

**Association between elevated blood eosinophils and chronic kidney disease progression:  
analyses of a large United States electronic health records database**

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**Table S1. Patient eligibility criteria**

<b>Inclusion criteria</b>	<b>Exclusion criteria</b>
Adults $\geq 18$ years	Acute kidney injury
CKD stages 3-4 identified by 2 confirmatory diagnoses (90-730 days apart)	History of renal transplant or renal replacement therapy
$\geq 2$ blood eosinophil tests during the CKD episode	Malignancies
$\geq 1$ year of continuous enrollment prior to the first confirmatory diagnosis of CKD stage 3 or higher	Myeloproliferative disorders
	Recent history, within 6 months of CKD diagnosis, of chronic or active infection or intake of cytotoxic or immunosuppressant medications (not including steroids) as determined from Current Procedural Terminology codes (4 <sup>th</sup> edition, CPT-4)

# Table S2

## Procedures

Procedure	CPT Code
Kidney transplant	50300,50320,50323,50325,50327,50328,50329,50340,50360,50365,50380,50547,55.51,55.54,55.61,0TY00Z0,0TY00Z1,0TY10Z0,0TY10Z1
Heart transplant	33940,33944,33945,37.51,02YA0Z0,02YA0Z1
Lung transplant	0BYM0Z0,0BYM0Z1,0BYK0Z0,0BYK0Z1,0BYL0Z0,0BYL0Z1,32850,32851,32852,32853,32854,32855,32856,S2060,S2061,33.50,33.51,33.52,0BYC0Z0,0BYC0Z1,0BYD0Z0,0BYD0Z1,0BYF0Z0,0BYF0Z1,0BYG0Z0,0BYG0Z1,0BYH0Z0,0BYH0Z1,0BYJ0Z0,0BYJ0Z1,0BYL0Z0,0BYL0Z1,0BYM0Z0,0BYM0Z1
Hemodialysis	90,935,909,379,093,900,000
Other dialysis	909,459,094,790,989,000,000,000,000
Blood transfusion	36430

## Diagnosis Codes for Identifying Diseases

Comorbidity	Diagnosis Code
Anemia	2820,2821,2822,2823,2824,28240,28241,28242,28243,28244,28245,28246,28247,28249,2825,28260,28261,28262,28263,28264,28268,28269,2827,2828,2829,2830,28310,28311,28319,2832,2839,28401,28409,2841,28411,28412,28419,2842,2848,28481,28489,2849,D6101,D6109,D611,D612,D613,D61810,D61811,D61818,D6182,D6189,D619,D62,D630,D631,D638,D640,D641,D642,D643,D644,D6481,D6489,D649
Diabetes	25002,E1165,25080,25060,25040,25062,25050,25070,E1140,25042,E118,E1122,25003,E11621,E1142,25090,E1169,E1121,E1129,25082,E1151,25010,25072,E1159,E11319,25092,25013,E1149,E11329,E1065,25052,25063,25051,24980,E11649,E11622,E1139,25081,25071,25022,25020,25012,E1310,E1152,E113299,E113293,25061,24940,E1342,E11628,E11610,E11359,E11351,E113393,E113312,E11331,E108,E1052,E1022,E0865,E08621,25093,25091,25053,25043,25041,25011,24950,24901,E138,E13621,E1351,E1341,E11620,E1143,E1141,E1137X9,E113513,E11349,E1341,E11339,E113313,E113213,E113212,E11311,E1101,E1100,E10649,E10621,E1059,E103313,E103312,E10329,E1029,E1021,E1010,E0965,E0940,E0842,E083392,E0829,25083,24990,24971,24960,E1369,E1365,E13649,E13641,E13638,E13630,E13628,E13622,E13620,E13618,E1359,E1352,E1349,E1344,E1343,E1340,E1339,E1337X1,E1336,E133599,E133593,E133591,E13359,E133531,E133513,E133512,E13351,E133499,E13349,E13341,E133399,E133393,E13339,E13331,E133299,E133293,E13329,E133213,E133211,E13321,E13319,E13311,E1329,E1322,E1321,E1311,E1301,E1300,E11641,E11638,E11630,E11618,E1144,E1137X3,E1137X2,E1137X1,E1136,E113599,E113593,E113592,E113591,E113559,E113553,E113552,E113551,E113543,E113542,E113541,E113533,E113532,E113531,E113523,E113522,E113521,E113519,E113512,E113511,E113499,E113493,E113492,E113491,E113419,E113413,E113412,E113411,E113399,E113392,E113391,E113319,E113311,E113292,E113291,E113219,E113211,E11321,E1111,E1110,E1069,E10641,E10638,E10628,E10622,E10620,E10618,E10610,E1051,E1049,E1044,E1043,E1042,E1041,E1040,E1039,E1037X1,E1036,E103599,E103593,E103592,E103591,E10359,E103559,E103553,E103552,E103542,E103533,E103532,E103531,E103523,E103522,E103521,E103519,E103513,E103512,E103511,E10351,E103499,E103493,E103492,E103491,E103419,E103413,E103412,E103411,E10341,E103399,E103393,E103392,E103391,E10339,E103319,E103311,E10331,E103299,E103293,E103292,E103291,E103219,E103213,E103212,E103211,E10321,E10319,E10311,E1011,E098,E0969,E09649,E09641,E09638,E09628,E09622,E09621,E0959,E0952,E0951,E0949,E0944,E0943,E0942,E0936,E09359,E093293,E09329,E09321,E09319,E09311,E0929,E0922,E0921,E0911,E0910,E0900,E0888,E0869,E08649,E08641,E08638,E08630,E08628,E08622,E08620,E08618,E08610,E0859,E0852,E0851,E0849,E0844,E0843,E0841,E0840,E0839,E0836,E083599,E083593,E083592,E083591,E08359,E083519,E083513,E083512,E083511,E08351,E08349,E083419,E083412,E08341,E08341,E083399,E083393,E083391,E08339,E083319,E083313,E08331,E083299,E083293,E083292,E08329,E083219,E083213,E083211,E08321,E08319,E08311,E0822,E0821,E0811,E0810,E0801,E0800,25073,25033,25032,25031,25030,25023,25021,24991,24981,24970,24961,24951,24941,24931,24930,24921,24920,24911,24910,25000,E119,79029,25001,79021,R7309,R739,E109,79022,R7301,24900,R7303,R7302,E139,E089,R81,V4585,E099,7915,Z9641,Z4681,V6546,V5391,R824,7916,7902
Hypertension	4019,I10,4011,40391,40390,I129,4010,I120,40210,40290,I110,40310,40491,I130,I160,I119,40301,I132,40599,40300,I159,40311,40201,I161,40493,I1310,4372,40410,40401,40211,I674,I1311,40591,40501,40492,40490,40413,40411,40402,40291,40200,N262,I169,I158,I152,I151,I150,40519,40511,40509,4049,40412,4041,40403,40400,4039,4031
Acute kidney injury	5845,5846,5847,5848,5849,586,N170,N171,N172,N178,N179
Hyperthyroidism	24200,24201,24210,24211,24220,24221,24230,24231,24240,24241,24280,24281,24290,24291,E0500,E0501,E0510,E0511,E0520,E0521,E0530,E0531,E0540,E0541,E0580,E0581,E0590,E0591
Dyslipidemia	E78.6,E78.1,272.4
Proteinuria	D511,7910,R809,R808,R803,R801,R800,O133,O139,O134,O135,O132,O131,N069,N068,N067,N065,N064,N063,N062,N061,N060,O1223,O1222,O1220,O1215,O1214,O1213,O1212,O1211,O1210,R802,5936
Urinary tract obstruction	59960, 59969, N139
Sickle cell disease	28260,28262,28261,D571,D5700,28269,28263,28264,28241,D5720,28268,D57819,D57419,D5740,D573,D57219,D5701,2825,28242,D57811,D5780,D57412,D57411,D57211,D5702
Polycystic kidney disease	Q613,75312,Q612,Q6119,75314,75313
Goodpasture's syndrome	44621,M310
Glomerulonephritis	58381,5819,5811,N049,5831,5821,N042,5839,58389,5829,5830,5820,58181,5813,5809,58089,N073,N072,N067,N065,N064,N063,N062,N057,N055,N054,N053,N052,N048,N047,N046,N045,N044,N043,N041,N040,N037,N035,N034,N033,N032,N027,N025,N024,N023,N022,N017,N013,N012,N007,N005,N004,N003,N002,5837,5836,5834,5832,58289,58281,5824,5822,58189,5812,5810,58081,5804,5800
Obesity	27800,27801,E669,E6601,E6609,E662,27803,E668,E661
Dialysis	Z992,V4511,V561,V560,Z4901,V562,Z9115,Z4902,V568,V4512,R880,7925
Asthma	493.0,493.00,493.01,493.02,493.1,493.10,493.11,493.12,493.81,493.82,493.9,493.90,493.91,493.92,445.20,445.21,445.22,445.30,445.31,445.32,445.40,445.41,445.42,445.50,445.51,445.52,445.901,445.902,445.909,445.990,445.991,445.998



