SUPPLEMENTARY DATA

Supplementary Table S1. Algorithm to identify patients with type 1 diabetes

1. Ratio of type 1 diagnosis to type 2 diagnosis codes greater than 0.5 plus either 1A or 1B:

1A. Prescription order for glucagon

1B. No record of any oral antidiabetes (OAD) medication or injectable typically used exclusively for type 2 diabetes:

- Meglitinide derivatives
- Sulfonylureas
- Dipeptidyl peptidase-4 (DPP-4) inhibitors
- Thiazolidinediones
- α-Glucosidase inhibitors
- Glucagon-like peptide-1 (GLP-1) receptor agonists
- Biguanide or sodium-glucose cotransporter 2 (SGLT 2) combinations containing any of the above medications

2. Laboratory measurement of C peptide <0.8

3. Positive test result for diabetes-related autoantibodies

- Islet cell cytoplasmic autoantibodies (ICA)
- Glutamic acid decarboxylase autoantibodies (GADA)
- Insulinoma-associated-2 autoantibodies (IA-2A)
- Insulin autoantibodies (IAA)

4. Prescription order for ketone strips

SUPPLEMENTARY DATA

Supplementary Table S2. Clinical outcome definitions and codes

Outcome	Definition	ICD-9 codes	ICD-10 codes
Baseline HbA1c*	HbA1c measurement closest to the index date during baseline period	NA	NA
Change in HbA1c*	Most recent post-index HbA1c value minus most recent pre-index HbA1c value	NA	NA
Any hypoglycemia (any or severe)	Ginde algorithm (see ICD-9 codes) OR ICD-10 diagnosis code for hypoglycemia in any position and in any health care setting OR a laboratory test result for plasma glucose of <70 mg/dL or <3.9 mmol/L	Ginde algorithm (1): 251.0, 251.1, 251.2, and 270.3; or 250.8x with no diagnosis codes 259.8, 272.7, 681.xx, 682.xx, 686.9x, 707.1-707.9, 709.3, 730.0-730.2, or 731.8 on the same date as the visit with diagnosis code 250.8x	E08.64, E08.641, E08.649, E09.64, E09.641, E09.649, E10.64, E10.641, E10.649, E11.64, E11.641, E11.649, E13.64, E13.641, E13.649, E15, E16.0, E16.1, E16.2
Severe hypoglycemia	Ginde algorithm (see ICD-9 codes) OR ICD-10 diagnosis code for hypoglycemia in any position and in any health care setting OR a laboratory test result for plasma glucose of <70 mg/dL or <3.9 mmol/L occurring with an inpatient admission or ER visit on the same date	See “any hypoglycemia” (above)	See “any hypoglycemia” (above)
DKA†	Identified using the presence of an ICD-9 or ICD-10 diagnosis code in any position in inpatient setting	250.1x	E1x.1
Neuropathy	Identified using the presence of an ICD-9 or ICD-10 diagnosis code in the primary or discharge position in any health care setting	260.60, 260.61, 260.62, 260.63, 707.10, 707.11, 707.12, 707.13, 707.14, 707.15, 707.19, 892.1, 785.4, 040.0	E08.40, E08.41, E08.42, E08.43, E09.40, E09.41, E09.42, E09.43, E10.40, E10.41, E10.42, E10.43, E11.40, E11.41, E11.42, E11.43, E13.40, E13.41, E13.42, E13.43
Nephropathy	Identified using the presence of an ICD-9 or ICD-10 diagnosis code in the primary or discharge position in any health care setting	250.40, 250.41, 250.42, 250.43	E08.21, E09.21, E10.21, E11.21, E13.21
Retinopathy	Identified using the presence of an ICD-9 or ICD-10 diagnosis code in the primary or discharge position in any health care setting	250.50, 250.51, 250.52, 250.53, 362.01, 362.02, 362.03, 362.04, 362.05, 362.06, 362.07, 366.41	E08.31, E08.32, E08.33, E08.34, E08.35, E09.31, E09.32, E09.33, E09.34, E09.35, E10.31, E10.32, E10.33, E10.34, E10.35, E11.31, E11.32, E11.33, E11.34, E11.35, E13.31, E13.32, E13.33, E13.34, E13.35

