

Time to Treatment Intensification with Glucagon-Like Peptide-1 Receptor Agonists Versus Comparators in People with Type 2 Diabetes Treated with Metformin

John W. Ostrominski^{1,2}, Vanita R. Aroda¹, Uffe C. Braae³, Christian Kruse³, Kabirdev Mandavya⁴, John B. Buse⁵

¹Department of Endocrinology, Diabetes and Hypertension, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, USA

²Cardiovascular Division, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, USA

³Novo Nordisk A/S, Søborg, Denmark

⁴Novo Nordisk Service Centre India Private Ltd, Bangalore, India

⁵Division of Endocrinology, Department of Medicine, University of North Carolina School of Medicine, Chapel Hill, NC, USA

Corresponding author: John W. Ostrominski, MD

Address: 75 Francis St., Boston, MA 02115, USA

Tel: (857) 307-4000

Fax: (617) 732-7134

Email: jostrominski@bwh.harvard.edu

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Supplementary Table S1 GLP-1RAs included in the analysis

Name	Dose	Administration route
Semaglutide	0.25 mg 0.5 mg 1.0 mg	Subcutaneous
Semaglutide	3 mg 7 mg 14 mg	Oral
Albiglutide	30 mg 50 mg	Subcutaneous
Dulaglutide	0.75 mg 1.5 mg 3 mg 4.5 mg	Subcutaneous
Exenatide	5 µg (daily) 10 µg (daily) 2 mg (weekly)	Subcutaneous
Liraglutide	0.6 mg 1.2 mg 1.8 mg	Subcutaneous
Lixisenatide	Not specified	Not specified

Supplementary Table S2 Observational Medical Outcomes Partnership Common Data Model disease codes used for diagnosis of type 2 diabetes

OMOP CDM Concept ID	Vocabulary	Code	Term
44833367	ICD9CM	250.72	Diabetes with peripheral circulatory disorders, type 2 or unspecified type, uncontrolled
45561952	ICD10	E11.9	T2D without complications
40518517	SNOMED	314370005	T2D with mononeuropathy
45757474	SNOMED	1481000119100	T2D without retinopathy
45463265	Read	C10FG11	T2D with arthropathy
45503180	Read	C10F500	T2D with gangrene
3121818	Nebraska Lexicon	190400006	T2D with diabetic cataract
45542739	ICD10	E11.1	T2D with ketoacidosis
45571656	ICD10	E11	T2D
45496541	Read	C109F00	Non-insulin-dependent diabetes with peripheral angiopathy
45446452	Read	C10FB00	T2D with polyneuropathy
1326492	ICD10CM	E11.10	T2D with ketoacidosis without coma
35206880	ICD10CM	E11.640	T2D with hypoglycemia without coma
45449783	Read	C10FC11	T2D with nephropathy
4099217	SNOMED	190390000	T2D with gangrene
45429911	Read	C109000	Non-insulin-dependent diabetes with renal complications
45473341	Read	C10F211	T2D with neurologic complications
45443104	Read	C10FJ11	Insulin-treated T2D
42689568	SNOMED	1065501000000102	T2D risk assessment telephone invitation
45605403	ICD10CM	E11.40	T2D with diabetic neuropathy, unspecified
37200234	ICD10CM	E11.3533	T2D with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
3301650	Nebraska Lexicon	314904008	T2D with neuropathic arthropathy

37200215	ICD10CM	E11.3412	T2D with severe non-proliferative diabetic retinopathy with macular edema, left eye
3356296	Nebraska Lexicon	9859006	T2D with acanthosis nigricans
3121813	Nebraska Lexicon	190392008	Non-insulin-dependent diabetes, poor control
40543502	SNOMED	371056000	T2D with complication
44827617	ICD9CM	250.90	Diabetes with unspecified complication, type 2 or unspecified type, not stated as uncontrolled
44836914	ICD9CM	250.00	Diabetes without mention of complication, type 2 or unspecified type, not stated as uncontrolled
45586140	ICD10CM	E11.618	T2D with other diabetic arthropathy
45459821	Read	C109612	T2D with retinopathy
44826461	ICD9CM	250.82	Diabetes with other specified manifestations, type 2 or unspecified type, uncontrolled
44829878	ICD9CM	250.10	Diabetes with ketoacidosis, type 2 or unspecified type, not stated as uncontrolled
3283797	Nebraska Lexicon	190388001	Non-insulin-dependent diabetes with multiple complications
4200875	SNOMED	314902007	T2D with peripheral angiopathy
3105088	Nebraska Lexicon	154688006	Insulin-treated non-insulin-dependent diabetes
45473334	Read	C109212	T2D with neurologic complications
40520431	SNOMED	314888007	T2D with diabetic cataract
45429917	Read	C10FP00	T2D with ketoacidotic coma
45576441	ICD10	E11.0	T2D with coma
4063043	SNOMED	199230006	Pre-existing T2D
45503175	Read	C109C00	Non-insulin-dependent diabetes with nephropathy
45499863	Read	C109A11	T2D with mononeuropathy
37200250	ICD10CM	E11.37	T2D with diabetic macular edema, resolved following treatment
3187674	Nebraska Lexicon	10656271000119102	T2D with diabetic ulcer of toe, skin breakdown
45503179	Read	C10F100	T2D with ophthalmic complications
37200225	ICD10CM	E11.3519	T2D with proliferative diabetic retinopathy with macular edema, unspecified eye
45586139	ICD10CM	E11.01	T2D with hyperosmolarity with coma
45489962	Read	C109E00	Non-insulin-dependent diabetes with diabetic cataract
3147259	Nebraska Lexicon	314772004	T2D with hypoglycemic coma

