

Supplemental Online Content

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This supplemental material has been provided by the authors to give readers additional information about their work.

eAppendix. Database

The data used in this study were collected and analyzed on April 26, 2024 within the TriNetX Analytics platform based on the “Research US Collaborative Network”. We used the TriNetX platform to access aggregated and de-identified electronic health records (EHRs) of 113 million patients from 64 healthcare organizations in the US across 50 states, covering diverse geographic regions (22% Northeast, 16% Midwest, 39% South, 13% West, 10% Unspecified), age, race/ethnic, income and insurance groups and clinical setting. TriNetX, LLC is compliant with the Health Insurance Portability and Accountability Act (HIPAA). Any data displayed on the TriNetX Platform in aggregate form, or any patient level data provided in a data set generated by the TriNetX Platform only contains de-identified data as per the de-identification standard defined in Section §164.514(a) of the HIPAA Privacy Rule. TriNetX built-in analytic functions (e.g., incidence, prevalence, outcomes analysis, survival analysis, propensity score matching) allow for patient-level analyses, while only reporting population-level data. The MetroHealth System, Cleveland OH, IRB determined research in the way described here, is not Human Subject Research and therefore IRB is not required.

TriNetX is a platform that de-identifies and aggregates electronic health record (EHR) data from contributing healthcare systems, most of which are large academic medical institutions with both inpatient and outpatient facilities at multiple locations, across all 50 states in the US. TriNetX Analytics provides web-based and secure access to patient EHR data from hospitals, primary care, and specialty treatment providers, covering diverse geographic locations, age groups, racial and ethnic groups, income levels and insurance types including various commercial insurances, governmental insurance (Medicare and Medicaid), self-pay/uninsured, worker compensation insurance, military/VA insurance among others.

Self-reported sex (female, male), race and ethnicity data in TriNetX comes from the underlying clinical EHR systems of the contributing healthcare systems. TriNetX maps race and ethnicity data from the contributing healthcare systems to the following categories: (1) Race: Asian, American Indian or Alaskan Native, Black or African American, Native Hawaiian or Other, White, Unknown race; and (2) Ethnicity: Hispanic or Latino, Not Hispanic or Latino, Unknown Ethnicity.

TriNetX completes an intensive data preprocessing stage to minimize missing values. TriNetX maps the data to a consistent clinical data model with a consistent semantic meaning so that the data can be queried consistently regardless of the underlying data source. All covariates are either binary, categorical (which expands to a set of binary columns), or continuous but essentially guaranteed to exist. Age is guaranteed to exist. Missing sex values are represented using “Unknown Sex”. The missing data for race and ethnicity are presented as “Unknown race” or “Unknown Ethnicity”. For other variables including medical conditions, procedures, lab tests and socio-economic determinant health, the value is either present or absent so “missing” is not pertinent.

eTable 1. Clinical diagnosis, and other codes used in the platform that are used to determine the status of variables for study population definitions, exposures, outcomes, and those for propensity-score matching for groups

Study population	T2D	Type 2 diabetes mellitus (International Classification of Diseases, Tenth Revision (ICD-10 or ICD-10 code: E11)	present/absent
Exposure (the first prescription of GLP-1RA, insulins or metformin in 4/2005-11/2018)	GLP-1RAs	A10BJGlucagon-like peptide-1 (GLP-1) analogues (The Anatomical Therapeutic Chemical (ATC) code: A10BJ)	present/absent
	Insulins	INSULINS AND ANALOGUES (ATC code: A10A)	present/absent
	Metformin	Metformin (RxNorm code: 6809)	present/absent
Outcomes (13 OACs) (15-year follow-up following the exposure or index event)	Esophageal cancer	Malignant neoplasm of esophagus (ICD-10 code: C15)	present/absent
	Breast cancer	Malignant neoplasm of breast (ICD-10 code: C50)	
	Colorectal cancer	<ul style="list-style-type: none"> • Malignant neoplasm of colon (ICD-10 code: C18) • Malignant neoplasm of rectosigmoid junction (ICD-10 code: C19) • Malignant neoplasm of rectum (ICD-10 code: C20) 	
	Endometrial cancer	Malignant neoplasm of endometrium (ICD-10 code: C54.1)	
	Gallbladder cancer	Malignant neoplasm of gallbladder (ICD-10 code: C23)	
	Stomach cancer	Malignant neoplasm of stomach (ICD-10 code: C16)	
	Kidney cancer	Malignant neoplasm of kidney, except renal pelvis (ICD-10 code: C64)	
	Ovarian cancer	Malignant neoplasm of ovary (ICD-10 code: C56)	
	Pancreatic cancer	Malignant neoplasm of pancreas (ICD-10 code: C25)	
Thyroid cancer	Malignant neoplasm of thyroid gland (ICD-10 code: C73)		

	Hepatocellular carcinoma	Liver cell carcinoma (ICD-10 code: C22.0)	
	Meningioma	Malignant neoplasm of meninges (ICD-10 code: C70)	
	Multiple myeloma	Multiple myeloma (ICD-10 code: C90.0)	
Demographics (variables to be propensity-score matched)	Age at the index event	Age	continuous
	Female	F	present/absent
	Male	M	present/absent
	Asian	Asian (Demographics: 2028-9)	present/absent
	American Indian or Alaska Native	American Indian or Alaska Native (Demographics: 1002--5)	Ik8ju76543e2w1aq`
	Black or African American	Black or African American (Demographics: 2054-5)	present/absent
	Native Hawaiian or Other Pacific Islander	Native Hawaiian or Other Pacific Islander (Demographics: 2076-8)	
	White	White (Demographics: 2106-3)	present/absent
	Hispanic/Latino	Hispanic or Latino (Demographics: 2135-2)	present/absent
	Not Hispanic or Latino	Not Hispanic or Latino (Demographics: 2186-5)	present/absent
	Unknown race	Unknown Race (Demographics: 2131-1)	present/absent
	Unknown ethnicity	Unknown Ethnicity (Demographics: UN)	present/absent
Adverse socioeconomic determinants of health, lifestyle factors, medical conditions, medication	Adverse socioeconomic and psychosocial circumstances	<p>Persons with potential health hazards related to socioeconomic and psychosocial circumstances (ICD-10 code: Z55-Z65)</p> <ul style="list-style-type: none"> • Problems related to education and literacy (ICD-10 code: Z55) • Problems related to employment and unemployment (ICD-10 code: Z56) • Problems related to housing and economic 	present/absent

<p>prescriptions, (anytime to 1 day before the index event)</p>		<p>circumstances (ICD-10 code: Z59)</p> <ul style="list-style-type: none"> • Problems related to social environment (ICD-10 code: Z60) • Problems related to upbringing (ICD-10 code: Z62) • Other problems related to primary support group, including family circumstances (ICD-10 code: Z63) • Problems related to certain psychosocial circumstances ICD-10 code: Z64) • Problems related to other psychosocial circumstances (ICD-10 code: Z65) 	
	<p>Family history of cancer</p>	<p>Family history of primary malignant neoplasm (ICD-10 code: Z80)</p>	<p>present/absent</p>
	<p>Family history of cancer of digestive organs</p>	<p>Family history of malignant neoplasm of digestive organs (ICD-10 code: Z80.0)</p>	
	<p>Family history of colonic polyps</p>	<p>Family history of colonic polyps (ICD-10 code: Z83.71)</p>	
	<p>Genetic susceptibility to cancer</p>	<p>Genetic susceptibility to malignant neoplasm (ICD-10 code: Z15.0)</p>	<p>present/absent</p>
	<p>Personal history of cancer</p>	<p>Personal history of malignant neoplasm (ICD-10 code: Z85)</p>	<p>present/absent</p>
	<p>Obesity/overweight</p>	<p>Overweight and obesity (ICD-10 code: E66)</p> <p>Body mass index [BMI] 40 or greater, adult (ICD-10 code: Z68.4)</p> <p>Body mass index [BMI] 30-39, adult (ICD-10 code: Z68.3)</p>	<p>present/absent</p>

