

SUPPLEMENT

Table S1. Code sets for included health conditions. All conditions were ascertained during the baseline 12 months preceding the index date for cohort entry.

| Comorbidity | ICD-9 Codes | ICD-10 codes | Included code types |
|--|--|--|--------------------------------------|
| 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, 190.x-195.x, 199.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-C76.x, C7A.xx, C80.xx-C96.x (except C90.x1, C91.x1, C92.x1, C93.x1, C94.x1, C95.x1) | All claims Codes in all positions |
| Cardiovascular disease | 410.x, 411.x, 412, 413.x, 414.x, 427.1, 427.3x, 427.4x, 427.5, 429.2, 440.x, 441.x | I20.x, I21.x, I22.x, I23.x, I24.x, I25.x, I46.x, I47.x, I48.x, I49.x, I70.x, I71.x | All claims Codes in all positions |
| 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 | All claims Codes in all positions |
| Chronic Kidney Disease | 585.3, 585.4, 585.5, 585.6 | N18.3, N18.4 | All claims Codes in all positions |
| Cirrhosis | 571.2, 571.5, 571.6 | K70.3x, K74.3, K74.4, K74.5, K74.6x | All claims Codes in all positions |
| 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 | All claims Codes in all positions |
| Depression | 290.13, 290.21, 290.43, 296.2x, 296.3x, 296.82, 298.0, 301.12, 309.0, 309.1, 309.28, 311 | F01.51, F32.x (except F32.81), F33.x, F34.8x, F43.21, F43.23 | All claims Codes in all positions |
| Heart failure | 398.91, 402.01, 402.11, 402.91, 404.01, 404.03, | I09.81, I11.0, I13.0, I13.2, I50.xx | All claims |

| | | | |
|-----------------------------|--|--|---|
| | 404.11, 404.13, 404.91, 404.93, 428.xx | | Codes in all positions |
| Hypoglycemia | 251.0, 251.1, 251.2, 962.3, 250.8x (for 250.8x: if no concurrent 259.8, 272.7, 681.xx, 682.xx, 686.9x, 707.1x-707.2x, 707.8, 707.9, 709.3, 730.0x-730.2x, 731.8) | E10.641, E10.649, E11.641, E11.649, E13.641, E13.649, E16.0, E16.1, E16.2, T38.3X1A, T38.3X1D, T38.3X1S, T38.3X2A, T38.3X2D, T38.3X2S, T38.3X3A, T38.3X3D, T38.3X3S, T38.3X4A, T38.3X4D, T38.3X4S, T38.3X5A, T38.3X5D, T38.3X5S | Hospital and ED claims Codes in 1 st position |
| Neuropathy | 357.2, 337.1, 356.9, 358.1, 458.0, 536.3, 564.5, 596.54, 713.5, 951.0, 951.1, 951.3, 250.6x, 249.6x, 337.0x, 354.x, 355.x | G90.09, G90.8, G90.9, G99.0, G60.9, G73.3, G90.01, I95.1, K31.84, K59.1, N31.9, E08.4x, E09.4x, E10.4x, E11.4x, E13.4x, G56.x, G57.x, H49.x, M14.6x, S04.x | All claims Codes in all positions |
| Peripheral vascular disease | 442.3, 440.21, 443.81, 443.9, 892.1, 040.0, 444.22, 785.4, 250.7x, 249.7, 707.1x | E08.51, E09.51, E10.51, E11.51, E13.51, E08.59, E09.59, E10.59, E11.59, E13.59, E08.621, E09.621, E10.621, E11.621, E13.621, I72.4, I73.89, I73.9, A48.0, I74.3, I96, E08.52, E09.52, E10.52, E11.52, E13.52, I70.21x, S91.3x, L97.x | All claims Codes in all positions |
| Retinopathy | 362.01, 362.03, 362.04, 362.05, 362.06, 362.07, 362.53, 362.81, 362.82, 362.83, 362.02, 379.23, 250.5x, 249.5x, 362.1x, 361.x, 369.x | H35.9, E08.3x, E09.3x, E10.3x, E11.3x, E13.3x, H35.0x, H35.35x, H35.6x, H35.8x, H33.x, H54.x, H43.1x | All claims Codes in all positions |