45581354	ICD10CM	E11.329	T2D with mild nonproliferative diabetic retinopathy without macular edema
3223979	Nebraska Lexicon	395204000	Hyperosmolar non-ketotic state in T2D
45766052	SNOMED	703138006	T2D in remission
37200199	ICD10CM	E11.3212	T2D with mild nonproliferative diabetic retinopathy with macular edema, left eye
45496547	Read	C10FL11	T2D with persistent proteinuria
35206882	ICD10CM	E11.9	T2D without complications
3256629	Nebraska Lexicon	421750000	Ketoacidosis in T2D
3150324	Nebraska Lexicon	359638003	Non-insulin-dependent diabetes without obesity
3192767	Nebraska Lexicon	10140001000004100	Poorly controlled T2D with circulatory disease
36674344	SNOMED	772789003	T2D risk assessment declined
45506461	Read	C10FE11	T2D with diabetic cataract
45533023	ICD10CM	E11.630	T2D with periodontal disease
44832194	ICD9CM	250.42	Diabetes with renal manifestations, type 2 or unspecified type, uncontrolled
45567896	ICD10CM	O24.113	Pre-existing T2D, in pregnancy, third trimester
45600641	ICD10CM	E11.610	T2D with diabetic neuropathic arthropathy
45493243	Read	C10F311	T2D with multiple complications
45436532	Read	C10FD00	T2D with hypoglycemic coma
3157995	Nebraska Lexicon	408660003	T2D with ketoacidosis
40386791	SNOMED	190396006	T2D with mononeuropathy
45513204	Read	C10FA00	T2D with mononeuropathy
45493235	Read	C109.11	Non-insulin-dependent diabetes
3270614	Nebraska Lexicon	199230006	Pre-existing T2D
40386793	SNOMED	190398007	T2D with nephropathy
37200200	ICD10CM	E11.3213	T2D with mild nonproliferative diabetic retinopathy with macular edema, bilateral
45516616	Read	C10FP11	T2D with ketoacidotic coma
42689565	SNOMED	1065471000000109	T2D risk assessment invitation second letter
45513206	Read	C10FR00	T2D with gastroparesis
3194082	Nebraska Lexicon	10150001000004102	Poorly controlled T2D with complications
45420115	Read	C109900	Non-insulin-dependent diabetes without complication

3227335	Nebraska Lexicon	721284006	Acidosis due to T2D
45587292	ICD10CM	O24.111	Pre-existing T2D, in pregnancy, first trimester
40386786	SNOMED	190391001	T2D with retinopathy
40386779	SNOMED	190385003	T2D with renal complications
45473337	Read	C109J12	Insulin-treated T2D
44829879	ICD9CM	250.52	Diabetes with ophthalmic manifestations, type 2 or unspecified type, uncontrolled
44826460	ICD9CM	250.30	Diabetes with other coma, type 2 or unspecified type, not stated as uncontrolled
37200203	ICD10CM	E11.3292	T2D with mild nonproliferative diabetic retinopathy without macular edema, left eye
192278	SNOMED	190392008	T2D, poor control
4231744	SNOMED	359638003	Non-insulin-dependent diabetes without obesity
45455399	Read	66At100	T2D dietary review
3318472	Nebraska Lexicon	1481000119100	T2D without retinopathy
45605405	ICD10CM	E11.65	T2D with hyperglycemia
45499861	Read	C109200	Non-insulin-dependent diabetes with neurologic complications
4228443	SNOMED	421847006	Ketoacidotic coma due to T2D
42690670	SNOMED	1065451000000100	T2D risk assessment invitation
44791061	SNOMED	24481000000101	T2D on diet only
3121812	Nebraska Lexicon	190391001	Non-insulin-dependent diabetes with retinopathy
1567956	ICD10CM	E11	T2D
45516609	Read	C109C12	T2D with nephropathy
37200253	ICD10CM	E11.37X3	T2D with diabetic macular edema, resolved following treatment, bilateral
44829882	ICD9CM	250.92	Diabetes with unspecified complication, type 2 or unspecified type, uncontrolled
3057410	Nebraska Lexicon	274590004	[EDTA] T2D (non-insulin-dependent) associated with renal failure
3191208	Nebraska Lexicon	10170001000004104	Poorly controlled T2D with neuropathy
40386792	SNOMED	190397002	T2D with polyneuropathy
45547626	ICD10CM	E11.620	T2D with diabetic dermatitis
37200241	ICD10CM	E11.355	T2D with stable proliferative diabetic retinopathy
443734	SNOMED	421750000	Ketoacidosis due to T2D

3084184	Nebraska Lexicon	408417004	T2D with exudative maculopathy
45509823	Read	C109G00	Non-insulin-dependent diabetes with arthropathy
45493237	Read	C109D12	T2D with hypoglycemic coma
37200210	ICD10CM	E11.3391	T2D with moderate non-proliferative diabetic retinopathy without macular edema, right eye
45449781	Read	C10F200	T2D with neurologic complications
45493244	Read	C10FR11	T2D with gastroparesis
40518526	SNOMED	314378003	T2D with nephropathy
44831045	ICD9CM	250.40	Diabetes with renal manifestations, type 2 or unspecified type, not stated as uncontrolled
45513203	Read	C109F11	T2D with peripheral angiopathy
37200249	ICD10CM	E11.3599	T2D with proliferative diabetic retinopathy without macular edema, unspecified eye
37200243	ICD10CM	E11.3552	T2D with stable proliferative diabetic retinopathy, left eye
45523152	Read	C109J11	Insulin-treated non-insulin-dependent diabetes
45576443	ICD10CM	E11.59	T2D with other circulatory complications
3285235	Nebraska Lexicon	314903002	T2D with arthropathy
4151282	SNOMED	314772004	T2D with hypoglycemic coma
45495482	Read	66At111	T2D dietary review
45605401	ICD10CM	E11.29	T2D with other diabetic kidney complication
45533022	ICD10CM	E11.52	T2D with diabetic peripheral angiopathy with gangrene
45476733	Read	C109D11	T2D with hypoglycemic coma
45493236	Read	C109911	T2D without complication
3329005	Nebraska Lexicon	44054006	T2D
3409032	Nebraska Lexicon	314902007	T2D with peripheral angiopathy
4099651	SNOMED	190389009	T2D with ulcer
37200236	ICD10CM	E11.354	T2D with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment
40386799	SNOMED	190402003	T2D with arthropathy
3194332	Nebraska Lexicon	10160001000004105	Poorly controlled T2D with renal complications
3061009	Nebraska Lexicon	55626003	T2D without obesity
40386780	SNOMED	190386002	T2D with ophthalmic complications