Coronary heart disease	Having coronary heart disease (identified using the presence of an ICD-9 or ICD-10 diagnosis code in the primary or discharge position in an inpatient setting or relevant procedure code)	Procedure codes 00.66, 36.0x, 36.1x, 36.2, 36.3x Diagnosis codes 410.x, 411.1, 411.81, 412, 413.x, 414.x	Too many to list. Available upon request.
Ischemic stroke	Identified using the presence of an ICD-9 or ICD-10 diagnosis code in the primary or discharge position in an inpatient setting	433.01, 433.11, 433.21, 433.31, 433.81, 433.91, 434.01, 434.11, 434.91, 435, 435.1, 435.2, 435.3, 435.8, 435.9	I63.22, I63.139, I63.239, I63.019, I63.119, I63.219, I63.59, I63.20, I63.30, I63.40, I63.50, G45.0, G45.8, G45.1, G45.9, I67.848,
Hemorrhagic stroke	Identified using the presence of an ICD-9 or ICD-10 diagnosis code in the primary or discharge position in an inpatient setting	431, 432.0, 432.1, 432.9	I61.9, I62.1, I62.00, I62.9
Peripheral arterial disease	Identified using the presence of an ICD-9 or ICD-10 diagnosis code in the primary or discharge position in an inpatient setting or relevant procedure code	Procedure codes 00.55, 39.90, 00.61, 00.64, 39.50 Diagnosis codes 445.0x, 441.3, 441.4	Too many to list. Available upon request.
Congestive heart failure	Identified using the presence of an ICD-9 or ICD-10 diagnosis code in the primary or discharge position in an inpatient setting	398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 425.4, 425.5, 425.7, 425.8, 425.9, 428.0, 428.1, 428.2, 428.3, 428.4, 428.5, 428.6, 428.7, 428.8, 428.9	109.81 I11.0, I13.0, I13.2, I50.00, I50.10, I50.20, I50.21, I50.22, I50.23, I50.30, I50.31, I50.32, I50.33, I50.40, I50.41, I50.42, I50.43, I50.80, I50.81, I50.82, I50.83, I50.84, I50.89, I50.90, I97.130, I97.131

NA, not applicable.
*The valid range for HbA1c is considered 2.5–25% because values outside this range are implausible (2).
†These codes have been validated, with a positive predictive value of 88.9% (95% confidence interval 71.9–96.1) (3)

SUPPLEMENTARY DATA

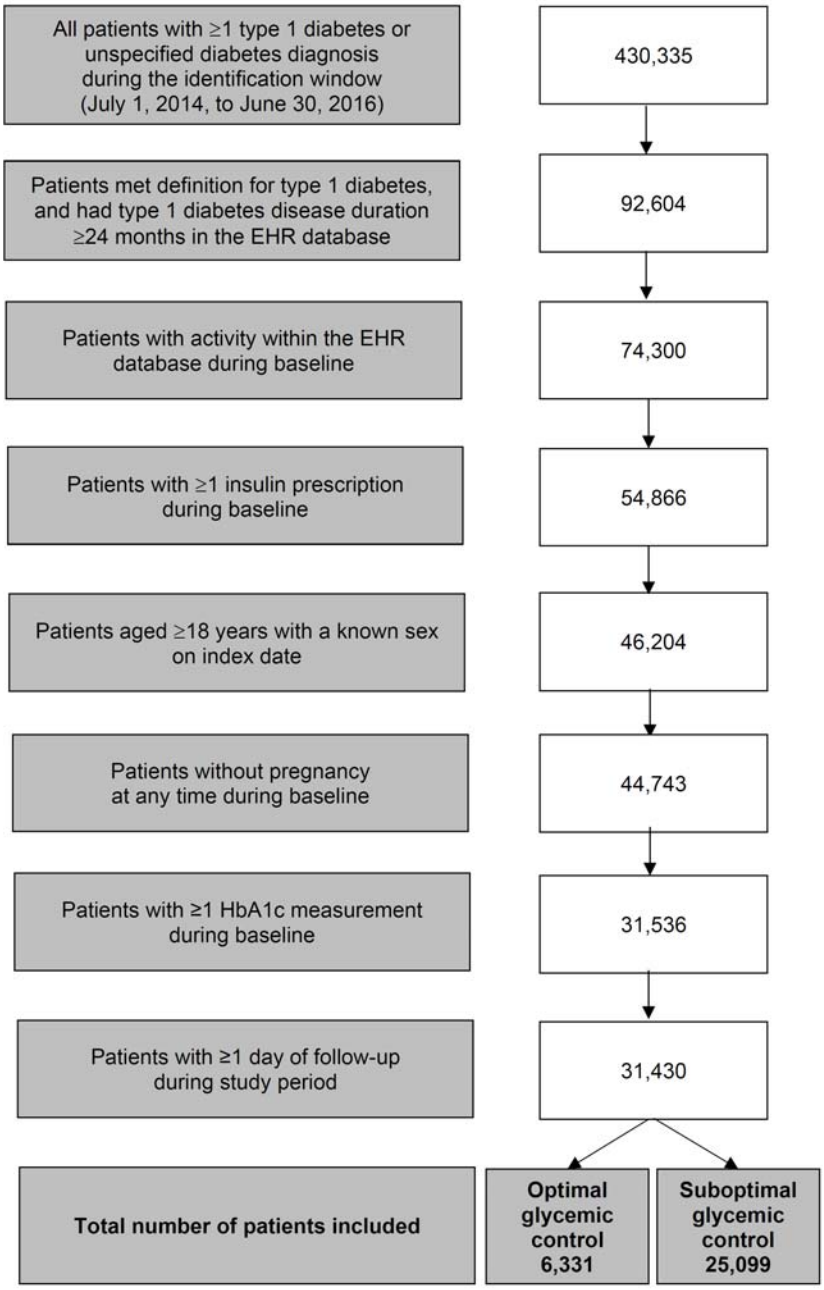
Supplementary Table S3. Baseline patient characteristics by age group