	<p>Body mass index [BMI] 25.0-25.9, adult (ICD-10 code: Z68.25)</p> <p>Body mass index [BMI] 26.0-26.9, adult (ICD-10 code: Z68.26)</p> <p>Body mass index [BMI] 27.0-27.9, adult (ICD-10 code: Z68.27)</p> <p>Body mass index [BMI] 28.0-28.9, adult (ICD-10 code: Z68.28)</p> <p>Body mass index [BMI] 29.0-29.9, adult (ICD-10 code: Z68.29)</p>	
Alcohol related disorders	Alcohol related disorders (ICD-10 code: F10)	present/absent
Nicotine dependence	Nicotine dependence (ICD-10 code: F17)	present/absent
Crohn's disease	Crohn's disease [regional enteritis] (ICD-10 code: K50)	present/absent
Ulcerative colitis	Ulcerative colitis (ICD-10 code: K51)	present/absent
Cystic fibrosis	Cystic fibrosis (ICD-10 code: E84)	present/absent
Colon polyps	Polyp of colon (ICD-10 code: K63.5)	present/absent
Benign neoplasm of colon and rectum	Benign neoplasm of colon, rectum, anus and anal canal (ICD-10 code: D12)	
Bariatric surgery	Bariatric surgery status (ICD-10 code: Z98.84)	present/absent
Encounter for screening for malignant neoplasms	Encounter for screening for malignant neoplasms (ICD-10 code: Z12)	present/absent
Colonoscopy	Colonoscopy (The Current Procedural Terminology (CPT) code: 1022231)	
DPP-4 inhibitors	Dipeptidyl peptidase 4 (DPP-4) inhibitors (ATC code: A10BH)	present/absent

	SGLT2 inhibitors	Sodium-glucose co-transporter 2 (SGLT2) inhibitors (ATC code: A10BK)	present/absent
	Sulfonylureas	Sulfonylureas (ATC code: A10BB)	present/absent
	Thiazolidinediones	Thiazolidinediones (ATC code: A10BG)	present/absent
	Alpha glucosidase inhibitors	Alpha glucosidase inhibitors (ATC code: A10BF)	present/absent
	Other blood glucose lowering drugs	Other blood glucose lowering drugs, excl. insulins (ATC code: A10BJ)	present/absent

eTable 2. Characteristics of the GLP-1RA/no insulin group and insulin/no GLP-1RA group before and after matched for baseline covariates related to esophageal cancer for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 48,983) and group 2 (N = 1,044,745) characteristics before propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1 2	AI Age at Index	55.9 +/- 11.7 61.8 +/- 15.9	48,983 1,044,745	100% 100%	<0.00 1	0.420
1 2	2106-3 White		32,592 633,989	66.5% 60.7%	<0.00 1	0.122
1 2	1002-5 American Indian or Alaska Native		199 3,443	0.4% 0.3%	0.004	0.013
1 2	UNK Unknown Race		7,099 142,470	14.5% 13.6%	<0.00 1	0.025
1 2	F Female		26,011 476,110	53.1% 45.6%	<0.00 1	0.151
1 2	2076-8 Native Hawaiian or Other Pacific Islander		205 10,677	0.4% 1.0%	<0.00 1	0.071
1 2	UN Unknown Gender		2,252 27,321	4.6% 2.6%	<0.00 1	0.106
1 2	2186-5 Not Hispanic or Latino		33,188 659,375	67.8% 63.1%	<0.00 1	0.098
1 2	2135-2 Hispanic or Latino		4,151 94,136	8.5% 9.0%	<0.00 1	0.019
1 2	2054-5 Black or African American		6,265 178,267	12.8% 17.1%	<0.00 1	0.120
1 2	M Male		20,720 541,314	42.3% 51.8%	<0.00 1	0.191
1 2	2028-9 Asian		1,204 41,822	2.5% 4.0%	<0.00 1	0.087

Diagnosis

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1 2	Z55- Z65 Persons with potential health hazards related to socioeconomic and		686 12,021	1.4% 1.2%	<0.00 1	0.022

		psychosocial circumstances				
1	E66	Overweight and obesity	18,401	37.6%	<0.00	0.504
2			166,445	15.9%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	4,204	8.6%	<0.00	0.183
2			43,128	4.1%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,886	7.9%	<0.00	0.208
2			33,396	3.2%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	157	0.3%	0.563	0.003
2			3,510	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	171	0.3%	0.957	<0.001
2			3,632	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	288	0.6%	<0.00	0.026
2			4,209	0.4%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	344	0.7%	<0.00	0.036
2			4,508	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	398	0.8%	<0.00	0.044
2			4,843	0.5%	1	
1	F10	Alcohol related disorders	563	1.1%	<0.00	0.115
2			28,538	2.7%	1	
1	Z80	Family history of primary malignant neoplasm	2,042	4.2%	<0.00	0.136
2			19,398	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	24	0.0%	<0.00	0.019
2			156	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	12,272	25.1%	<0.00	0.402
2			105,217	10.1%	1	
1	Z85	Personal history of malignant neoplasm	1,239	2.5%	<0.00	0.066
2			38,294	3.7%	1	
1	Z98.84	Bariatric surgery status	632	1.3%	<0.00	0.085
2			5,136	0.5%	1	
1	F17	Nicotine dependence	3,593	7.3%	<0.00	0.070
2			96,860	9.3%	1	

1	E66.0	Obesity due to excess calories	9,157	18.7%	<0.00	0.366
2			69,998	6.7%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	150	0.3%	0.118	0.007
2			3,643	0.3%		
1	E66.3	Overweight	1,010	2.1%	<0.00	0.122
2			6,796	0.7%		
1	E66.8	Other obesity	235	0.5%	<0.00	0.065
2			1,298	0.1%		
1	E66.9	Obesity, unspecified	13,805	28.2%	<0.00	0.433
2			118,555	11.3%		
1	Z72.0	Tobacco use	1,064	2.2%	<0.00	0.064
2			13,876	1.3%		
1	K21	Gastro-esophageal reflux disease	9,681	19.8%	<0.00	0.146
2			149,344	14.3%		
1	K22.7	Barrett's esophagus	399	0.8%	<0.00	0.042
2			4,995	0.5%		
1	K22.0	Achalasia of cardia	32	0.1%	0.446	0.004
2			783	0.1%		
1	D69.4	Evans syndrome	0	0%	0.214	0.008
2			1	33		
1	D50.1	Sideropenic dysphagia	86	0.2%	<0.00	0.021
2			1,038	0.1%		
1	S27.81	Injury of esophagus (thoracic part)	0	0%	0.108	0.010
2			55	0.0%		
1	C34	Malignant neoplasm of bronchus and lung	67	0.1%	<0.00	0.113
2			10,154	1.0%		
1	C06	Malignant neoplasm of other and unspecified parts of mouth	10	0.0%	<0.00	0.034
2			1,096	0.1%		
1	C32	Malignant neoplasm of larynx	10	0.0%	<0.00	0.041
2			1,426	0.1%		
1	B97.7	Papillomavirus as the cause of diseases classified elsewhere	114	0.2%	<0.00	0.037
2			900	0.1%		
1	R87.8	High risk human papillomavirus (HPV) DNA test positive from female genital organs	158	0.3%	<0.00	0.054
2			1	830		

