-pk”, “insulin reg human semi-syn”, “insulin reg, hum s-s buff”, “insulin regular, human”, “insulin regular, human/insulin release unit”, “insulin regular, human/insulin release unit/chamber/inhaler”, “insulin regular, beef-pork”, “insulin regular, human buffered”, “insulin zinc beef”, “insulin zinc extend human rec”, “insulin zinc extended, bf-pk”, “insulin zinc human rec”, “insulin zinc human semi-syn”, “insulin zinc prompt, bf-pk”, “insulin zinc, beef purified”, “insulin zinc, beef purified/insulin zinc, pork purified”, “insulin zinc, beef-pork”, “insulin zinc, pork purified”, “insulin, beef”, “insulin, pork”, “insulin, pork purified”, “insulin, pork purified/insulin isophane, pork pure”, “insulin, pork reg. concentrate”, “nph, human insulin isophane”, “nph, human insulin isophane/insulin regular, human” |
| Number of unique glucose lowering agents | Count of number of unique glucose lowering agents across baseline |

**Table 5. Clinical outcomes definitions**

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| --- | --- |
| Variable | Definition |
| All-cause hospitalization | Any inpatient claim. |
| CV hospitalization as defined by MI, stroke, and HF diagnosis codes | MI: ICD-9 inpatient diagnosis code 410.xx or ICD-10 inpatient or outpatient diagnosis code I21.xx or I22.xx (Sun et al, 2017; American Diabetes Association 2018) in the primary or secondary position  Stroke: ICD-9 inpatient diagnosis code 430.x-431.x, 433.x1, 434.x1 or 436.x or ICD-10 inpatient diagnosis code I60.x, I61.x-I63.x or I67.89 (Andrade et al, 2012; Sacco et al, 2013) in the primary or secondary position  HF: ICD-9 inpatient diagnosis code 398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, or 428.xx or ICD-10 inpatient diagnosis code I09.81, I11.0, I13.0, I13.2, I50.1. I50.20, I50.21, I50.22, I50.23, I50.30, I50.31, I50.32, I50.33, I50.40, I50.41, I50.42, I50.43, or I50.9 in the primary or secondary position |
| Renal hospitalization as defined by CKD diagnosis codes | One claim for ICD-9 inpatient diagnosis code 250.4, 285.21, 403, 403.00, 403.01, 403.10, 403.11, 403.90, 403.91, 404, 404.00, 404.01, 404.02, 404.03, 404.10, 404.11, 404.12, 404.13, 404.90, 404.91, 404.92, 404.93, 585, 585.1, 585.2, 585.3, 585.4, 585.5, or 585.9) or ICD-10 inpatient diagnosis code D63.1, E08.22, E09.22, E11.22, E13.22, I12, I12.0, I12.9, I13, I13.0, I13.1, I13.10, I13.11, I13.2, N18, N18.1, N18.2, N18.3, N18.4, N18.5, N18.6 or N18.9 in the primary or secondary position |
| Non-acute Kidney Failure | One claim for ESRD, kidney transplant, or dialysis in the inpatient or outpatient setting. |
| Acute Kidney Failure | One claim for ICD-9 inpatient or outpatient diagnosis code 584.xx or 586 or ICD-10 inpatient or outpatient diagnosis code N17.xx or N19 in the primary or secondary position |
| Kidney Transplant | One claim for ICD-9 inpatient or outpatient procedure code  55.51, 55.52, 55.53, 55.54, 55.61, or 55.69 (any position) or  ICD-10 inpatient or outpatient diagnosis code 0TY00Z0, 0TY00Z1, 0TY00Z2, 0TY10Z0, 0TY10Z1, or 0TY10Z2 (any position) or HCPCs code 00862, 00868, 50300, 50320, 50323, 50325, 50327, 50328, 50329, 50340, 50360, 50365, 50370, 50380, or 50547 (Li et al, 2009) in the primary or secondary position |
| Dialysis | One claim for ICD-9 inpatient or outpatient diagnosis code V45.11, V45.12, V56, V56.0, V56.1, V56.2, V56.3, V56.31, V56.32 or V56.8 or ICD-9 inpatient or outpatient procedure code 39.95 or 54.98 or ICD-10 inpatient or outpatient diagnosis code Z91.15 or Z99.2 (any position) or CPT code 90935, 90937, 90945, or 90947 or revenue code 0800, 0801, 0802, 0803, or 0804 in the primary or seconday position |
| Hyperkalemia | ICD-9 inpatient or outpatient diagnosis code 276.7 or ICD-10 inpatient or outpatient diagnosis code E87.5 or a potassium test result of >5.5 mEq/L resulting from LOINC codes 12812-4, 12813-2, 22760-3, 2823-3, 2824-1, 29349-8, 42569-4, 51618-7, 6298-4, 75940-7, 77142-8 or CPT procedure code 84132 in the primary or secondary position. |