Patient characteristic	Overall (n = 31,430)	Age group, years			
		18–25 (n = 4,913)	26–49 (n = 12,724)	50–64 (n = 9,040)	≥65 (n = 4,753)
Female, n (%)	15,369 (48.9)	2,342 (47.7)	6,009 (47.2)	4,522 (50.0)	2,496 (52.5)
Race, n (%)					
African American	2,214 (7.0)	405 (8.2)	929 (7.3)	525 (5.8)	355 (7.5)
Caucasian	27,697 (88.1)	4,183 (85.1)	11,125 (87.4)	8,156 (90.2)	4,233 (89.1)
All other or unknown	1,519 (4.8)	325 (6.6)	670 (5.3)	359 (4.0)	165 (3.5)
Ethnicity, n (%)					
Hispanic	998 (3.2)	240 (4.9)	488 (3.8)	185 (2.1)	85 (1.8)
Not Hispanic	29,447 (93.7)	4,513 (91.9)	11,816 (92.9)	8,588 (95.0)	4,530 (95.3)
Unknown	985 (3.1)	160 (3.3)	420 (3.3)	267 (3.0)	138 (2.9)
BMI categories, kg/m^2, n (%)					
Normal: <25	10,036 (31.9)	2,464 (50.2)	3,846 (30.2)	2,393 (26.5)	1,333 (28.1)
Overweight: 25 to <30	10,624 (33.8)	1,504 (30.6)	4,386 (34.5)	3,161 (35.0)	1,573 (33.1)
Obesity: 30 to <35	5,812 (18.5)	523 (10.7)	2,434 (19.1)	1,879 (20.8)	976 (20.5)
Severe obesity: ≥35	4,172 (13.3)	283 (5.8)	1,728 (13.6)	1,387 (15.3)	774 (16.3)
Unknown	786 (2.5)	139 (2.8)	330 (2.6)	220 (2.4)	97 (2.0)
Census division, n (%)					
South Atlantic/West South Central	8,039 (25.6)	1,162 (23.7)	3,273 (25.7)	2,187 (24.2)	1,417 (29.8)
East North Central	11,022 (35.1)	1,735 (35.3)	4,379 (34.4)	3,267 (36.1)	1,641 (34.5)
West North Central	5,406 (17.2)	868 (17.7)	2,250 (17.7)	1,588 (17.6)	700 (14.7)
East South Central	521 (1.7)	37 (0.8)	188 (1.5)	171 (1.9)	125 (2.6)
Middle Atlantic	1,371 (4.4)	198 (4.0)	499 (3.9)	432 (4.8)	242 (5.1)
New England	1,287 (4.1)	231 (4.7)	566 (4.4)	367 (4.1)	123 (2.6)
Mountain	1,215 (3.9)	159 (3.2)	509 (4.0)	360 (4.0)	187 (3.9)
Pacific	1,575 (5.0)	242 (4.9)	579 (4.6)	514 (5.7)	240 (5.0)
Other or unknown	994 (3.2)	281 (5.7)	481 (3.8)	154 (1.7)	78 (1.6)
Insurance type, n (%)					
Commercial	18,056 (57.5)	3,137 (63.9)	8,086 (63.6)	5,693 (63.0)	1,140 (24.0)
Medicare	4,940 (15.7)	43 (0.9)	813 (6.4)	1,175 (13.0)	2,909 (61.2)
Medicaid	2,387 (7.6)	690 (14.0)	1,221 (9.6)	412 (4.6)	64 (1.4)
Other	781 (2.5)	142 (2.9)	339 (2.7)	242 (2.7)	58 (1.2)
Uninsured	649 (2.1)	145 (3.0)	348 (2.7)	141 (1.6)	15 (0.3)
Unknown	4617 (14.7)	756 (15.4)	1917 (15.1)	1377 (15.2)	567 (11.9)
Endocrinologist encounter, n (%)*	15,846 (59.4)	3,220 (73.4)	6,548 (59.9)	4,229 (56.5)	1,849 (47.8)

*Indicates number of patients with ≥1 encounter. Population of healthcare utilization measure only included patients in Integrated care Delivery Network (n=26,678).