3250509	Nebraska Lexicon	703138006	T2D in remission
37200245	ICD10CM	E11.3559	T2D with stable proliferative diabetic retinopathy, unspecified eye
3121815	Nebraska Lexicon	190395005	T2D without complication
37200229	ICD10CM	E11.3523	T2D with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
45547625	ICD10CM	E11.41	T2D with diabetic mononeuropathy
37200204	ICD10CM	E11.3293	T2D with mild nonproliferative diabetic retinopathy without macular edema, bilateral
45503174	Read	C109311	T2D with multiple complications
1326493	ICD10CM	E11.11	T2D with ketoacidosis with coma
45561951	ICD10	E11.8	T2D with unspecified complications
40585980	SNOMED	408660003	T2D with ketoacidosis
1567965	ICD10CM	E11.4	T2D with neurologic complications
45605404	ICD10CM	E11.49	T2D with other diabetic neurologic complication
45509822	Read	C109B12	T2D with polyneuropathy
1567969	ICD10CM	E11.62	T2D with skin complications
45426567	Read	C10F300	T2D with multiple complications
43021173	SNOMED	472969004	History of T2D
45499864	Read	C109G11	T2D with arthropathy
40386781	SNOMED	190387006	T2D with neurologic complications
40386790	SNOMED	190395005	T2D without complication
37200254	ICD10CM	E11.37X9	T2D with diabetic macular edema, resolved following treatment, unspecified eye
44836916	ICD9CM	250.20	Diabetes with hyperosmolarity, type 2 or unspecified type, not stated as uncontrolled
3251756	Nebraska Lexicon	119831000119106	Hypoglycemia unawareness in T2D
37200228	ICD10CM	E11.3522	T2D with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
37200224	ICD10CM	E11.3513	T2D with proliferative diabetic retinopathy with macular edema, bilateral
45473335	Read	C109300	Non-insulin-dependent diabetes with multiple complications
37200239	ICD10CM	E11.3543	T2D with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral

40602086	SNOMED	55626003	T2D without obesity
40482801	SNOMED	443694000	T2D uncontrolled
45429912	Read	C109111	T2D with ophthalmic complications
45493234	Read	C109.00	Non-insulin-dependent diabetes
37200213	ICD10CM	E11.3399	T2D with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye
45581353	ICD10CM	E11.319	T2D with unspecified diabetic retinopathy without macular edema
37200211	ICD10CM	E11.3392	T2D with moderate nonproliferative diabetic retinopathy without macular edema, left eye
44824073	ICD9CM	250.22	Diabetes with hyperosmolarity, type 2 or unspecified type, uncontrolled
44827616	ICD9CM	250.70	Diabetes with peripheral circulatory disorders, type 2 or unspecified type, not stated as uncontrolled
44805528	SNOMED	754121000000107	T2D dietary review
1567970	ICD10CM	E11.63	T2D with oral complications
1567966	ICD10CM	E11.5	T2D with circulatory complications
3357040	Nebraska Lexicon	421847006	T2D with ketoacidotic coma
37200220	ICD10CM	E11.3493	T2D with severe nonproliferative diabetic retinopathy without macular edema, bilateral
37200198	ICD10CM	E11.3211	T2D with mild nonproliferative diabetic retinopathy with macular edema, right eye
45436533	Read	C10FE00	T2D with diabetic cataract
45459820	Read	C109012	T2D with renal complications
4193704	SNOMED	313436004	T2D without complication
40545711	SNOMED	366909003	Insulin-treated T2D
45513202	Read	C109512	T2D with gangrene
35206881	ICD10CM	E11.8	T2D with unspecified complications
45443101	Read	C109E11	T2D with diabetic cataract
45466592	Read	C109912	T2D without complication
45552386	ICD10CM	E11.359	T2D with proliferative diabetic retinopathy without macular edema
45605402	ICD10CM	E11.349	T2D with severe nonproliferative diabetic retinopathy without macular edema
45523150	Read	C109A12	T2D with mononeuropathy
201826	SNOMED	44054006	T2D