Parasitic infection  
0060,0061,0062,0063,0064,0065,0066,0068,0069,0070,0071,0072,0073,0074,0075,0078,0079,0840,0841,0842,0843,0844,0845,0846,0847,0848,0849,0850,0851,0852,0853,0854,0855,0859,0860,0861,0862,0863,0864,0865,0869,0882,0889,0889,1200,1201,1202,1203,1208,1209,1210,1211,1212,1213,1214,1215,1216,1218,1219,1220,1221,1222,1223,1224,1225,1226,1227,1228,1229,1230,1231,1232,1233,1234,1235,1236,1238,1239,124,125,1251,1252,1253,1254,1255,1256,1257,1259,1260,1261,1262,1263,1268,1269,1270,1271,1272,1273,1274,1275,1276,1277,1278,1279,1280,1281,1282,1283,1284,1285,1289,129,1300,1301,1302,1303,1304,1305,1309,1310,1311,13100,13101,13102,13103,13109,1318,1319,1320,1321,1322,1323,1329,1330,1338,1339,1340,1341,1342,1348,1349,135,136,1360,1361,1362,13621,13629,1363,1364,1365,1368,1369,1398,A060,A061,A062,A063,A064,A065,A066,A067,A0681,A0682,A0689,A069,A070,A071,A072,A073,A074,A078,A079,A5900,A5901,A5902,A5903,A5909,A598,A599,B500,B508,B509,B510,B518,B519,B520,B528,B529,B530,B531,B538,B54,B550,B551,B552,B559,B560,B561,B569,B570,B571,B572,B573,B574,B579,B5740,B5741,B5732,B5739,B5740,B5741,B5742,B5749,B575,B5800,B5801,B5802,B5803,B5804,B5805,B5806,B5807,B5808,B5809,B5810,B5811,B5812,B5813,B5819,B5820,B5829,B5830,B5831,B5832,B5833,B5834,B5838,B5839,B5850,B5851,B5852,B5853,B5854,B586,B5870,B5871,B5872,B5873,B5874,B5878,B5879,B5880,B5881,B5882,B5883,B5888,B5889,B589,B590,B600,B601,B6011,B6012,B6013,B6019,B602,B608,B64,B650,B651,B652,B653,B658,B659,B660,B661,B662,B663,B664,B665,B668,B669,B670,B671,B672,B6731,B6732,B6739,B674,B675,B6761,B6769,B677,B678,B6790,B6799,B680,B681,B689,B690,B691,B6981,B6989,B699,B700,B701,B710,B711,B718,B719,B72,B7300,B7301,B7302,B7309,B731,B740,B741,B742,B743,B744,B748,B749,B75,B760,B761,B768,B769,B770,B7781,B7789,B779,B780,B781,B787,B789,B79,B80,B810,B811,B812,B813,B814,B820,B829,B830,B831,B832,B833,B834,B838,B839,B850,B851,B852,B853,B854,B86,B870,B871,B872,B873,B874,B8781,B8782,B879,B880,B881,B882,B883,B888,B889,B89,B948,B949

Chronic kidney disease  
0001,0010,0011,0019,002,0020,0021,0022,0023,0029,003,0030,0031,0032,0033,0034,0039,004,0040,0041,0042,0043,0048,0049,005,0050,0051,0052,0053,0054,0058,00581,00589,0059,0