1	Z80.0	Family history of malignant neoplasm of digestive organs	784	1.6%	<0.00	0.089
2			6,889	0.7%	1	
1	D10	Benign neoplasm of mouth and pharynx	60	0.1%	0.153	0.006
2			1,059	0.1%		
1	D13.0	Benign neoplasm of esophagus	11	0.0%	0.816	0.001
2			252	0.0%		

Medication

Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10B	Biguanides		27,075	55.3%	<0.00	0.806
2	A			199,802	19.1%	1	
1	A10B	Sulfonylureas		14,077	28.7%	<0.00	0.424
2	B			125,703	12.0%	1	
1	A10B	Alpha glucosidase inhibitors		229	0.5%	<0.00	0.054
2	F			1,718	0.2%	1	
1	A10B	Thiazolidinediones		4,107	8.4%	<0.00	0.213
2	G			35,435	3.4%	1	
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors		9,485	19.4%	<0.00	0.481
2	H			44,595	4.3%	1	
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors		4,808	9.8%	<0.00	0.423
2	K			6,447	0.6%	1	
1	A10B	Other blood glucose lowering drugs, excl. insulins		614	1.3%	<0.00	0.059
2	X			7,048	0.7%	1	

Group 1 (N = 48,437) and group 2 (N = 48,437) characteristics after propensity score matching

Demographics

Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	55.9 +/- 11.7	48,437	100%	<0.00	0.022
2			56.2 +/- 13.4	48,437	100%	1	
1	2106-3	White		32,239	66.6%	<0.00	0.041
2				33,166	68.5%	1	
1	1002-5	American Indian or Alaska Native		196	0.4%	1	<0.001
2				196	0.4%		
1	UNK	Unknown Race		6,973	14.4%	0.001	0.022
2				6,605	13.6%		
1	F	Female		25,706	53.1%	0.001	0.021
2				26,204	54.1%		

1	2076-8	Native Hawaiian or Other Pacific Islander	204	0.4%	0.032	0.014
2			163	0.3%		
1	UN	Unknown Gender	2,163	4.5%	0.009	0.017
2			1,997	4.1%		
1	2186-5	Not Hispanic or Latino	32,828	67.8%	0.001	0.022
2			33,324	68.8%		
1	2135-2	Hispanic or Latino	4,113	8.5%	0.198	0.008
2			4,002	8.3%		
1	2054-5	Black or African American	6,223	12.8%	0.001	0.022
2			5,878	12.1%		
1	M	Male	20,568	42.5%	0.031	0.014
2			20,236	41.8%		
1	2028-9	Asian	1,195	2.5%	0.015	0.016
2			1,080	2.2%		

Diagnosis

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	677	1.4%	<0.001	0.024
2	Z65		546	1.1%		
1	E66	Overweight and obesity	17,983	37.1%	0.806	0.002
2			18,020	37.2%		
1	Z68.3	Body mass index [BMI] 30-39, adult	4,040	8.3%	<0.001	0.026
2			3,695	7.6%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,779	7.8%	<0.001	0.025
2			3,456	7.1%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	156	0.3%	0.293	0.007
2			138	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	171	0.4%	0.160	0.009
2			146	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	284	0.6%	0.001	0.021
2			213	0.4%		

1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	332	0.7%	0.043	0.013
2			282	0.6%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	382	0.8%	0.117	0.010
2			340	0.7%		
1	F10	Alcohol related disorders	562	1.2%	<0.001	0.024
2			444	0.9%		
1	Z80	Family history of primary malignant neoplasm	1,993	4.1%	0.001	0.021
2			1,795	3.7%		
1	Z15.0	Genetic susceptibility to malignant neoplasm	22	0.0%	0.034	0.014
2			10	0.0%		
1	Z12	Encounter for screening for malignant neoplasms	11,921	24.6%	0.003	0.019
2			11,527	23.8%		
1	Z85	Personal history of malignant neoplasm	1,229	2.5%	0.001	0.021
2			1,075	2.2%		
1	Z98.84	Bariatric surgery status	614	1.3%	0.450	0.005
2			588	1.2%		
1	F17	Nicotine dependence	3,571	7.4%	<0.001	0.035
2			3,141	6.5%		
1	E66.0	Obesity due to excess calories	8,908	18.4%	0.450	0.005
2			8,817	18.2%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	149	0.3%	0.281	0.007
2			131	0.3%		
1	E66.3	Overweight	980	2.0%	0.016	0.016
2			877	1.8%		
1	E66.8	Other obesity	219	0.5%	0.496	0.004
2			205	0.4%		
1	E66.9	Obesity, unspecified	13,461	27.8%	0.280	0.007
2			13,612	28.1%		
1	Z72.0	Tobacco use	1,040	2.1%	0.008	0.017
2			924	1.9%		
1	K21	Gastro-esophageal reflux disease	9,520	19.7%	0.006	0.018
2			9,180	19.0%		
1	K22.7	Barrett's esophagus	390	0.8%	0.773	0.002
2			382	0.8%		
1	K22.0	Achalasia of cardia	31	0.1%	0.276	0.007
2			23	0.0%		

1	D69.4	Evans syndrome	0	0%	--	--
2	1		0	0%		
1	D50.1	Sideropenic dysphagia	83	0.2%	0.814	0.002
2			80	0.2%		
1	S27.81	Injury of esophagus (thoracic part)	0	0%	0.002	0.020
2			10	0.0%		
1	C34	Malignant neoplasm of bronchus and lung	67	0.1%	0.864	0.001
2			69	0.1%		
1	C06	Malignant neoplasm of other and unspecified parts of mouth	10	0.0%	0.003	0.019
2			28	0.1%		
1	C32	Malignant neoplasm of larynx	10	0.0%	0.317	0.006
2			15	0.0%		
1	B97.7	Papillomavirus as the cause of diseases classified elsewhere	114	0.2%	0.687	0.003
2			108	0.2%		
1	R87.8	High risk human papillomavirus (HPV) DNA test positive from female genital organs	154	0.3%	0.024	0.014
2	1		117	0.2%		
1	Z80.0	Family history of malignant neoplasm of digestive organs	764	1.6%	0.003	0.019
2			654	1.4%		
1	D10	Benign neoplasm of mouth and pharynx	59	0.1%	1	<0.001
2			59	0.1%		
1	D13.0	Benign neoplasm of esophagus	11	0.0%	0.077	0.011
2			21	0.0%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 A10B		26,535	54.8%	0.003	0.019
2 A	Biguanides	27,001	55.7%		
1 A10B		13,752	28.4%	0.001	0.022
2 B	Sulfonylureas	14,240	29.4%		
1 A10B		221	0.5%	0.260	0.007
2 F	Alpha glucosidase inhibitors	198	0.4%		
1 A10B		4,019	8.3%	0.063	0.012
2 G	Thiazolidinediones	4,180	8.6%		
1 A10B		9,079	18.7%	0.954	<0.001
2 H	Dipeptidyl peptidase 4 (DPP-4) inhibitors	9,086	18.8%		

1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	4,290	8.9%	<0.001	0.034
2	K		3,835	7.9%		
1	A10B	Other blood glucose lowering drugs, excl. insulins	604	1.2%	0.579	0.004
2	X		585	1.2%		

eTable 3. Characteristics of the GLP-1RA/no insulin group and insulin/no GLP-1RA group before and after matched for covariates related to breast cancer for the study populations of women (age 55 and older) with T2D and no history of any OAC