37200244	ICD10CM	E11.3553	T2D with stable proliferative diabetic retinopathy, bilateral
1326491	ICD10CM	E11.1	T2D with ketoacidosis
45423317	Read	C10FN11	T2D with ketoacidosis
45466591	Read	C109412	T2D with ulcer
40386778	SNOMED	190384004	T2D
45509828	Read	C10FN00	T2D with ketoacidosis
45426564	Read	C109B00	Non-insulin-dependent diabetes with polyneuropathy
42690662	SNOMED	1064541000000100	T2D risk assessment declined
3159022	Nebraska Lexicon	421164006	Hypoglycemic coma in T2D
45772060	SNOMED	119831000119106	Hypoglycemia unawareness due to T2D
40584911	SNOMED	408417004	T2D with exudative maculopathy
45439820	Read	C10F600	T2D with retinopathy
37200240	ICD10CM	E11.3549	T2D with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye
45466596	Read	C10FF11	T2D with peripheral angiopathy
37200205	ICD10CM	E11.3299	T2D with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye
45591031	ICD10CM	E11.649	T2D with hypoglycemia without coma
37200208	ICD10CM	E11.3313	T2D with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
3338973	Nebraska Lexicon	359642000	T2D without obesity
45420116	Read	C109H12	T2D with neuropathic arthropathy
1567964	ICD10CM	E11.35	T2D with proliferative diabetic retinopathy
45443103	Read	C10FJ00	Insulin-treated T2D
3062976	Nebraska Lexicon	190398007	T2D with nephropathy
45595797	ICD10CM	E11.22	T2D with diabetic chronic kidney disease
45486688	Read	C109C11	T2D with nephropathy
44836915	ICD9CM	250.02	Diabetes without mention of complication, type 2 or unspecified type, uncontrolled
1567968	ICD10CM	E11.61	T2D with diabetic arthropathy
3450024	Nebraska Lexicon	164971000119101	T2D controlled by diet
3157462	Nebraska Lexicon	401112005	T2D with persistent microalbuminuria

45503184	Read	C10P100	T2D in remission
45470051	Read	C109211	T2D with neurologic complications
3472292	Nebraska Lexicon	444110003	T2D well controlled
37200237	ICD10CM	E11.3541	T2D with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
44791270	SNOMED	279321000000104	T2D review
45453111	Read	C109511	T2D with gangrene
45449782	Read	C10F400	T2D with ulcer
3318274	Nebraska Lexicon	609567009	Pre-existing T2D in pregnancy
37200217	ICD10CM	E11.3419	T2D with severe nonproliferative diabetic retinopathy with macular edema, unspecified eye
3064697	Nebraska Lexicon	190397002	T2D with polyneuropathy
45582458	ICD10CM	O24.13	Pre-existing T2D, in the puerperium
45506460	Read	C10F700	T2D, poor control
45542738	ICD10CM	E11.00	T2D with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma
45503182	Read	C10FM11	T2D with persistent microalbuminuria
1571686	ICD10CM	O24.1	Pre-existing T2D, in pregnancy, childbirth, and the puerperium
45466597	Read	C10FH11	T2D with neuropathic arthropathy
3147239	Nebraska Lexicon	314378003	Non-insulin-dependent diabetes with nephropathy
40485020	SNOMED	444110003	T2D well controlled
3121806	Nebraska Lexicon	190384004	T2D
3121821	Nebraska Lexicon	190402003	T2D with arthropathy
40386795	SNOMED	190400006	T2D with diabetic cataract
37200230	ICD10CM	E11.3529	T2D with proliferative diabetic retinopathy with traction retinal detachment involving the macula, unspecified eye
45606547	ICD10CM	O24.119	Pre-existing T2D, in pregnancy, unspecified trimester
1567971	ICD10CM	E11.64	T2D with hypoglycemia
37200218	ICD10CM	E11.3491	T2D with severe nonproliferative diabetic retinopathy without macular edema, right eye
40575613	SNOMED	401112005	T2D with persistent microalbuminuria
45483323	Read	C109700	Non-insulin-dependent diabetes, poor control

45476732	Read	C109011	T2D with renal complications
45496548	Read	C10FQ00	T2D with exudative maculopathy
45480049	Read	C10F111	T2D with ophthalmic complications
40386794	SNOMED	190399004	T2D with hypoglycemic coma
1567967	ICD10CM	E11.6	T2D with other specified complications
40386354	SNOMED	190323008	Non-insulin-dependent diabetes
1567959	ICD10CM	E11.3	T2D with ophthalmic complications
40353859	SNOMED	274590004	[EDTA] T2D (non-insulin-dependent) associated with renal failure
45420120	Read	C10FH00	T2D with neuropathic arthropathy
37200248	ICD10CM	E11.3593	T2D with proliferative diabetic retinopathy without macular edema, bilateral
43531010	SNOMED	609567009	Pre-existing T2D in pregnancy
45513201	Read	C100112	Non-insulin-dependent diabetes
45591029	ICD10CM	E11.339	T2D with moderate nonproliferative diabetic retinopathy without macular edema
44828795	ICD9CM	250.60	Diabetes with neurological manifestations, type 2 or unspecified type, not stated as uncontrolled
3392131	Nebraska Lexicon	81531005	T2D with obesity
45591028	ICD10	E11.3	T2D with ophthalmic complications
44824072	ICD9CM	250.12	Diabetes with ketoacidosis, type 2 or unspecified type, uncontrolled
45561949	ICD10CM	E11.641	T2D with hypoglycemia with coma
45537962	ICD10CM	E11.43	T2D with diabetic autonomic (poly)neuropathy
37200247	ICD10CM	E11.3592	T2D with proliferative diabetic retinopathy without macular edema, left eye
3121816	Nebraska Lexicon	190396006	T2D with mononeuropathy
45486691	Read	C10F.11	T2D
45476735	Read	C10FG00	T2D with arthropathy
45466593	Read	C109D00	Non-insulin-dependent diabetes with hypoglycemic coma
3151601	Nebraska Lexicon	371056000	T2D with complication
37200202	ICD10CM	E11.3291	T2D with mild nonproliferative diabetic retinopathy without macular edema, right eye