Infections (Excluding Parasitic)  
06,007,008,0080,00800,00801,00802,00803,00804,00809,0081,0082,0083,0084,00841,00842,00843,00844,00845,00846,00847,00849,0085,0086,00861,00862,00863,00864,00865,009,0090,0091,0092,0093,010,0100,01000,01001,01002,01003,01004,01005,01006,0101,01010,01011,01012,01013,01014,01015,01016,0108,01081,01082,01083,01084,01085,01086,0109,01090,01091,01092,01093,01094,01095,01096,011,0110,01100,01101,01102,01103,01104,01105,01106,0111,01110,01111,01112,01113,01114,01115,01116,01117,01118,01119,01120,01121,01122,01123,01124,01125,01126,0113,01130,01131,01132,01133,01134,01135,01136,0114,01140,01141,01142,01143,01144,01145,01146,0115,01150,01151,01152,01153,01154,01155,01156,0116,01160,01161,01162,01163,01164,01165,01166,0117,01170,01171,01172,01173,01174,01175,01176,0118,01181,01182,01183,01184,01185,01186,0119,01190,01191,01192,01193,01194,01195,01196,012,0120,01200,01201,01202,01203,01204,01205,01206,0121,01210,01211,01212,01213,01214,01215,01216,0122,01220,0121,01222,01223,01224,01225,01226,0123,01230,01231,01232,01233,01234,01235,01236,0128,01280,01281,01282,01283,01284,01285,01286,013,0130,01300,01301,01302,01303,01304,01305,01306,0131,01310,01311,01312,01313,01314,01315,01316,0132,01320,01321,01322,01323,01324,01325,01326,0133,01330,01331,01332,01333,01334,01335,01336,0134,01340,01341,01342,01343,01344,01345,01346,0135,01350,01351,01352,01353,01354,01355,01356,0136,01360,01361,01362,01363,01364,01365,01366,0138,01380,01381,01382,01383,01384,01385,01386,0139,01390,01391,01392,01393,01394,01395,01396,014,0140,01400,01401,01402,01403,01404,01405,01406,0148,01480,01481,01482,01483,01484,01485,01486,015,0150,01500,01501,01502,01503,01504,01505,01506,0151,01510,01511,01512,01513,01514,01515,01516,0152,01520,01521,01522,01523,01524,01525,01526,0155,01550,01551,01552,01553,01554,01555,01556,0156,01560,01561,01562,01563,01564,01565,01566,0157,01570,01571,01572,01573,01574,01575,01576,0158,01580,01581,01582,01583,01584,01585,01586,0159,01590,01591,01592,01593,01594,01595,01596,016,0160,01600,01601,01602,01603,01604,01605,01606,0161,01610,01611,01612,01613,01614,01615,01616,0162,01620,01621,01622,01623,01624,01625,01626,01627,0163,01630,01631,01632,01633,01634,01635,01636,0164,01640,01641,01642,01643,01644,01645,01646,0165,01650,01651,01652,01653,01654,01655,01656,0166,01660,01661,01662,01663,01664,01665,01666,0167,01670,01671,01672,01673,01674,01675,01676,0169,01690,01691,01692,01693,01694,01695,01696,017,0170,01700,01701,01702,01703,01704,01705,01706,0171,01710,01711,01712,01713,01714,01715,01716,0172,01720,01721,01722,01723,01724,01725,01726,0173,01730,01731,01732,01733,01734,01735,01736,0174,01740,01741,01742,01743,01744,01745,01746,0175,01750,01751,01752,01753,01754,01755,01756,0176,01760,01761,01762,0173,01763,01764,01765,01766,0177,01770,01771,01772,01773,01774,01775,01776,0178,01780,01781,01782,01783,01784,01785,01786,0179,01790,01791,01792,01793,01794,01795,01796,018,0180,01801,01802,01803,01804,01805,01806,0188,01880,01881,01882,01883,01884,01885,01886,0189,01890,01891,01892,01893,01894,01895,01896,02,020,0200,0201,0202,0203,0204,0205,0208,0209,021,0210,0211,0212,0213,0218,0219,022,0220,0221,0222,0223,0228,0229,023,0230,0231,0232,0233,0238,0239,024,025,026,0260,0261,0262,027,0270,0271,0272,0272,0279,0279,030,0300,0301,0302,0303,0308,0309,031,0310,0311,0312,0318,0319,0320,0321,0322,032

Primary & Secondary malignancy  
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Mveloproliferative disorders	23876,23879,2384,2385,23871,D4702,D473,D45,D471
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**Medications**