Group 1 (N = 13,865) and group 2 (N = 284,997) characteristics before propensity score matching						
Demographics						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	13,865	100%	<0.00	0.566
2			284,997	100%	1	
1	2106-3	White	9,776	70.5%	<0.00	0.198
2			174,355	61.2%	1	
1	1002-5	American Indian or Alaska Native	50	0.4%	0.264	0.009
2			874	0.3%		
1	UNK	Unknown Race	1,328	9.6%	<0.00	0.043
2			31,022	10.9%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander	48	0.3%	<0.00	0.074
2			2,664	0.9%	1	
1	UN	Unknown Ethnicity	2,902	20.9%	<0.00	0.133
2			75,794	26.6%	1	
1	2186-5	Not Hispanic or Latino	9,979	72.0%	<0.00	0.158
2			184,217	64.6%	1	
1	2135-2	Hispanic or Latino	984	7.1%	<0.00	0.062
2			24,986	8.8%	1	
1	2054-5	Black or African American	2,027	14.6%	<0.00	0.123
2			54,813	19.2%	1	
1	2028-9	Asian	279	2.0%	<0.00	0.129
2			12,141	4.3%	1	
Diagnosis						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55- Z65	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	196	1.4%	<0.00	0.044
2			2,666	0.9%	1	
1	E66	Overweight and obesity	4,915	35.4%	<0.00	0.400
2			51,523	18.1%	1	

1	Z68.3	Body mass index [BMI] 30-39, adult	983	7.1%	<0.00	0.128
2			11,795	4.1%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	857	6.2%	<0.00	0.115
2			10,539	3.7%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	32	0.2%	0.965	<0.001
2			663	0.2%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	39	0.3%	0.244	0.010
2			662	0.2%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	63	0.5%	<0.00	0.029
2			803	0.3%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	72	0.5%	<0.00	0.030
2			920	0.3%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	75	0.5%	<0.00	0.029
2			989	0.3%	1	
1	F10	Alcohol related disorders	84	0.6%	<0.00	0.056
2			3,218	1.1%	1	
1	Z80	Family history of primary malignant neoplasm	791	5.7%	<0.00	0.149
2			7,754	2.7%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	10	0.1%	<0.00	0.024
2			60	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	4,506	32.5%	<0.00	0.404
2			44,384	15.6%	1	
1	Z85	Personal history of malignant neoplasm	421	3.0%	<0.00	0.035
2			10,433	3.7%	1	
1	Z98.84	Bariatric surgery status	234	1.7%	<0.00	0.089
2			2,038	0.7%	1	
1	E66.0	Obesity due to excess calories	2,298	16.6%	<0.00	0.271
2			22,234	7.8%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	40	0.3%	0.003	0.028
2			1,313	0.5%		
1	E66.3	Overweight	262	1.9%	<0.00	0.111
2			1,855	0.7%	1	

1	E66.8	Other obesity	64	0.5%	<0.00	0.061
2			367	0.1%	1	
1	E66.9	Obesity, unspecified	3,747	27.0%	<0.00	0.364
2			36,255	12.7%	1	
1	O92.7	Other and unspecified disorders of lactation	0	0%	0.485	0.008
2			10	0.0%		
1	Z79.89	Hormone replacement therapy	88	0.6%	<0.00	0.038
2	0		1,050	0.4%	1	
1	Z92.23	Personal history of estrogen therapy	10	0.1%	0.058	0.014
2			111	0.0%		
1	Z98.82	Breast implant status	10	0.1%	0.002	0.021
2			75	0.0%		
1	Z80.3	Family history of malignant neoplasm of breast	392	2.8%	<0.00	0.116
2			3,435	1.2%	1	
1	R92	Abnormal and inconclusive findings on diagnostic imaging of breast	1,289	9.3%	<0.00	0.210
2			11,640	4.1%	1	
1	D24	Benign neoplasm of breast	113	0.8%	<0.00	0.050
2			1,201	0.4%	1	
1	N60	Benign mammary dysplasia	496	3.6%	<0.00	0.133
2			4,263	1.5%	1	
1	N62	Hypertrophy of breast	79	0.6%	<0.00	0.063
2			529	0.2%	1	
1	N63	Unspecified lump in breast	700	5.0%	<0.00	0.132
2			7,212	2.5%	1	
1	N64	Other disorders of breast	759	5.5%	<0.00	0.151
2			7,195	2.5%	1	
1	N61	Inflammatory disorders of breast	70	0.5%	<0.00	0.037
2			781	0.3%	1	
1	D05	Carcinoma in situ of breast	31	0.2%	0.005	0.021
2			381	0.1%		

Procedure

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1		0	0%	0.464	0.009
2		11	0.0%		

1	58300	Insertion of intrauterine device (IUD)	18	0.1%	<0.00	0.039
2			66	0.0%	1	
1	1001	Radiation	28	0.2%	<0.00	0.057
2			1,571	0.6%	1	

Medication

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10B	Biguanides	7,389	53.3%	<0.00	0.716
2	A		59,166	20.8%	1	
1	A10B	Sulfonylureas	4,083	29.4%	<0.00	0.429
2	B		35,332	12.4%	1	
1	A10B	Alpha glucosidase inhibitors	64	0.5%	<0.00	0.052
2	F		488	0.2%	1	
1	A10B	Thiazolidinediones	1,173	8.5%	<0.00	0.211
2	G		9,921	3.5%	1	
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors	2,792	20.1%	<0.00	0.471
2	H		14,092	4.9%	1	
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	1,294	9.3%	<0.00	0.409
2	K		1,768	0.6%	1	
1	A10B	Other blood glucose lowering drugs, excl. insulins	198	1.4%	<0.00	0.070
2	X		2,014	0.7%	1	
1	HS200	CONTRACEPTIVE S,SYSTEMIC	143	1.0%	<0.00	0.109
2			535	0.2%	1	

Group 1 (N = 13,768) and group 2 (N = 13,768) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	63.6 +/- 6.2	100%	0.545	0.007
2			63.5 +/- 6.3	13,768		
1	2106-3	White	9,696	70.4%	0.001	0.039
2			9,941	72.2%		
1	1002-5	American Indian or Alaska Native	50	0.4%	0.840	0.002
2			48	0.3%		
1	UNK	Unknown Race	1,322	9.6%	0.068	0.022
2			1,234	9.0%		

1	2076-8	Native Hawaiian or Other Pacific Islander	48	0.3%	0.190	0.016
2			36	0.3%		
1	UN	Unknown Ethnicity	2,889	21.0%	0.689	0.005
2			2,862	20.8%		
1	2186-5	Not Hispanic or Latino	9,901	71.9%	0.142	0.018
2			10,010	72.7%		
1	2135-2	Hispanic or Latino	978	7.1%	0.050	0.024
2			896	6.5%		
1	2054-5	Black or African American	2,017	14.6%	0.186	0.016
2			1,940	14.1%		
1	2028-9	Asian	278	2.0%	0.068	0.022
2			237	1.7%		

Diagnosis

Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances		193	1.4%	0.151	0.017
2	Z65			166	1.2%		
1	E66	Overweight and obesity		4,850	35.2%	0.350	0.011
2				4,776	34.7%		
1	Z68.3	Body mass index [BMI] 30-39, adult		966	7.0%	0.007	0.032
2				855	6.2%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult		848	6.2%	0.025	0.027
2				761	5.5%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult		32	0.2%	0.068	0.022
2				19	0.1%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult		39	0.3%	0.909	0.001
2				38	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult		63	0.5%	0.583	0.007
2				57	0.4%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult		70	0.5%	0.933	0.001
2				71	0.5%		