37200214	ICD10CM	E11.3411	T2D with severe nonproliferative diabetic retinopathy with macular edema, right eye
45513205	Read	C10FD11	T2D with hypoglycemic coma
45420114	Read	C109.12	T2D
45470052	Read	C109H11	T2D with neuropathic arthropathy
37200242	ICD10CM	E11.3551	T2D with stable proliferative diabetic retinopathy, right eye
45595798	ICD10CM	E11.36	T2D with diabetic cataract
3314801	Nebraska Lexicon	237599002	Insulin-treated T2D
45503181	Read	C10FF00	T2D with peripheral angiopathy
45429915	Read	C10F000	T2D with renal complications
3121810	Nebraska Lexicon	190390000	Non-insulin-dependent diabetes with gangrene
37200223	ICD10CM	E11.3512	T2D with proliferative diabetic retinopathy with macular edema, left eye
45426568	Read	C10FB11	T2D with polyneuropathy
42689567	SNOMED	1065491000000108	T2D risk assessment verbal invitation
1567957	ICD10CM	E11.0	T2D with hyperosmolarity
3121808	Nebraska Lexicon	190386002	Non-insulin-dependent diabetes with ophthalmic complications
45423312	Read	C109100	Non-insulin-dependent diabetes with ophthalmic complications
3121820	Nebraska Lexicon	190401005	T2D with peripheral angiopathy
45600642	ICD10CM	E11.622	T2D with other skin ulcer
45453118	Read	C10F011	T2D with renal complications
37200226	ICD10CM	E11.352	T2D with proliferative diabetic retinopathy with traction retinal detachment involving the macula
45581355	ICD10CM	E11.621	T2D with foot ulcer
45453110	Read	C109.13	T2D
45496542	Read	C109H00	Non-insulin-dependent diabetes with neuropathic arthropathy
40386800	SNOMED	190403008	T2D with neuropathic arthropathy
40518519	SNOMED	314371009	T2D with polyneuropathy
45519842	Read	C109112	T2D with ophthalmic complications
44831047	ICD9CM	250.80	Diabetes with other specified manifestations, type 2 or unspecified type, not stated as uncontrolled
4230254	SNOMED	359642000	T2D without obesity

45561950	ICD10	E11.7	T2D with multiple complications
45605400	ICD10	E11.2	T2D with renal complications
45591027	ICD10CM	E11.21	T2D with diabetic nephropathy
44810565	SNOMED	888211000000106	T2D in remission
45533021	ICD10CM	E11.51	T2D with diabetic peripheral angiopathy without gangrene
45499862	Read	C109400	Non-insulin-dependent diabetes with ulcer
3147236	Nebraska Lexicon	314370005	Non-insulin-dependent diabetes with mononeuropathy
45489963	Read	C109J00	Insulin-treated T2D
40575612	SNOMED	401111003	T2D with persistent proteinuria
45503185	Read	C10P111	T2D in remission
37200233	ICD10CM	E11.3532	T2D with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
45591030	ICD10CM	E11.351	T2D with proliferative diabetic retinopathy with macular edema
37200201	ICD10CM	E11.3219	T2D with mild nonproliferative diabetic retinopathy with macular edema, unspecified eye
45557113	ICD10CM	E11.42	T2D with diabetic polyneuropathy
1567961	ICD10CM	E11.32	T2D with mild nonproliferative diabetic retinopathy
3438725	Nebraska Lexicon	443694000	T2D uncontrolled
37200232	ICD10CM	E11.3531	T2D with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye
37200216	ICD10CM	E11.3413	T2D with severe nonproliferative diabetic retinopathy with macular edema, bilateral
45463264	Read	C10F911	T2D without complication
45547627	ICD10CM	E11.628	T2D with other skin complications
45473342	Read	C10F711	T2D, poor control
45483322	Read	C109500	Non-insulin-dependent diabetes with gangrene
3121822	Nebraska Lexicon	190403008	T2D with neuropathic arthropathy
45436526	Read	C109F12	T2D with peripheral angiopathy
36684827	SNOMED	368101000119109	T2D with periodontal disease
37200222	ICD10CM	E11.3511	T2D with proliferative diabetic retinopathy with macular edema, right eye
37200221	ICD10CM	E11.3499	T2D with severe nonproliferative diabetic retinopathy without macular edema, unspecified eye

42689566	SNOMED	1065481000000106	T2D risk assessment invitation third letter
37200246	ICD10CM	E11.3591	T2D with proliferative diabetic retinopathy without macular edema, right eye
45439821	Read	C10FC00	T2D with nephropathy
3157461	Nebraska Lexicon	401111003	T2D with persistent proteinuria
45443100	Read	C109B11	T2D with polyneuropathy
45509821	Read	C109611	T2D with retinopathy
1567958	ICD10CM	E11.2	T2D with kidney complications
36717156	SNOMED	721284006	Acidosis due to T2D
3147266	Nebraska Lexicon	314888007	Non-insulin-dependent diabetes with diabetic cataract
3423685	Nebraska Lexicon	719216001	Hypoglycemic coma co-occurrent and due to T2D
45757363	SNOMED	120731000119103	Hypoglycemia due to T2D
45533020	ICD10CM	E11.44	T2D with diabetic amyotrophy
45582457	ICD10CM	O24.112	Pre-existing T2D, in pregnancy, second trimester
45420119	Read	C10F.00	T2D
45533019	ICD10CM	E11.39	T2D with other diabetic ophthalmic complication
44832193	ICD9CM	250.32	Diabetes with other coma, type 2 or unspecified type, uncontrolled
45446453	Read	C10FL00	T2D with persistent proteinuria
1571687	ICD10CM	O24.11	Pre-existing T2D, in pregnancy
4198296	SNOMED	314904008	T2D with neuropathic arthropathy
3299249	Nebraska Lexicon	190331003	T2D with hyperosmolar coma
45595799	ICD10CM	E11.69	T2D with other specified complication
3193274	Nebraska Lexicon	29690001000004108	Poorly controlled T2D
37200227	ICD10CM	E11.3521	T2D with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
3273490	Nebraska Lexicon	313436004	Non-insulin-dependent diabetes without complication
37200212	ICD10CM	E11.3393	T2D with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
4304377	SNOMED	81531005	T2D with obesity
45459822	Read	C109E12	T2D with diabetic cataract
37200251	ICD10CM	E11.37X1	T2D with diabetic macular edema, resolved following treatment, right eye
45465547	Read	66Ao.00	T2D review