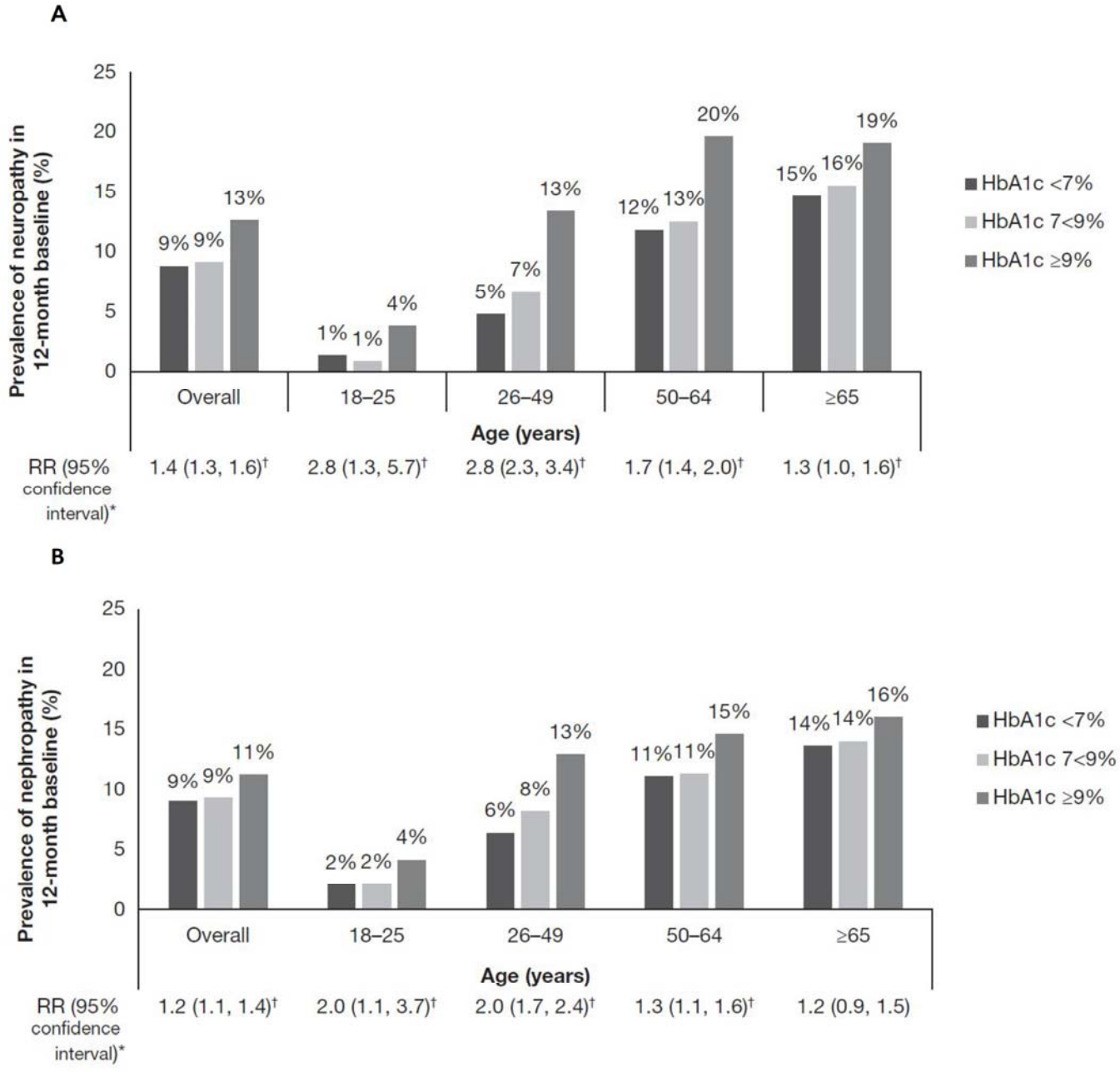
SUPPLEMENTARY DATA

Supplementary Figure S1. Patient attrition diagram



SUPPLEMENTARY DATA

Supplementary Figure S2. Microvascular complications stratified by age and glycemic control. *A*: neuropathy; *B*: nephropathy. The values beneath each set of bars show the RRs of neuropathy or nephropathy among those with HbA1c ≥9% vs <7% within each age category. In the HbA1c <7%, 7 to <9%, and ≥9% groups, respectively: age group 18–25 years, n = 570, 2,072, and 2,262; 26–59 years, n = 2,406, 6,604, and 3,714; 60–64 years, n = 1,952, 5,153, and 1,935; ≥65 years, n = 1,394, 2,710, and 649. *RR for HbA1c ≥9% vs <7%. †$P < 0.05$.



SUPPLEMENTARY DATA

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