1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	74	0.5%	0.868	0.002
2			72	0.5%		
1	F10	Alcohol related disorders	83	0.6%	0.035	0.025
2			58	0.4%		
1	Z80	Family history of primary malignant neoplasm	777	5.6%	0.152	0.017
2			723	5.3%		
1	Z15.0	Genetic susceptibility to malignant neoplasm	10	0.1%	1	<0.001
2			10	0.1%		
1	Z12	Encounter for screening for malignant neoplasms	4,437	32.2%	0.060	0.023
2			4,292	31.2%		
1	Z85	Personal history of malignant neoplasm	417	3.0%	0.184	0.016
2			380	2.8%		
1	Z98.84	Bariatric surgery status	230	1.7%	0.191	0.016
2			203	1.5%		
1	E66.0	Obesity due to excess calories	2,271	16.5%	0.246	0.014
2			2,200	16.0%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	40	0.3%	1	<0.001
2			40	0.3%		
1	E66.3	Overweight	258	1.9%	0.621	0.006
2			247	1.8%		
1	E66.8	Other obesity	63	0.5%	0.661	0.005
2			68	0.5%		
1	E66.9	Obesity, unspecified	3,692	26.8%	0.714	0.004
2			3,719	27.0%		
1	O92.7	Other and unspecified disorders of lactation	0	0%	--	--
2			0	0%		
1	Z79.89	Hormone replacement therapy	88	0.6%	0.151	0.017
2	0		70	0.5%		
1	Z92.23	Personal history of estrogen therapy	10	0.1%	1	<0.001
2			10	0.1%		
1	Z98.82	Breast implant status	10	0.1%	1	<0.001
2			10	0.1%		
1	Z80.3	Family history of malignant neoplasm of breast	385	2.8%	0.264	0.013
2			355	2.6%		

1	R92	Abnormal and inconclusive findings on diagnostic imaging of breast	1,274	9.3%	0.091	0.020
2			1,194	8.7%		
1	D24	Benign neoplasm of breast	113	0.8%	0.122	0.019
2			91	0.7%		
1	N60	Benign mammary dysplasia	491	3.6%	0.153	0.017
2			448	3.3%		
1	N62	Hypertrophy of breast	78	0.6%	0.407	0.010
2			68	0.5%		
1	N63	Unspecified lump in breast	686	5.0%	0.299	0.013
2			649	4.7%		
1	N64	Other disorders of breast	747	5.4%	0.098	0.020
2			686	5.0%		
1	N61	Inflammatory disorders of breast	68	0.5%	0.864	0.002
2			70	0.5%		
1	D05	Carcinoma in situ of breast	31	0.2%	0.599	0.006
2			27	0.2%		

Procedure

Group	Mean ± SD	Patients	% of Group	P-Value	SMD	
1	C1789	Prosthesis, breast (implantable)	0	0%	0.002	0.038
2			10	0.1%		
1	58300	Insertion of intrauterine device (IUD)	18	0.1%	1	<0.001
2			18	0.1%		
1	1001	Radiation	28	0.2%	0.680	0.005
2			25	0.2%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD	
1	A10B	Biguanides	7,292	53.0%	0.530	0.008
2			A	7,344		
1	A10B	Sulfonylureas	4,021	29.2%	0.094	0.020
2			B	4,148		
1	A10B	Alpha glucosidase inhibitors	64	0.5%	0.464	0.009
2			F	56		
1	A10B	Thiazolidinediones	1,162	8.4%	0.635	0.006
2			G	1,184		

1	A10B	Dipeptidyl peptidase	2,714	19.7%		
2	H	4 (DPP-4) inhibitors	2,789	20.3%	0.258	0.014
1	A10B	Sodium-glucose co-	1,197	8.7%		
2	K	transporter 2 (SGLT2) inhibitors	1,046	7.6%	0.001	0.040
1	A10B	Other blood glucose	194	1.4%		
2	X	lowering drugs, excl. insulins	215	1.6%	0.295	0.013
1	HS200	CONTRACEPTIVE	139	1.0%		
2		S,SYSTEMIC	135	1.0%	0.808	0.003

eTable 4. Characteristics of the GLP-1RA/no insulin group and insulin/no GLP-1RA group before and after matched for covariates related to endometrial cancer for the study populations of women with T2D and no history of any OAC

Group 1 (N = 26,011) and group 2 (N = 476,110) characteristics before propensity score matching						
Demographics						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	26,011	100%	<0.00	0.469
2			476,110	100%	1	
1	2106-3	White	17,165	66.0%	<0.00	0.138
2			282,423	59.3%	1	
1	1002-5	American Indian or Alaska Native	123	0.5%	0.003	0.018
2			1,701	0.4%		
1	UNK	Unknown Race	2,772	10.7%	<0.00	0.035
2			55,979	11.8%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander	105	0.4%	<0.00	0.075
2			4,943	1.0%	1	
1	UN	Unknown Ethnicity	5,078	19.5%	<0.00	0.156
2			124,092	26.1%	1	
1	2186-5	Not Hispanic or Latino	18,384	70.7%	<0.00	0.142
2			304,990	64.1%	1	
1	2135-2	Hispanic or Latino	2,549	9.8%	0.682	0.003
2			47,028	9.9%		
1	2054-5	Black or African American	4,436	17.1%	<0.00	0.077
2			95,352	20.0%	1	
1	2028-9	Asian	619	2.4%	<0.00	0.098
2			19,593	4.1%	1	
Diagnosis						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55- Z65	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	468	1.8%	<0.00	0.048
2			5,762	1.2%	1	
1	E66	Overweight and obesity	10,477	40.3%	<0.00	0.493
2			87,968	18.5%	1	

1	Z68.3	Body mass index [BMI] 30-39, adult	1,815	7.0%	<0.00	0.146
2			17,667	3.7%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	2,154	8.3%	<0.00	0.183
2			18,645	3.9%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	56	0.2%	0.857	0.001
2			1,000	0.2%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	50	0.2%	0.747	0.002
2			959	0.2%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	87	0.3%	0.003	0.018
2			1,140	0.2%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	107	0.4%	<0.00	0.025
2			1,266	0.3%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	119	0.5%	<0.00	0.028
2			1,376	0.3%	1	
1	Z80	Family history of primary malignant neoplasm	1,430	5.5%	<0.00	0.160
2			11,367	2.4%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	<0.00	0.023
2			100	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	7,877	30.3%	<0.00	0.410
2			65,044	13.7%	1	
1	Z85	Personal history of malignant neoplasm	593	2.3%	<0.00	0.052
2			14,844	3.1%	1	
1	Z98.84	Bariatric surgery status	474	1.8%	<0.00	0.099
2			3,408	0.7%	1	
1	E66.0	Obesity due to excess calories	5,392	20.7%	<0.00	0.356
2			39,813	8.4%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	82	0.3%	0.029	0.015
2			1,919	0.4%		
1	E66.3	Overweight	535	2.1%	<0.00	0.120
2			3,181	0.7%	1	
1	E66.8	Other obesity	134	0.5%	<0.00	0.064
2			702	0.1%	1	