45557112	ICD10CM	E11.341	T2D with severe nonproliferative diabetic retinopathy with macular edema
45463262	Read	C109711	T2D, poor control
45489967	Read	C10FA11	T2D with mononeuropathy
40321151	SNOMED	154688006	Insulin-treated non-insulin-dependent diabetes
42689569	SNOMED	1065511000000100	T2D risk assessment invitation SMS (short message service) text message
45449784	Read	C10FM00	T2D with persistent microalbuminuria
45537961	ICD10CM	E11.331	T2D with moderate nonproliferative diabetic retinopathy with macular edema
45566731	ICD10CM	E11.638	T2D with other oral complications
45534187	ICD10	O24.1	Diabetes in pregnancy: Pre-existing diabetes, non-insulin-dependent
3147237	Nebraska Lexicon	314371009	Non-insulin-dependent diabetes with polyneuropathy
45757508	SNOMED	164971000119101	T2D controlled by diet
45489961	Read	C109411	T2D with ulcer
45523149	Read	C109712	T2D, poor control
3359211	Nebraska Lexicon	120731000119103	Hypoglycemia due to T2D
45453112	Read	C109600	Non-insulin-dependent diabetes with retinopathy
37200235	ICD10CM	E11.3539	T2D with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye
45581352	ICD10CM	E11.311	T2D with unspecified diabetic retinopathy with macular edema
1567962	ICD10CM	E11.33	T2D with moderate nonproliferative diabetic retinopathy
1567963	ICD10CM	E11.34	T2D with severe nonproliferative diabetic retinopathy
3121817	Nebraska Lexicon	190399004	T2D with hypoglycemic coma
45587293	ICD10CM	O24.12	Pre-existing T2D, in childbirth
44791047	SNOMED	24471000000103	Insulin-treated T2D
44819500	ICD9CM	250.50	Diabetes with ophthalmic manifestations, type 2 or unspecified type, not stated as uncontrolled
4130162	SNOMED	237599002	Insulin-treated T2D
37200207	ICD10CM	E11.3312	T2D with moderate nonproliferative diabetic retinopathy with macular edema, left eye
45557114	ICD10	E11.5	T2D with peripheral circulatory complications
45480047	Read	C109312	T2D with multiple complications
45523158	Read	C10F411	T2D with ulcer

3121807	Nebraska Lexicon	190385003	Non-insulin-dependent diabetes with renal complications
3255828	Nebraska Lexicon	190389009	Non-insulin-dependent diabetes with ulcer
45429916	Read	C10F611	T2D with retinopathy
44833366	ICD9CM	250.62	Diabetes with neurologic manifestations, type 2 or unspecified type, uncontrolled
37200209	ICD10CM	E11.3319	T2D with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye
45552387	ICD10	E11.6	T2D with other specified complications
3156726	Nebraska Lexicon	394511005	Hyperosmolar non-ketotic state in T2D
3150973	Nebraska Lexicon	366909003	Insulin-treated T2D
45576442	ICD10	E11.4	T2D with neurologic complications
37200238	ICD10CM	E11.3542	T2D with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye
37200231	ICD10CM	E11.353	T2D with proliferative diabetic retinopathy with traction retinal detachment not involving the macula
37200252	ICD10CM	E11.37X2	T2D with diabetic macular edema, resolved following treatment, left eye
45503183	Read	C10FQ11	T2D with exudative maculopathy
45523151	Read	C109G12	T2D with arthropathy
3327799	Nebraska Lexicon	472969004	History of T2D
45473336	Read	C109A00	Non-insulin-dependent diabetes with mononeuropathy
42689564	SNOMED	1065461000000102	T2D risk assessment invitation first letter
3121809	Nebraska Lexicon	190387006	Non-insulin-dependent diabetes with neurologic complications
37200219	ICD10CM	E11.3492	T2D with severe nonproliferative diabetic retinopathy without macular edema, left eye
40386798	SNOMED	190401005	T2D with peripheral angiopathy
36714116	SNOMED	719216001	Hypoglycemic coma due to T2D
4227824	SNOMED	421164006	Hypoglycemic coma in T2D
45423316	Read	C10F511	T2D with gangrene
1567960	ICD10CM	E11.31	T2D with unspecified diabetic retinopathy
37200206	ICD10CM	E11.3311	T2D with moderate nonproliferative diabetic retinopathy with macular edema, right eye
45552385	ICD10CM	E11.321	T2D with mild nonproliferative diabetic retinopathy with macular edema

45496546 Read C10F900 T2D without complication

CDM Common Data Model, *ICD10* International Statistical Classification of Diseases and Related Health Problems 10th revision; *ICD10CM* International Statistical Classification of Diseases and Related Health Problems 10th revision Clinical Modification; *OMOP* Observational Medical Outcomes Partnership, *SNOMED* Systematized Nomenclature of Medicine; *T2D* type 2 diabetes

Supplementary Table S3 Standardized mean differences across all matching analyses