Medication	OPTUM Class / Drug Name
Diuretics	<ol style="list-style-type: none"> <li>1. Diuretic combinations</li> <li>2. Diuretics; miscellaneous</li> <li>3. Antihypertensive combinations; beta blocker &amp; thiazide diuretic</li> <li>4. Loop diuretics</li> <li>5. Osmotic diuretics</li> <li>6. Potassium-sparing diuretics</li> </ol>
Angiotensin-converting enzyme inhibitors (ACEIs)	<ol style="list-style-type: none"> <li>1. Angiotensin-converting enzyme (ACE) inhibitors</li> </ol>
Angiotensin II receptor blockers (ARBs)	<ol style="list-style-type: none"> <li>1. Angiotensin II receptor antagonists (ARB)</li> </ol>
Beta blockers	<ol style="list-style-type: none"> <li>1. Beta-adrenergic antagonists (beta blockers) w/o ISA</li> <li>2. Beta-adrenergic antagonists; glaucoma treatment</li> <li>3. Alpha- &amp; beta-adrenergic antagonists</li> </ol>
Calcium channel blockers	<ol style="list-style-type: none"> <li>1. Calcium channel antagonists (calcium channel blockers)</li> </ol>
Statins	<ol style="list-style-type: none"> <li>1. HMG &amp; CoA reductase inhibitors (statins)</li> <li>2. HMG &amp; CoA reductase inhibitor combinations; statin &amp; various</li> </ol>
Antiplatelet drugs	<ol style="list-style-type: none"> <li>1. Antiplatelets or aggregation inhibitors</li> <li>2. Antiplatelet agents; glycoprotein IIb/IIIa inhibitors</li> <li>3. Antiplatelet combinations</li> </ol>
Hematopoietic agents	<ol style="list-style-type: none"> <li>1. Hematopoietic agents</li> </ol>
Immunosuppressive agents	<ol style="list-style-type: none"> <li>1. Systemic glucocorticoids</li> <li>2. Immunologics; immunosuppressive</li> </ol>
Cytotoxic agents	<ol style="list-style-type: none"> <li>1. Antimetabolite</li> <li>2. Alkylating agents</li> <li>3. Antineoplastic antibiotics; miscellaneous</li> </ol>
Proton pump inhibitors (PPI)	<ol style="list-style-type: none"> <li>1. Proton pump inhibitors (PPI)</li> </ol>
Antibiotics	<ol style="list-style-type: none"> <li>1. Otic antibiotics</li> <li>2. Ophthalmic antibiotic combinations</li> <li>3. Otic steroid &amp; antibiotic combinations</li> <li>4. Antibiotics; miscellaneous</li> <li>5. Anthracycline antibiotics</li> <li>6. Ophthalmic steroid &amp; antibiotic combinations</li> <li>7. Ophthalmic antibiotics; miscellaneous</li> <li>8. Beta-lactam antibiotics; miscellaneous</li> </ol>
Non-steroidal anti-inflammatory (NSAID)	<ol style="list-style-type: none"> <li>1. Non-steroidal anti-inflammatory (NSAID) agents</li> <li>2. NSAIDs; cyclooxygenase-2 (COX-2) inhibitors</li> <li>3. Non-steroidal anti-inflammatory (NSAID) combinations; various</li> </ol>
Iron	<ol style="list-style-type: none"> <li>1. Iron</li> <li>2. Iron combination products; miscellaneous</li> </ol>
Systemic Steroids	<ol style="list-style-type: none"> <li>1. Systemic glucocorticoids</li> </ol>
Diabetes	<ol style="list-style-type: none"> <li>1. Insulin</li> <li>2. Antidiabetic agents; amylin analogs</li> <li>3. Glucagon-like peptide 1 receptor agonists; and other misc. diabetes agents</li> <li>4. Insulin &amp; other antidiabetic medication</li> <li>5. Antidiabetic agents; meglitinides</li> <li>6. Antidiabetic agents; biguanides</li> <li>7. Antidiabetic agents; sulfonylurea</li> <li>8. Antidiabetic agents; alpha-glucosidase inhibitors</li> <li>9. Sodium-glucose co-transporter 2 inhibitors</li> <li>10. Antidiabetic agents; dipeptidyl peptidase inhibitors</li> <li>11. Antidiabetic combination agents</li> <li>12. Antidiabetic agents; thiazolidinediones</li> </ol>