1	E66.9	Obesity, unspecified	7,879	30.3%	<0.00	0.431
2			61,596	12.9%	1	
1	Z79.89	Hormone replacement therapy	137	0.5%	<0.00	0.037
2	0		1,374	0.3%	1	
1	Z92.23	Personal history of estrogen therapy	10	0.0%	0.233	0.007
2			124	0.0%		
1	E28.2	Polycystic ovarian syndrome	979	3.8%	<0.00	0.219
2			2,780	0.6%	1	
1	Z80.41	Family history of malignant neoplasm of ovary	104	0.4%	<0.00	0.056
2			554	0.1%	1	
1	Z80.49	Family history of malignant neoplasm of other genital organs	38	0.1%	<0.00	0.025
2			315	0.1%	1	
1	N85.0	Endometrial hyperplasia	182	0.7%	<0.00	0.053
2			1,527	0.3%	1	
1	D25	Leiomyoma of uterus	1,031	4.0%	<0.00	0.130
2			8,571	1.8%	1	
1	D26	Other benign neoplasms of uterus	45	0.2%	<0.00	0.026
2			377	0.1%	1	
1	D27	Benign neoplasm of ovary	95	0.4%	<0.00	0.033
2			902	0.2%	1	
1	Z80.3	Family history of malignant neoplasm of breast	736	2.8%	<0.00	0.127
2			5,122	1.1%	1	

Procedure

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1		306	1.2%	<0.00	0.123
2		825	0.2%	1	
1		53	0.2%	<0.00	0.048
2		2,303	0.5%	1	

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1		14,271	54.9%	<0.00	0.780
2		93,949	19.7%	1	
1		6,822	26.2%	<0.00	0.373
2		56,352	11.8%	1	

1	A10B	Alpha glucosidase inhibitors	112	0.4%	<0.00	0.049
2	F		784	0.2%	1	
1	A10B	Thiazolidinediones	1,834	7.1%	<0.00	0.170
2	G		15,689	3.3%	1	
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors	4,637	17.8%	<0.00	0.444
2	H		20,235	4.3%	1	
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	2,219	8.5%	<0.00	0.391
2	K		2,614	0.5%	1	
1	A10B	Other blood glucose lowering drugs, excl. insulins	297	1.1%	<0.00	0.047
2	X		3,287	0.7%	1	
1	HS200	CONTRACEPTIVE S,SYSTEMIC	1,345	5.2%	<0.00	0.237
2			5,117	1.1%	1	
1	10324	tamoxifen	37	0.1%	<0.00	0.026
2			287	0.1%	1	

Group 1 (N = 25,750) and group 2 (N = 25,750) characteristics after propensity score matching

Demographics

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1	54.9 +/- 11.9	25,750	100%	0.621	0.004
2	54.9 +/- 13.6	25,750	100%		
1		16,960	65.9%	<0.00	0.040
2		17,446	67.8%		
1		122	0.5%	0.796	0.002
2		118	0.5%		
1		2,753	10.7%	0.041	0.018
2		2,611	10.1%		
1		105	0.4%	0.623	0.004
2		98	0.4%		
1		5,052	19.6%	0.018	0.021
2		4,841	18.8%		
1		18,166	70.5%	0.013	0.022
2		18,423	71.5%		
1		2,532	9.8%	0.494	0.006
2		2,486	9.7%		
1		4,407	17.1%	0.094	0.015
2		4,265	16.6%		

1	2028-9	Asian		616	2.4%	0.001	0.029
2				507	2.0%		
Diagnosis							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances		462	1.8%	0.616	0.004
2	Z65			447	1.7%		
1	E66	Overweight and obesity		10,268	39.9%	0.893	0.001
2				10,283	39.9%		
1	Z68.3	Body mass index [BMI] 30-39, adult		1,777	6.9%	0.011	0.022
2				1,633	6.3%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult		2,098	8.1%	0.001	0.031
2				1,888	7.3%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult		56	0.2%	0.432	0.007
2				48	0.2%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult		50	0.2%	0.291	0.009
2				40	0.2%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult		87	0.3%	0.007	0.024
2				55	0.2%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult		106	0.4%	0.047	0.018
2				79	0.3%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult		118	0.5%	0.173	0.012
2				98	0.4%		
1	Z80	Family history of primary malignant neoplasm		1,399	5.4%	0.086	0.015
2				1,312	5.1%		
1	Z15.0	Genetic susceptibility to malignant neoplasm		17	0.1%	0.257	0.010
2				11	0.0%		
1	Z12	Encounter for screening for malignant neoplasms		7,704	29.9%	0.013	0.022
2				7,448	28.9%		

1	Z85	Personal history of malignant neoplasm	590	2.3%	0.049	0.017
2			525	2.0%		
1	Z98.84	Bariatric surgery status	455	1.8%	0.543	0.005
2			437	1.7%		
1	E66.0	Obesity due to excess calories	5,269	20.5%	0.484	0.006
2			5,205	20.2%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	82	0.3%	0.064	0.016
2			60	0.2%		
1	E66.3	Overweight	514	2.0%	0.034	0.019
2			449	1.7%		
1	E66.8	Other obesity	130	0.5%	0.088	0.015
2			104	0.4%		
1	E66.9	Obesity, unspecified	7,716	30.0%	0.223	0.011
2			7,843	30.5%		
1	Z79.89	Hormone replacement therapy	136	0.5%	0.045	0.018
2	0		105	0.4%		
1	Z92.23	Personal history of estrogen therapy	10	0.0%	1	<0.001
2			10	0.0%		
1	E28.2	Polycystic ovarian syndrome	938	3.6%	0.814	0.002
2			928	3.6%		
1	Z80.41	Family history of malignant neoplasm of ovary	99	0.4%	0.338	0.008
2			86	0.3%		
1	Z80.49	Family history of malignant neoplasm of other genital organs	37	0.1%	0.722	0.003
2			34	0.1%		
1	N85.0	Endometrial hyperplasia	180	0.7%	0.387	0.008
2			164	0.6%		
1	D25	Leiomyoma of uterus	1,018	4.0%	0.107	0.014
2			948	3.7%		
1	D26	Other benign neoplasms of uterus	43	0.2%	0.365	0.008
2			35	0.1%		
1	D27	Benign neoplasm of ovary	94	0.4%	0.017	0.021
2			64	0.2%		
1	Z80.3	Family history of malignant neoplasm of breast	724	2.8%	0.081	0.015
2			660	2.6%		

Procedure

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
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1	58300	Insertion of intrauterine device (IUD)	290	1.1%	0.144	0.013
2			256	1.0%		
1	1001	Radiation	53	0.2%	0.844	0.002
2			51	0.2%		

Medication

Group			Mean ± SD	Patients	% of Group	P- Value	SMD
1	A10B	Biguanides		14,013	54.4%	0.018	0.021
2	A			14,280	55.5%		
1	A10B	Sulfonylureas		6,700	26.0%	0.013	0.022
2	B			6,948	27.0%		
1	A10B	Alpha glucosidase inhibitors		109	0.4%	0.892	0.001
2	F			107	0.4%		
1	A10B	Thiazolidinediones		1,799	7.0%	0.311	0.009
2	G			1,858	7.2%		
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors		4,454	17.3%	0.077	0.016
2	H			4,607	17.9%		
1	A10B	Sodium-glucose co- transporter 2 (SGLT2) inhibitors		1,978	7.7%	<0.00 1	0.042
2	K			1,699	6.6%		
1	A10B	Other blood glucose lowering drugs, excl. insulins		291	1.1%	0.934	0.001
2	X			293	1.1%		
1	HS200	CONTRACEPTIVE S,SYSTEMIC		1,299	5.0%	0.025	0.020
2				1,190	4.6%		
1	10324	tamoxifen		37	0.1%	0.096	0.015
2				24	0.1%		

eTable 5. Characteristics of the GLP-1RA/no insulin group and insulin/no GLP-1RA group before and after matched for covariates related to gallbladder cancer for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 48,983) and group 2 (N = 1,044,745) characteristics before propensity score matching						
Demographics						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	48,983	100%	<0.00	0.420
2			1,044,745	100%	1	
1	2106-3	White	32,592	66.5%	<0.00	0.122
2			633,989	60.7%	1	
1	UNK	Unknown Race	7,099	14.5%	<0.00	0.025
2			142,470	13.6%	1	
1	F	Female	26,011	53.1%	<0.00	0.151
2			476,110	45.6%	1	
1	UN	Unknown Gender	2,252	4.6%	<0.00	0.106
2			27,321	2.6%	1	
1	2186-5	Not Hispanic or Latino	33,188	67.8%	<0.00	0.098
2			659,375	63.1%	1	
1	2135-2	Hispanic or Latino	4,151	8.5%	<0.00	0.019
2			94,136	9.0%	1	
1	2054-5	Black or African American	6,265	12.8%	<0.00	0.120
2			178,267	17.1%	1	
1	M	Male	20,720	42.3%	<0.00	0.191
2			541,314	51.8%	1	
1	2028-9	Asian	1,204	2.5%	<0.00	0.087
2			41,822	4.0%	1	
Diagnosis						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	686	1.4%	<0.00	0.022
2	Z65		12,021	1.2%	1	
1	E66	Overweight and obesity	18,401	37.6%	<0.00	0.504
2			166,445	15.9%	1	