*Ginde AA, Blanc PG, Lieberman RM, Camargo Jr CA. Validation of ICD-9-CM coding algorithm for improving identification of hypoglycemic visits. BMC Endocr Disord 2008;8:4

Table S2. Classification scheme for glucose-lowering medications.

| Medication class | Included agents* |
|----------------------------|--|
| Insulin: Long-acting | NPH/isophane Detemir Glargine Degludec |
| Insulin: Short-acting | Regular Aspart Lispro Glulisine Inhaled powder insulin |
| Sulfonylureas and Glinides | Glimepiride Glipizide |

| | |
|-------------------------|---|
| | Glyburide Nateglinide Repaglinide |
| Biguanides | Metformin |
| GLP-1 receptor agonists | Exenatide Liraglutide Albiglutide Dulaglutide Lixisenatide Semaglutide |
| SGLT2 inhibitors | Canagliflozin Empagliflozin Dapagliflozin Ertugliflozin |
| DPP-4 inhibitors | Sitagliptin Saxagliptin Linagliptin Alogliptin |
| Thiazolidinediones | Pioglitazone Rosiglitazone |

* Mixed insulins are included as each combination medication is included as the sum of its component parts.

Table S3. Baseline characteristics of patients with and without a glucagon fill during the study period.

| | Glucagon fill | No glucagon fill | Total | Percentage with a fill |
|--------------------------------|---------------|------------------|-----------|------------------------|
| Diabetes Type | | | | |
| Type 1 | 15,865 | 78,515 | 94,380 | 16.8% |
| Type 2 | 25,649 | 2,694,435 | 2,720,084 | 0.9% |
| History of Severe Hypoglycemia | | | | |
| Hypoglycemia | 2,426 | 25,718 | 28,144 | 8.6% |
| No hypoglycemia | 39,088 | 2,747,232 | 2,786,320 | 1.4% |
| Insulin Regimen | | | | |
| No insulin | 9,237 | 2,261,007 | 2,270,244 | 0.4% |
| Basal insulin only | 5,439 | 230,300 | 235,939 | 2.3% |
| Prandial insulin | 26,838 | 281,443 | 308,281 | 8.7% |
| Gender | | | | |
| Female | 22,840 | 1,387,929 | 1,410,769 | 1.6% |
| Male | 18,674 | 1,385,021 | 1,403,695 | 1.3% |
| Race | | | | |
| Asian | 803 | 113,988 | 114,791 | 0.7% |
| Black | 5,311 | 485,668 | 490,979 | 1.1% |
| Hispanic | 3,238 | 374,943 | 378,181 | 0.9% |
| White | 30,785 | 1,701,044 | 1,731,829 | 1.8% |
| Other/Unknown | 1,377 | 97,307 | 98,684 | 1.4% |
| Income | | | | |
| <\$40,000 | 10,988 | 895,515 | 906,503 | 1.2% |
| \$40,000-\$74,999 | 9,693 | 795,588 | 805,281 | 1.2% |
| \$75,000-\$124,999 | 9,306 | 605,520 | 614,826 | 1.5% |

| | | | | |
|---------------------|--------|-----------|-----------|------|
| \$125,000-\$199,999 | 4,526 | 225,470 | 229,996 | 2.0% |
| ≥\$200,000 | 3,222 | 106,679 | 109,901 | 2.9% |
| Other/Unknown | 3,779 | 144,178 | 147,957 | 2.6% |
| Insurance | | | | |
| Commercial | 19,622 | 1,173,217 | 1,192,839 | 1.6% |
| Medicare Advantage | 21,892 | 1,599,733 | 1,621,625 | 1.4% |