**Medication J codes**

Medication	J codes
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<p>Cytotoxic Agents</p>	<p>J9190,J9060,J9263,J9060,J9185,J9040,J9260,J9090,J9100,J9263,J9070,J9250,J9100,J9280,J9040,J9070,J9065,J9190,J8530,J9190,J8610,J9045,J9045,J9263,J9190,J9263,J9190,J9201,J9190,J9280,J9190,J9025,J9045,J0894,J9280,J9260,J8610,J9045,J9190,J9045,J9208,J8521,J9040,J9320,J9280,A9270,J9260,J9190,J9045,J9201,J9060,J9280,J9250,J9185,J9070,J9260,J9070,J9130,J9280,J9307,J9025,J9045,J8610,J0894,J9201,J9040,J8521,J9065,J9307,J9185,J9250,J9091,J9091,J9060,J9208,J9260,J9033,J9130,J9263,J9190,J9060,J9140,J9070,J9280,J0894,J9263,J0894,J9260,J9320,J9268,J9260,J9340,J9340,J9280,J9250,J9040,J9190,J9291,J9060,J9065,J9201,J9070,J9250,J9263,J9040,J8610,J9062,J9060,J9033,J9260,J0894,J0894,J9045,J8521,G0482,J9290,J9201,J9263,J9070,J9045,J9070,J0894,J9263,J9260,J8610,J9025,J9065,J9260,J9250,J9070,J9034,J9050,J9062,J9280,J9208,J9290,J9190,J9070,J9190,J9045,J9280,J9065,J9040,J9263,J9260,J9045,J9263,J9100,J9070,J8610,J9185,J9307,J9033,J8530,J9040,J9293,J9260,J9263,J9045,J9201,J0894,J9260,J9263,J9263,J9130,J9130,J9100,J9280,J9208,J9045,J9062,J9070,J9090,J9291,J9060,J9100,J9040,J9080,J0894,J9250,J8520,J8530,J9045,J9060,J9070,J9201,J9060,J9190,J9070,J9263,J9060,J9100,J9025,J9185,J9130,J9025,J8521,J9250,J9185,J9190,J9190,J9090,J9201,J9190,J9045,J9250,J9208,J9290,J9250,J9045,J9033,J9062,J9100,J9040,J9250,J9040,J9208,J9045,J8530,J9025,J9060,J9280,J9040,J9280,J9065,J9263,J9250,J9070,J9263,J9025,J9070,J9263,J0894,J9263,J9190,J8610,J9280,J9060,J9070,J9100,J9268,J9140,J9201,J9190,J9045,J8610,J9263,J9190,J9090,J9208,J9025,J8521,J9260,J9091,J9110,J9025,S0108,J9280,J9280,J9201,J9250,J9070,J9260,J9130,J9034,J9208,J9025,J9208,J9130,J9190,J9070,J9100,J9045,S0108,J9025,J9260,J9045,J9025,J9280,J9025,J9280,J9045,J9100,J9070,J9190,J9260,J9100,J9027,J9260,J9130,G0480,J9260,J9291,J9025,J9190,J9045,J9190,J9130,J9060,J9025,J9070,J9185,J0894,J9208,J9027,J9045,J9120,J9280,J9280,J9352,J9027,J9307,J9100,J9098,A9270,J9045,J9045,J9190,J0894,J8530,J9280,J8610,J9208,J9263,J9100,J9201,J9208,J9040,J9245,J8520,J9190,J9070,J9190,J9060,J9060,J9070,J9263,J9263,J9260,J9100,J9070,J9091,J9250,J9307,J9100,J9260,J9033,J9062,J9140,J9280,J9070,J9280,J9060,J9045,J9185,J9130,J9280,J9291,J9130,J9190,J9280,J9045,J9208,J9060,J9307,J9260,J0894,J9352,J9120,J9190,J9280,J9100,J9120,J9263,J8600,J9190,J9201,J9190,J9130,J9263,J9185,J9040,J8610,J9025,A9270,J9045,J9025,C9480,J9033,J9060,J9293,J9060,J8521,J9290,J9260,J9280,J9045,J9040,J9208,J9250,J9040,J9025,J9040,J9100,J9190,J9120,J9070,J9100,J9190,J9208,J9280,J9060,J9025,J9201,J9280,J9280,J9098,J9260,J9280,J9280,J9060,J9268,J9999</p>
<p>Immunosuppressive agents</p>	<p>J1040,J1100,J2930,J1720,J3301,J1100,J1100,J3301,J7512,J1720,J8540,J1100,J1100,J1100,J2930,J7515,J8499,J1040,J1100,J2930,A9270,J8540,A9270,J1720,A9270,J1720,J1720,J1100,J1100,J7506,J1100,J2930,J1100,A9270,J1100,J1040,J1100,J1720,J7506,J2930,J1040,J1100,J2930,A9270,A9270,J1030,J1720,J1040,J1020,J2930,J7502,J7510,J2920,J1100,J7512,A9270,J0480,J1100,J8540,J7506,J2930,J7517,J1030,A9270,J7502,J7515,J7510,J8540,J1020,J1100,J1040,J7506,J1030,J1100,J1100,J7510,J1020,J7512,J3301,J8540,J1020,J1094,J7512,J7515,J1020,J3301,A9270,J7507,J2930,J3301,A9270,J2930,J8540,J7515,A9270,G6035,J1094,J7506,J1020,J1020,J1100,J1030,J1700,J1720,J1094,J1720,J1100,J3301,J2930,J1100,J1040,J2930,A9270,J7510,J1020,J1100,J1094,J1094,J1094,J7502,A9270,J2920,J7510,J1030,J7502,J3301,J7516,X6004,J7520,J1720,A9270,J7517,J7510,J1100,J7506,J8540,J2920,J1030,J1030,J2930,J2930,J7500,J1040,J1100,J3303,J1030,J7510,J1030,A9270,J1094,J2930,J8540,J1094,A9270,J3301,J3301,J7509,J7506,J7507,J3301,A9270,J2930,J9999,J7638,J3301,J2930,J1100,J1100,J2920,J1094,J7510,J8540,J1030,J2920,J7512,A9270,J1030,J1030,J7510,J1020,J3300,J1100,A9270,J7509,J7506,J2930,J7515,J8540,J2930,J1720,A9270,J1030,A9270,J1020,J1100,J0702,J7512,J1040,J1100,J2920,J3301,J2930,J2930,J1030,J8540,J2920,A9270,J7507,J7510,J2930,J2920,J3301,J2930,J1100,J7515,J7507,J2930,J1040,J2920,J8540,J7520,J7512,S0173,J1720,A9270,J7506,J1100,J1100,J1040,J2920,J2930,J3301,J1030,J1030,J1100,J1040,J7512,J7506,A9270,J1030,J2920,A9270,J1020,J2930,J7502,J1040,J1100,J9330,J7512,J2920,A9270,J7506,J9330,J2920,J1040,J7507,J1030,J1720,J3303,J3300,J7512,J7506,J2930,J2930,J0702,J7509,J1020,J1100,J1094,J2920,J7507,J1100,J3301,J8540,J2920,J2930,J9070,J1020,J3301,J2920,J1094,J1100,J1030,J1100,J3300,A9270,J2930,A9270,J1720,J9330,J7510,J1100,J2930,J7512,J2920,A9270,J1040,J1100,J7507,J1040,J1094,J7510,J3301,J1040,J2930,J1030,J2930,J1100,J1100,A9270,J7500,J1020,J7507,J2930,A9270,J1040,J1100,J7517,J8540,J3301,J2930,J8530,J1020,J1040,J9330,J7512,A9270,A9270,J7520,J2930,J1100,J1100,J7512,J1100,J2930,J1030,J1100,J2920,J1094,J7517,J1100,J1100,J3301,J1100,J1040,J3300,J1040,J1040,J2930,J2930,A9270,A9270,J3303,J7500,J1040,J7520,J7502,J1040,J8540,J2930,J1094,J1720,J2920,J7502,J7507,J7516,J7527,J7510,G0480,J7520,J2930,J3301,J1100,J1020,J3301,J2930,J1020,J1040,J1040,J2930,J1100,J7512,A9270,J7507,J7506,J3302,J1100,J1030,J1030,J2930,J1094,J1094,J2930,J7506,J2920,J7502,J2920,J1100,J7512,J1100,J1094,J2920,J2920,J7512,J2930,J1100,J7506,J3301,J3301,J1720,J1100,J1100,J7506,J7500,J1100,J1030,J2930,J1040,J7509,J8540,J7512,J1030,J1720,J2930,J2930,J7512,J3301,J1720,J7507,J2930,J7500,J7506,A9270,A9270,J1100,J7510,J1040,J3301,J2920,J1720,J8540,J1040,J1030,J3303,J1100,J7512,J1030,J2930,J1040,J1040,J1040,J1040,J1030,J1040,J1100,A9270,J7515,J1720,J7506,A9270,J7502,J7502,A9270,J3303,J7502,J2930,J1720,J7312,A9270,J7520,J3301,J1100,J3301,J2920,J1040,J1720,J8540,J1720,J7500,J2930,J1100,J7500,J3301,J1100,J9070,J1720,J1720,J3301,J7506,J1100,J1030,J7507,J1030,J9330,J1030,J7506,J1720,J2930,J8540,J1030,J7510,J8540,J2930,J7506,J1030,J7512,J7506,J7507,J2930,J2930,J1100,J7512,J9330,J3300,J1100,A9270,J2930,J7507,J1020,J7506,J7500,J1720,J7637,J1100,J1720,J7510,A9270,A9270,J9330,J1030,J1040,J1720,A9270,J7506,A9270,J1100,J1100,J7506,J1020,J7510,J1040,J3303,J3301,J7512,J2930,J2930,J7512,J7510,J7520,J2930,J7506,J7500,J7515,J3301,J1030,J2930,J9330,A9270,X5554,J7506,J2920,J1020,J1030,J7512,J1100,J2930,J7512,J7500,J3301,J1100,J2920,J8540,J1100,J8540,J1720,J1100,J3301,A9270,J1040,A9270,A9270,J1100,J7512,J8540,J1040,J1020,J1040,J7510,J2920,J7515,A9270,J1100,J9330,J1020,J2920,J1020,J1030,J3303,J2930,J2930,J7506,J2930,J7506,J1100,J1720,J7506,J7512,J2920,J3301,J1100,J7517,J1030,J2930,J1100,J1040,J8540,A9270,J1720,J2930,J3303,J8540,J3303,J1020,J7502,J7506,J7502,J2920,J9330,J8530,J2920,J2930,J7520,J1094,J3301,J1030,J7512,J1720,J7506,J8540,J2930,J7638,J1030,J1100,J2920,J1720,J2930,J2920,J7512,J1100,J2930,A9270,J3301,J1100,J3301,J2930,A9270,J1094,J1030,J8540,J7517,A9270,J7507,J7509,J7512,J7509,J8540,J7638,J7512,J1030,J7510</p>