1	Z68.3	Body mass index	4,204	8.6%	<0.00	0.183
2		[BMI] 30-39, adult	43,128	4.1%	1	
1	Z68.4	Body mass index	3,886	7.9%	<0.00	0.208
2		[BMI] 40 or greater, adult	33,396	3.2%	1	
1	Z68.25	Body mass index	157	0.3%	0.563	0.003
2		[BMI] 25.0-25.9, adult	3,510	0.3%		
1	Z68.26	Body mass index	171	0.3%	0.957	<0.001
2		[BMI] 26.0-26.9, adult	3,632	0.3%		
1	Z68.27	Body mass index	288	0.6%	<0.00	0.026
2		[BMI] 27.0-27.9, adult	4,209	0.4%	1	
1	Z68.28	Body mass index	344	0.7%	<0.00	0.036
2		[BMI] 28.0-28.9, adult	4,508	0.4%	1	
1	Z68.29	Body mass index	398	0.8%	<0.00	0.044
2		[BMI] 29.0-29.9, adult	4,843	0.5%	1	
1	F17	Nicotine dependence	3,593	7.3%	<0.00	0.070
2			96,860	9.3%	1	
1	E66.0	Obesity due to excess calories	9,157	18.7%	<0.00	0.366
2			69,998	6.7%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	150	0.3%	0.118	0.007
2			3,643	0.3%		
1	E66.3	Overweight	1,010	2.1%	<0.00	0.122
2			6,796	0.7%	1	
1	E66.8	Other obesity	235	0.5%	<0.00	0.065
2			1,298	0.1%	1	
1	E66.9	Obesity, unspecified	13,805	28.2%	<0.00	0.433
2			118,555	11.3%	1	
1	Z72.0	Tobacco use	1,064	2.2%	<0.00	0.064
2			13,876	1.3%	1	
1	Q44.5	Other congenital malformations of bile ducts	11	0.0%	0.083	0.009
2			396	0.0%		
1	K82.4	Cholesterolosis of gallbladder	99	0.2%	<0.00	0.023
2			1,160	0.1%	1	
1	K83.0	Primary sclerosing cholangitis	10	0.0%	0.005	0.010
2	1		87	0.0%		

1	A01.0	Typhoid fever	10	0.0%	<0.00	0.017
2			23	0.0%	1	
1	Z85.09	Personal history of malignant neoplasm of other digestive organs	10	0.0%	0.571	0.003
2			256	0.0%		
1	D13.5	Benign neoplasm of extrahepatic bile ducts	27	0.1%	0.314	0.004
2			472	0.0%		

Medication

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10B	Biguanides	27,075	55.3%	<0.00	0.806
2	A		199,802	19.1%	1	
1	A10B	Sulfonylureas	14,077	28.7%	<0.00	0.424
2	B		125,703	12.0%	1	
1	A10B	Alpha glucosidase inhibitors	229	0.5%	<0.00	0.054
2	F		1,718	0.2%	1	
1	A10B	Thiazolidinediones	4,107	8.4%	<0.00	0.213
2	G		35,435	3.4%	1	
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors	9,485	19.4%	<0.00	0.481
2	H		44,595	4.3%	1	
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	4,808	9.8%	<0.00	0.423
2	K		6,447	0.6%	1	
1	A10B	Other blood glucose lowering drugs, excl. insulins	614	1.3%	<0.00	0.059
2	X		7,048	0.7%	1	

Group 1 (N = 48,587) and group 2 (N = 48,587) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	55.9 +/- 11.8	48,587	100%	0.005
2			56.1 +/- 12.6	48,587	100%	
1	2106-3	White	32,319	66.5%	<0.00	0.031
2			33,024	68.0%	1	
1	UNK	Unknown Race	7,011	14.4%	0.007	0.017
2			6,716	13.8%		
1	F	Female	25,779	53.1%	0.979	<0.001
2			25,775	53.0%		

1	UN	Unknown Gender	2,186	4.5%	0.465	0.005
2			2,139	4.4%		
1	2186-5	Not Hispanic or Latino	32,920	67.8%	0.019	0.015
2			33,260	68.5%		
1	2135-2	Hispanic or Latino	4,126	8.5%	0.074	0.011
2			3,972	8.2%		
1	2054-5	Black or African American	6,241	12.8%	0.159	0.009
2			6,095	12.5%		
1	M	Male	20,622	42.4%	0.741	0.002
2			20,673	42.5%		
1	2028-9	Asian	1,199	2.5%	0.022	0.015
2			1,091	2.2%		

Diagnosis

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 Z55- 2 Z65	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	682 596	1.4% 1.2%	0.015	0.016
E66	Overweight and obesity	17,410 17,367	36.9% 36.8%	0.772	0.002
1 Z68.3 2	Body mass index [BMI] 30-39, adult	3,964 3,562	8.4% 7.5%	<0.001	0.031
1 Z68.4 2	Body mass index [BMI] 40 or greater, adult	3,642 3,272	7.7% 6.9%	<0.001	0.030
1 Z68.25 2	Body mass index [BMI] 25.0-25.9, adult	151 134	0.3% 0.3%	0.313	0.007
1 Z68.26 2	Body mass index [BMI] 26.0-26.9, adult	169 156	0.4% 0.3%	0.470	0.005
1 Z68.27 2	Body mass index [BMI] 27.0-27.9, adult	278 236	0.6% 0.5%	0.063	0.012
1 Z68.28 2	Body mass index [BMI] 28.0-28.9, adult	322 286	0.7% 0.6%	0.143	0.010

1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	382	0.8%	0.042	0.013
2			328	0.7%		
1	F17	Nicotine dependence	3,576	7.4%	<0.001	0.032
2			3,185	6.6%		
1	E66.0	Obesity due to excess calories	8,635	18.3%	0.345	0.006
2			8,523	18.0%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	139	0.3%	0.762	0.002
2			134	0.3%		
1	E66.3	Overweight	941	2.0%	0.075	0.012
2			866	1.8%		
1	E66.8	Other obesity	204	0.4%	1	<0.001
2			204	0.4%		
1	E66.9	Obesity, unspecified	13,034	27.6%	0.948	<0.001
2			13,043	27.6%		
1	Z72.0	Tobacco use	1,044	2.2%	0.157	0.009
2			981	2.0%		
1	K82.4	Cholesterolosis of gallbladder	93	0.2%	0.040	0.013
2			67	0.1%		
1	K83.0	Primary sclerosing cholangitis	10	0.0%	1	<0.001
2	1		10	0.0%		
1	A01.0	Typhoid fever	10	0.0%	1	<0.001
2			10	0.0%		
1	Z85.09	Personal history of malignant neoplasm of other digestive organs	10	0.0%	1	<0.001
2			10	0.0%		
1	D13.5	Benign neoplasm of extrahepatic bile ducts	26	0.1%	0.297	0.007
2			19	0.0%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 A10B		26,679	54.9%	0.010	0.017
2 A		27,080	55.7%		
1 A10B		13,835	28.5%	0.011	0.016
2 B		14,192	29.2%		
1 A10B		219	0.5%	0.924	0.001
2 F		217	0.4%		
1 A10B		4,045	8.3%	0.532	0.004
2 G		4,099	8.4%		