Variable	Standardized mean difference
Kaplan–Meier	
GLP-1RA vs SGLT2i	
Sex: Female	0.079
Sex: Male	−0.079
Sex: Not specified	0.003
Age	−0.127
T2D duration	−0.083
Index year: 2006	0.022
Index year: 2007	0.046
Index year: 2008	0.067
Index year: 2009	0.064
Index year: 2010	0.086
Index year: 2011	0.125
Index year: 2012	0.179
Index year: 2013	0.118
Index year: 2014	−0.015
Index year: 2015	−0.025
Index year: 2016	−0.049
Index year: 2017	−0.087
Index year: 2018	−0.066
Index year: 2019	−0.083
Index year: 2020	−0.060
Index year: 2021	0.016
Index year: 2022	0.043
GLP-1RA vs DPP-4i	
Sex: Female	0.019
Sex: Male	−0.019
Sex: Not specified	N/A
Age	−0.115
T2D duration	0.123
Index year: 2006	0.015

Index year: 2007	-0.027
Index year: 2008	-0.064
Index year: 2009	-0.020
Index year: 2010	-0.052
Index year: 2011	-0.044
Index year: 2012	-0.110
Index year: 2013	-0.180
Index year: 2014	-0.160
Index year: 2015	-0.188
Index year: 2016 ^a	-0.210
Index year: 2017	-0.184
Index year: 2018	-0.060
Index year: 2019	0.053
Index year: 2020	0.115
Index year: 2021 ^a	0.247
Index year: 2022 ^a	0.303
GLP-1RA vs SU	
Sex: Female	0.012
Sex: Male	-0.012
Sex: Not specified	0.003
Age	-0.074
T2D duration	0.024
Index year: 2006	-0.004
Index year: 2007	-0.004
Index year: 2008	-0.004
Index year: 2009	0.016
Index year: 2010	0.020
Index year: 2011	0.011
Index year: 2012	0.008
Index year: 2013	0.004
Index year: 2014	-0.002
Index year: 2015	-0.022
Index year: 2016	-0.034
Index year: 2017	-0.031

Index year: 2018	-0.051
Index year: 2019	-0.040
Index year: 2020	-0.027
Index year: 2021	0.052
Index year: 2022	0.097
Cox regression model	
GLP-1RA vs SGLT2i	
Sex: Female	0.079
Sex: Male	-0.079
Sex: Not specified	0.003
Age	-0.127
T2D duration	-0.083
Index year: 2006	0.022
Index year: 2007	0.046
Index year: 2008	0.067
Index year: 2009	0.064
Index year: 2010	0.086
Index year: 2011	0.125
Index year: 2012	0.179
Index year: 2013	0.118
Index year: 2014	-0.015
Index year: 2015	-0.025
Index year: 2016	-0.049
Index year: 2017	-0.087
Index year: 2018	-0.066
Index year: 2019	-0.083
Index year: 2020	-0.060
Index year: 2021	0.016
Index year: 2022	0.043
GLP-1RA vs DPP-4i	
Sex: Female	0.011
Sex: Male	-0.012
Sex: Not specified	0.004
Age	-0.030

T2D duration	0.035
Index year: 2006	0.009
Index year: 2007	0.002
Index year: 2008	-0.025
Index year: 2009	0.010
Index year: 2010	0.013
Index year: 2011	0.024
Index year: 2012	0.003
Index year: 2013	-0.026
Index year: 2014	-0.029
Index year: 2015	-0.052
Index year: 2016	-0.070
Index year: 2017	-0.098
Index year: 2018	-0.065
Index year: 2019	0.006
Index year: 2020	0.046
Index year: 2021	0.058
Index year: 2022	0.112
GLP-1RA vs SU	
Sex: Female	0.012
Sex: Male	-0.012
Sex: Not specified	0.003
Age	-0.073
T2D duration	0.023
Index year: 2006	-0.004
Index year: 2007	-0.002
Index year: 2008	-0.003
Index year: 2009	0.016
Index year: 2010	0.020
Index year: 2011	0.012
Index year: 2012	0.008
Index year: 2013	0.005
Index year: 2014	N/A
Index year: 2015	-0.021

Index year: 2016	-0.033
Index year: 2017	-0.029
Index year: 2018	-0.049
Index year: 2019	-0.038
Index year: 2020	-0.029
Index year: 2021	0.047
Index year: 2022	0.095
Logistic regression (HbA_{1c} level <7%)	
GLP-1RA vs SGLT2i	
Sex: Female	0.012
Sex: Male	-0.012
Age	-0.047
T2D duration	-0.006
Index year: 2007	N/A
Index year: 2008	N/A
Index year: 2009	N/A
Index year: 2010	N/A
Index year: 2011	N/A
Index year: 2012	N/A
Index year: 2013	0.019
Index year: 2014	0.046
Index year: 2015	0.025
Index year: 2016	N/A
Index year: 2017	-0.007
Index year: 2018	-0.014
Index year: 2019	-0.004
Index year: 2020	-0.033
Index year: 2021	0.018
Index year: 2022	N/A
Baseline HbA _{1c}	0.049
GLP-1RA vs DPP-4i	
Sex: Female	0.051
Sex: Male	-0.051
Sex: Not specified	N/A

Age	-0.090
T2D duration	0.001
Index year: 2007	N/A
Index year: 2008	N/A
Index year: 2009	0.045
Index year: 2010	-0.032
Index year: 2011	0.060
Index year: 2012	-0.020
Index year: 2013	N/A
Index year: 2014	N/A
Index year: 2015	N/A
Index year: 2016	0.015
Index year: 2017	-0.050
Index year: 2018	-0.116
Index year: 2019	-0.097
Index year: 2020	0.054
Index year: 2021	0.122
Index year: 2022	0.045
Baseline HbA _{1c}	0.001
GLP-1RA vs SU	
Sex: Female	0.048
Sex: Male	-0.048
Sex: Not specified	N/A
Age	-0.032
T2D duration	0.029
Index year: 2006	N/A
Index year: 2007	N/A
Index year: 2008	0.039
Index year: 2009	-0.039
Index year: 2010	0.028
Index year: 2011	0.013
Index year: 2012	N/A
Index year: 2013	0.009
Index year: 2014	0.034