**Severity Test for select comorbidities**

Comorbidity	Tests (OPTUM)	Comorbidity Types / Severity
Anemia	a. Hemoglobin (HGB)	a. High (Hemoglobin: >18 g/dl) b. Normal (Hemoglobin: 12-18 g/dl) c. Mild (Hemoglobin: 10.0-11.9 g/dl ) d. Moderate (Hemoglobin: 7.0-9.9 g/dl) e. Severe (Hemoglobin: less than 7.0 g/dl)
Diabetes	a. Hemoglobin A1c	a. Non-Diabetic (HA1C<6.5 ) b. Good Diabetic Control (HA1C 6.5- 7.5) c. Fair Diabetic Control (HA1C 7.5 - 8.5) d. Poor Diabetic Control ( HA1C 8.5-10) e. Severe Diabetic (HA1C 10+)
Dyslipidemia	a. Triglycerides (TG) b. Cholesterol.HDL c. Cholesterol.LDL d. Cholesterol.total	Severity: a. Normal High (Total<200 mg/dL, LDL=< 130 mg/dL, HDL> 59 mg/dL, TG<150 mg/dL) b. Borderline High (Total=200-239 mg/dL, LDL=130-159 mg/dL, HDL=40-59 mg/dL, TG=150-199 mg/dL) c. High (Total≥240 mg/dL, LDL≥160 mg/dL, HDL<40 mg/dL, TG>200 mg/dL)
Hypertension	a. SBP b. DBP	a. Normal (SBP: <129, DBP:<80) b. Stage 1 (SBP: 130-139, DBP: 80-89) c. Stage 2 (SBP: 140-179, DBP:90-119) d. Stage 3 (SBP:180+, DBP: 120+)
Proteinuria	a. Albumin/creatinine ratio.urine	1. Normal - 30mg/g ACR( Albumin Creatine Ratio) 2. Moderate - 30-300 mg/g ACR 3. Severe - 300-2,200 mg/g ACR 4. Nephrotic range proteinuria > 2,200 mg/g ACR
Sickle Cell Disease	a. Hemoglobin S.percent	Normal: Hemoglobin S percent =0 Severe: Hemoglobin S percent >0
Hyperthyroidism	a. Thyroxine.total (T4) b. Thyroid stimulating hormone (TSH)	Normal: T4 <12ug/dl or TTSH >0.4 mU/L Severere: T4 > 12ug/dl , and serum TTSH <0.4 mU / L
Obesity	a. BMI	a. Underweight (BMI < 18.5) b. Normal weight (BMI of 18.5-24.9) c. Overweight (BMI of 25-29.9) d. Obese (BMI > 30) e. Morbidly obese (BMI is over 40)

**Laboratory Test**

Laboratory Test	OPTUM Name	Severity Ranges
Serum uric acid levels	Uric acid	Normal: 2.4-7.0 mg/dL Low: <2.4 mg/dL High: >7.0 mg/dL
Albumin-to-creatinine ratio (ACR)	Albumin/creatinine ratio.urine	A1 (normal): <30 mg/g A2 (moderate severe): 30-300 mg/g A3 (severe): >300 mg/g
Hemoglobin	Hemoglobin (HGB)	Normal: >12 g/dl Mild: 10.0-11.9 g/dl Moderate: 7.0-9.9 g/dl Severe: <7.0 g/dl
Serum bicarbonate	Bicarbonate (HCO3)	Low: <23 mEq/L Normal: 23-30 mEq/L High: >30 mEq/L
Serum phosphate	Phosphorus (PO4)	Normal range: 2.5-4.5 mg/dL Hypophosphatemia moderate severity: 1.5-2.4 mg/dL Hypophosphatemia severe: 1-1.5 mg/dL Hypophosphatemia extremely severe: <1 mg/dL Hyperphosphatemia mild severity: 4.5-6.5 mg/dL Hyperphosphatemia severe: >6.6 mg/dL



**Table S3. CKD Common Medications**

<b>Medication</b>	<b>Optum Class / Drug Name</b>
Diuretic	Diuretic combinations Diuretics; miscellaneous Antihypertensive combinations; beta blocker & thiazide diuretic Loop diuretics Osmotic diuretics Potassium-sparing diuretics
Angiotensin-converting enzyme inhibitors	Angiotensin-converting enzyme inhibitors
Angiotensin II receptor blockers	Angiotensin II receptor antagonists
Beta blockers	Beta-adrenergic antagonists (beta blockers) w/o ISA Beta-adrenergic antagonists; glaucoma treatment Alpha- & beta-adrenergic antagonists
Calcium channel blockers	Calcium channel antagonists (calcium channel blockers)
Statins	HMG-CoA reductase inhibitors (statins) HMG-CoA reductase inhibitor combinations; statin & various
Antiplatelet drugs	Antiplatelets or aggregation inhibitors Antiplatelet agents; glycoprotein IIb/IIIa inhibitors Antiplatelet combinations
Hematopoietic agents	Hematopoietic agents
Immunosuppressive agents	Systemic glucocorticoids Immunologics; immunosuppressive
Cytotoxic agents	Antimetabolite Alkylating agents Antineoplastic antibiotics; miscellaneous
Proton pump inhibitors	Proton pump inhibitors
Antibiotics	Otic antibiotics Ophthalmic antibiotic combinations Otic steroid & antibiotic combinations Antibiotics; miscellaneous Anthracycline antibiotics Ophthalmic steroid & antibiotic combinations Ophthalmic antibiotics; miscellaneous Beta-lactam antibiotics; miscellaneous

Non-steroidal anti-inflammatory	Non-steroidal anti-inflammatory (NSAID) agents NSAIDs; cyclooxygenase-2 inhibitors NSAID combinations; various
Iron	Iron Iron combination products; miscellaneous
Systemic steroids	Systemic glucocorticoids
Diabetes	Insulin Antidiabetic agents; amylin analogs Glucagon-like peptide 1 receptor agonists; and other misc. diabetes agents Insulin & other antidiabetic medication Antidiabetic agents; meglitinides Antidiabetic agents; biguanides Antidiabetic agents; sulfonylurea Antidiabetic agents; alpha-glucosidase inhibitors Sodium-glucose co-transporter 2 inhibitors Antidiabetic agents; dipeptidyl peptidase inhibitors Antidiabetic combination agents Antidiabetic agents; thiazolidinediones

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ISA=intrinsic sympathomimetic activity; HMG-CoA= 3-hydroxymethyl-3-methylglutaryl coenzyme A; NSAID=non-steroidal anti-inflammatory

**Table S4. Follow-up Characteristics of Patient Episodes**

Characteristic	Stage 3 to 3				Stage 3 to 4/5				Stage 4 to 4				Stage 4 to 5			
Episode no. (%)	257786 (85.5)	33192 (11.0)	10161 (3.4)	454 (0.2)	22236 (80.0)	4146 (14.9)	1348 (4.9)	60 (0.2)	38563 (84.0)	5474 (11.9)	1773 (3.9)	79 (0.2)	6511 (77.2)	1389 (16.5)	515 (6.1)	21 (0.3)
EOS count (cells/ $\mu$ l)	0- 299	300- 499	500- 1499	$\geq$ 1500	0- 299	300- 499	500- 1499	$\geq$ 1500	0- 299	300- 499	500- 1499	$\geq$ 1500	0- 299	300- 499	500- 1499	$\geq$ 1500
<b>BMI</b>																
Normal	67044 (26.0)	6751 (20.3)	2280 (22.4)	143 (31.5)	4577 (20.6)	625 (15.1)	241 (17.9)	16 (26.7)	10253 (26.6)	1180 (21.6)	381 (21.5)	30 (38.0)	1316 (20.2)	206 (14.8)	87 (16.9)	6 (28.6)
Morbid Obese	21891 (8.5)	3509 (10.6)	934 (9.2)	26 (5.7)	2151 (9.7)	518 (12.5)	140 (10.4)	1 (1.7)	3122 (8.1)	570 (10.4)	138 (7.8)	4 (5.1)	612 (9.4)	171 (12.3)	56 (10.9)	6 (28.6)
Obese	70462 (27.3)	10119 (30.5)	2942 (29.0)	112 (24.7)	6145 (27.6)	1234 (29.8)	386 (28.6)	18 (30.0)	9659 (25.0)	1490 (27.2)	473 (26.7)	10 (12.7)	1711 (26.3)	400 (28.8)	127 (24.7)	4 (19.0)
Overweight	65597 (25.4)	8567 (25.8)	2575 (25.3)	115 (25.3)	4956 (22.3)	911 (22.0)	307 (22.8)	9 (15.0)	9091 (23.6)	1299 (23.7)	423 (23.9)	22 (27.8)	1291 (19.8)	287 (20.7)	122 (23.7)	3 (14.3)
Underweight	10496 (4.1)	767 (2.3)	232 (2.3)	15 (3.3)	669 (3.0)	68 (1.6)	23 (1.7)	0 (0.0)	2001 (5.2)	131 (2.4)	53 (3.0)	2 (2.5)	243 (3.7)	20 (1.4)	9 (1.7)	0 (0.0)
Unknown	22296 (8.6)	3479 (10.5)	1198 (11.8)	43 (9.5)	3738 (16.8)	790 (19.1)	251 (18.6)	16 (26.7)	4437 (11.5)	804 (14.7)	305 (17.2)	11 (13.9)	1338 (20.5)	305 (22.0)	114 (22.1)	2 (9.5)
<b>Smoking</b>																
Current	30278 (11.7)	3563 (10.7)	1094 (10.8)	54 (11.9)	2601 (11.7)	460 (11.1)	155 (11.5)	7 (11.7)	4762 (12.3)	617 (11.3)	189 (10.7)	11 (13.9)	839 (12.9)	149 (10.7)	54 (10.5)	6 (28.6)
Never	105343 (40.9)	12304 (37.1)	3688 (36.3)	164 (36.1)	3858 (35.3)	1263 (30.5)	429 (31.8)	13 (21.7)	15153 (39.3)	1876 (34.3)	538 (30.3)	24 (30.4)	2143 (32.9)	431 (31.0)	144 (28.0)	6 (28.6)
Not current	10139 (3.9)	1289 (3.9)	403 (4.0)	25 (5.5)	942 (4.2)	161 (3.9)	44 (3.3)	5 (8.3)	1591 (4.1)	213 (3.9)	69 (3.9)	4 (5.1)	316 (4.9)	60 (4.3)	23 (4.5)	0 (0.0)
Previously	80220 (31.1)	11368 (34.2)	3483 (34.3)	152 (33.5)	6508 (29.3)	1353 (32.6)	440 (32.6)	22 (36.7)	11647 (30.2)	1851 (33.8)	612 (34.5)	27 (34.2)	1780 (27.3)	421 (30.3)	161 (31.3)	6 (28.6)
Unknown	31806 (12.3)	4668 (14.1)	1493 (14.7)	59 (13.0)	4327 (19.5)	909 (21.9)	280 (20.8)	13 (21.7)	5410 (14.0)	917 (16.8)	365 (20.6)	13 (16.5)	1433 (22.0)	328 (23.6)	133 (25.8)	3 (14.3)
<b>Mortality</b>																
Mean time to death	546 (397.9)	561 (398.0)	550 (387.5)	538 (420.4)	1052 (528.3)	1044 (516.4)	1055 (539.3)	850 (550.3)	523 (464.7)	531 (427.6)	514 (390.5)	388 (287.4)	1048 (293.6)	1043 (254.3)	1027 (257.8)	496 (176.7)
<b>Eosinophils*</b>																
Mean no. tests	6 (6.6)	5 (6.9)	6 (7.7)	6 (7.9)	6 (8.2)	6 (8.0)	6 (7.1)	7 (9.6)	7 (387.5)	7 (375.2)	7 (366.5)	7 (210.8)	7 (539.7)	7 (547.7)	9 (493.2)	7 (215.9)