Index year: 2015	-0.008
Index year: 2016	-0.026
Index year: 2017	0.007
Index year: 2018	-0.066
Index year: 2019	-0.054
Index year: 2020	0.050
Index year: 2021	0.052
Index year: 2022	-0.039
Baseline HbA _{1c}	-0.004
Logistic regression (weight loss ≥5%)	
GLP-1RA vs SGLT2i	
Sex: Female	N/A
Sex: Male	N/A
Age	-0.025
T2D duration	0.033
Index year: 2010	N/A
Index year: 2011	N/A
Index year: 2012	N/A
Index year: 2013	0.014
Index year: 2014	-0.019
Index year: 2015	-0.022
Index year: 2016	-0.012
Index year: 2017	N/A
Index year: 2018	0.004
Index year: 2019	0.007
Index year: 2020	N/A
Index year: 2021	0.010
Index year: 2022	-0.017
Baseline BMI	0.007
GLP-1RA vs DPP-4i	
Sex: Female	0.059
Sex: Male	-0.059
Sex: Not specified	N/A
Age	-0.036

T2D duration	0.056
Index year: 2008	N/A
Index year: 2009	N/A
Index year: 2010	0.043
Index year: 2011	-0.046
Index year: 2012	N/A
Index year: 2013	N/A
Index year: 2014	-0.021
Index year: 2015	-0.024
Index year: 2016	0.007
Index year: 2017	-0.088
Index year: 2018	-0.098
Index year: 2019	-0.065
Index year: 2020	0.061
Index year: 2021	0.143
Index year: 2022	0.019
Baseline BMI	0.016
GLP-1RA vs SU	
Sex: Female	-0.014
Sex: Male	0.014
Sex: Not specified	N/A
Age	-0.015
T2D duration	0.008
Index year: 2009	N/A
Index year: 2010	N/A
Index year: 2011	0.027
Index year: 2012	0.015
Index year: 2013	-0.027
Index year: 2014	-0.046
Index year: 2015	-0.007
Index year: 2016	-0.025
Index year: 2017	-0.006
Index year: 2018	-0.041
Index year: 2019	-0.018

Index year: 2020	0.010
Index year: 2021	0.075
Index year: 2022	0.017
Baseline BMI	0.014

All variables were balanced (standardized mean difference ≤ 0.2) unless otherwise indicated.
N/A denotes where no participants were in the final match.

^aUnbalanced (standardized mean difference > 0.2)

BMI body mass index, *DPP-4i* dipeptidyl peptidase-4 inhibitor, *GLP-1RA* glucagon-like peptide-1 receptor agonist, *HbA_{1c}* glycated hemoglobin, *N/A* not applicable, *SGLT2i* sodium–glucose cotransporter-2 inhibitor, *SU* sulfonylurea, *T2D* type 2 diabetes

Supplementary Table S4 Time to treatment intensification: robustness tests for proportionality assumptions

Comparison	Number of events	Number of participants	%	HR	95% CI	<i>p</i> value	<i>p</i> value (MaxCombo)
GLP-1RA vs SGLT2i	6976	23,866	29.2	0.93	0.88, 0.97	0.0014	0.0020
GLP-1RA vs DPP-4i	6633	19,164	34.6	0.77	0.74, 0.81	1.384e-25	0.0002
GLP-1RA vs SU	7148	23,762	30.1	0.84	0.80, 0.88	1.6852e-13	0.0002

CI confidence interval, *DPP-4i* dipeptidyl peptidase-4 inhibitor, *GLP-1RA* glucagon-like peptide-1 receptor agonist, *HR* hazard ratio, *SGLT2i* sodium–glucose cotransporter-2 inhibitor, *SU* sulfonylurea

Supplementary Table S5 Participant numbers for HbA_{1c} level and BMI analyses by treatment class

Endpoint	Class	Number of participants, <i>n</i> (%)	Baseline value available, <i>n</i> (%)	Follow-up available, <i>n</i> (%)	Delta available, <i>n</i> (%)	60% PDC with Delta available, <i>n</i> (%)
HbA _{1c} level	GLP-1RA	11,933 (100)	11,933 (100)	6479 (54.3)	6479 (54.3)	679 (5.7)
	SGLT2i	13,726 (100)	13,726 (100)	7851 (57.2)	7851 (57.2)	1079 (7.9)
	DPP-4i	14,415 (100)	14,415 (100)	8857 (61.4)	8857 (61.4)	1010 (7.0)
	SU	19,884 (100)	19,884 (100)	11,197 (56.3)	11,197 (56.3)	1538 (7.7)
BMI	GLP-1RA	11,933 (100)	11,025 (92.4)	7300 (61.2)	6874 (57.6)	790 (6.6)
	SGLT2i	13,726 (100)	12,913 (94.1)	8719 (63.5)	8318 (60.6)	1199 (8.7)
	DPP-4i	14,415 (100)	12,796 (88.8)	10,034 (69.6)	9200 (63.8)	1172 (8.1)
	SU	19,884 (100)	17,988 (90.5)	13,035 (65.6)	12,097 (60.8)	1825 (9.2)

BMI body mass index, *DPP-4i* dipeptidyl peptidase-4 inhibitor, *GLP-1RA* glucagon-like peptide-1 receptor agonist, *HbA_{1c}* glycated hemoglobin, *PDC* proportion of days covered, *SGLT2i* sodium–glucose cotransporter-2 inhibitor, *SU* sulfonylurea