Mean	140 (75)	379 (54)	690 (195)	18918 (47789)	156 (75)	382 (55)	680 (181)	16853 (55480)	140 (8)	381 (8)	700 (9)	8167 (12)	158 (8)	383 (8)	688 (12)	3424 (6)
Median	134 (81)	369 (77)	657 (221)	15224 (44932)	151 (80)	373 (74)	650 (203)	7275 (34663)	133 (75)	370 (54)	668 (198)	5610 (34015)	153 (75)	374 (55)	656 (191)	1919 (3786)
Max	236 (151)	582 (249)	1121 (698)	40247 (100124)	253 (151)	579 (222)	1083 (716)	65151 (250107)	243 (82)	603 (80)	1185 (222)	19849 (31825)	263 (80)	595 (73)	1136 (201)	11595 (1295)
Min	68 (73)	216 (129)	375 (248)	5459 (25535)	79 (75)	222 (127)	382 (239)	955 (972)	65 (158)	202 (252)	355 (734)	4194 (64660)	77 (156)	214 (246)	348 (624)	752 (17611)
eGFR*																
Mean time to progression	618 (454.8)	575 (428.4)	552 (415.7)	560 (448.4)	477 (318.9)	453 (301.5)	435 (285.2)	396 (289.8)	623 (71.1)	547 (131.2)	514 (245.0)	441 (28943.7)	422 (74.1)	382 (127.9)	386 (236.0)	320 (959.1)
Mean no. tests	10 (13.4)	9 (13.3)	10 (14.1)	10 (14.0)	12 (16.3)	12 (15.2)	12 (17.2)	13 (18.5)	12 (15.3)	12 (15.9)	13 (16.3)	15 (23.1)	13 (15.0)	14 (17.4)	15 (16.9)	16 (9.2)
Mean	49 (13.9)	49 (14.1)	47 (14.1)	46 (13.7)	33 (9.5)	31 (9.4)	31 (9.6)	31 (10.0)	26 (12.0)	24 (11.5)	23 (10.5)	23 (11.1)	16 (5.6)	15 (5.6)	15 (4.6)	15 (4.4)
Median	49 (15.2)	49 (15.1)	48 (15.1)	47 (14.5)	33 (11.0)	32 (10.6)	31 (10.5)	31 (11.4)	25 (12.3)	24 (11.5)	23 (10.9)	23 (11.3)	17 (5.8)	16 (5.9)	15 (4.9)	16 (5.6)
Max	66 (19.2)	63 (18.6)	62 (18.8)	61 (18.1)	50 (18.6)	47 (17.4)	46 (17.7)	48 (21.5)	44 (25.3)	37 (21.9)	35 (20.7)	36 (20.3)	28 (18.6)	24 (15.2)	24 (14.2)	23 (8.8)
Min	33 (17.3)	35 (16.7)	35 (16.4)	33 (15.7)	19 (9.5)	20 (8.8)	20 (8.8)	19 (10.4)	15 (9.8)	16 (9.4)	16 (8.3)	16 (10.4)	9 (4.7)	10 (4.4)	10 (3.8)	9 (3.4)
Starting	47 (14.4)	47 (13.7)	47 (13.7)	37 (13.2)	40 (12.8)	39 (12.6)	39 (12.1)	38 (12.2)	24 (10.5)	23 (9.2)	23 (8.2)	24 (7.3)	21 (8.6)	20 (7.3)	19 (6.4)	20 (5.0)
Ending	48 (22.5)	47 (21.6)	48 (22.1)	45 (13.9)	22 (11.1)	23 (9.5)	23 (10.3)	24 (15.9)	26 (20.4)	25 (19.5)	27 (20.5)	21 (4.2)	10 (7.2)	11 (5.6)	11 (5.0)	11 (6.9)
Mean change	0.2 (1.3)	0.0 (0.7)	0.1 (0.8)	0.1 (0.5)	-0.4 (0.7)	-0.4 (0.4)	-0.4 (0.3)	0.8 (7.7)	0.7 (3.9)	0.2 (1.1)	0.8 (1.4)	0.2 (0.4)	-0.4 (0.7)	-0.3 (0.9)	-0.4 (0.4)	-0.4 (0.4)
Laboratory*																
PO4	3.1 (10.7)	3.1 (0.8)	3.1 (0.9)	3.3 (0.8)	3.4 (0.9)	3.5 (0.9)	3.6 (0.9)	3.7 (0.7)	3.4 (1.0)	3.6 (0.9)	3.6 (0.9)	3.6 (0.9)	3.9 (1.0)	4.1 (0.9)	4.1 (1.0)	3.7 (0.9)
HCO3	25.1 (4.5)	25.0 (4.0)	24.9 (3.9)	24.3 (3.3)	24.6 (4.3)	24.6 (4.2)	24.1 (3.7)	24.9 (3.3)	24.5 (5.2)	24.1 (4.6)	23.6 (5.1)	23.8 (3.9)	23.3 (4.9)	23.2 (4.0)	22.4 (4.4)	24.2 (4.9)
Uric acid	6.0 (2.5)	6.3 (2.2)	6.4 (2.3)	7.4 (2.9)	6.8 (2.4)	7.0 (2.2)	6.7 (2.0)	7.1 (1.7)	6.4 (2.7)	6.9 (2.5)	6.8 (2.6)	6.1 (2.3)	6.8 (2.3)	6.9 (2.2)	6.7 (1.9)	8.0 (3.0)
HGB	11.5 (1.9)	11.6 (1.9)	11.5 (2.0)	11.2 (2.0)	11.1 (1.8)	11.0 (1.8)	11.0 (1.8)	10.9 (1.8)	10.9 (1.9)	10.8 (1.9)	10.5 (1.9)	10.5 (2.1)	10.4 (1.8)	10.1 (1.6)	10.0 (1.6)	9.7 (1.5)
ACR	238.7 (767.5)	297.3 (944.1)	315.4 (868.9)	183.1 (539.7)	2084.7	1221.1	1248.9	1168.9	602.8	774.6	771.0	940.3	1789.5	1890.0	2711.0	2741.3

					(81977. 3)	(3176.3 )	(1883.7 )	(1708.7 )	(1363.1 )	(1531.6 )	(1243.5 )	(1571.2 )	(2187.3 )	(1904.6 )	(2786.0 )	(2773.6 )
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Data are presented as number (%) unless otherwise noted.

\* Data are expressed as mean (SD).

**Figure S1. Patient Funnel**