1	A10B	Dipeptidyl peptidase	9,167	18.9%	0.556	0.004
2	H	4 (DPP-4) inhibitors	9,239	19.0%		
1	A10B	Sodium-glucose co-	4,419	9.1%	<0.00	0.028
2	K	transporter 2 (SGLT2) inhibitors	4,037	8.3%		
1	A10B	Other blood glucose	609	1.3%	0.098	0.011
2	X	lowering drugs, excl. insulins	553	1.1%		

eTable 6. Characteristics of the GLP-1RA/no insulin group and insulin/no GLP-1RA group before and after matched for covariates related to stomach cancer for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 48,983) and group 2 (N = 1,044,745) characteristics before propensity score matching						
Demographics						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	48,983	100%	<0.00	0.420
2			1,044,745	100%	1	
1	2106-3	White	32,592	66.5%	<0.00	0.122
2			633,989	60.7%	1	
1	1002-5	American Indian or Alaska Native	199	0.4%	0.004	0.013
2			3,443	0.3%		
1	UNK	Unknown Race	7,099	14.5%	<0.00	0.025
2			142,470	13.6%	1	
1	F	Female	26,011	53.1%	<0.00	0.151
2			476,110	45.6%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander	205	0.4%	<0.00	0.071
2			10,677	1.0%	1	
1	UN	Unknown Gender	2,252	4.6%	<0.00	0.106
2			27,321	2.6%	1	
1	2186-5	Not Hispanic or Latino	33,188	67.8%	<0.00	0.098
2			659,375	63.1%	1	
1	2135-2	Hispanic or Latino	4,151	8.5%	<0.00	0.019
2			94,136	9.0%	1	
1	2054-5	Black or African American	6,265	12.8%	<0.00	0.120
2			178,267	17.1%	1	
1	M	Male	20,720	42.3%	<0.00	0.191
2			541,314	51.8%	1	
1	2028-9	Asian	1,204	2.5%	<0.00	0.087
2			41,822	4.0%	1	
Diagnosis						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and	686	1.4%	<0.00	0.022
2	Z65		12,021	1.2%	1	

		psychosocial circumstances				
1	E66	Overweight and obesity	18,401	37.6%	<0.00	0.504
2			166,445	15.9%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	4,204	8.6%	<0.00	0.183
2			43,128	4.1%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,886	7.9%	<0.00	0.208
2			33,396	3.2%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	157	0.3%	0.563	0.003
2			3,510	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	171	0.3%	0.957	<0.001
2			3,632	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	288	0.6%	<0.00	0.026
2			4,209	0.4%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	344	0.7%	<0.00	0.036
2			4,508	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	398	0.8%	<0.00	0.044
2			4,843	0.5%	1	
1	F10	Alcohol related disorders	563	1.1%	<0.00	0.115
2			28,538	2.7%	1	
1	Z80	Family history of primary malignant neoplasm	2,042	4.2%	<0.00	0.136
2			19,398	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	24	0.0%	<0.00	0.019
2			156	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	12,272	25.1%	<0.00	0.402
2			105,217	10.1%	1	
1	Z85	Personal history of malignant neoplasm	1,239	2.5%	<0.00	0.066
2			38,294	3.7%	1	
1	Z98.84	Bariatric surgery status	632	1.3%	<0.00	0.085
2			5,136	0.5%	1	
1	F17	Nicotine dependence	3,593	7.3%	<0.00	0.070
2			96,860	9.3%	1	

1	E66.0	Obesity due to excess calories	9,157	18.7%	<0.00	0.366
2			69,998	6.7%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	150	0.3%	0.118	0.007
2			3,643	0.3%		
1	E66.3	Overweight	1,010	2.1%	<0.00	0.122
2			6,796	0.7%	1	
1	E66.8	Other obesity	235	0.5%	<0.00	0.065
2			1,298	0.1%	1	
1	E66.9	Obesity, unspecified	13,805	28.2%	<0.00	0.433
2			118,555	11.3%	1	
1	Z72.0	Tobacco use	1,064	2.2%	<0.00	0.064
2			13,876	1.3%	1	
1	Z85.09	Personal history of malignant neoplasm of other digestive organs	10	0.0%	0.571	0.003
2			256	0.0%		
1	B96.8	Helicobacter pylori [H. pylori] as the cause of diseases classified elsewhere	254	0.5%	<0.00	0.021
2	1		3,973	0.4%	1	
1	D13.1	Benign neoplasm of stomach	213	0.4%	<0.00	0.023
2			3,086	0.3%	1	
1	K31.7	Polyp of stomach and duodenum	266	0.5%	<0.00	0.028
2			3,728	0.4%	1	
1	D51.0	Vitamin B12 deficiency anemia due to intrinsic factor deficiency	143	0.3%	<0.00	0.018
2			2,101	0.2%	1	
1	Z80.0	Family history of malignant neoplasm of digestive organs	784	1.6%	<0.00	0.089
2			6,889	0.7%	1	
1	D83	Common variable immunodeficiency	19	0.0%	0.582	0.002
2			356	0.0%		
1	B27	Infectious mononucleosis	45	0.1%	<0.00	0.016
2			513	0.0%	1	
Procedure						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	10073	Excision Procedures on the Stomach	10	0.0%	0.057	0.008
2	52		115	0.0%		
Medication						

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10B		27,075	55.3%	<0.00	0.806
2	A		199,802	19.1%	1	
1	A10B		14,077	28.7%	<0.00	0.424
2	B		125,703	12.0%	1	
1	A10B		229	0.5%	<0.00	0.054
2	F		1,718	0.2%	1	
1	A10B		4,107	8.4%	<0.00	0.213
2	G		35,435	3.4%	1	
1	A10B		9,485	19.4%	<0.00	0.481
2	H		44,595	4.3%	1	
1	A10B		4,808	9.8%	<0.00	0.423
2	K		6,447	0.6%	1	
1	A10B		614	1.3%	<0.00	0.059
2	X		7,048	0.7%	1	

Group 1 (N = 48,449) and group 2 (N = 48,449) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	55.9 +/- 11.7	48,449	100%	0.030	0.014
2		56.1 +/- 13.2	48,449	100%		
1	2106-3		32,245	66.6%	<0.00	0.042
2			33,198	68.5%	1	
1	1002-5		196	0.4%	0.091	0.011
2			164	0.3%		
1	UNK		6,980	14.4%	0.002	0.020
2			6,650	13.7%		
1	F		25,712	53.1%	0.004	0.018
2			26,156	54.0%		
1	2076-8		204	0.4%	0.011	0.016
2			156	0.3%		
1	UN		2,170	4.5%	0.037	0.013
2			2,038	4.2%		
1	2186-5		32,837	67.8%	0.036	0.013
2			33,141	68.4%		

1	2135-2	Hispanic or Latino	4,114	8.5%	0.525	0.004
2			4,059	8.4%		
1	2054-5	Black or African American	6,222	12.8%	0.001	0.021
2			5,889	12.2%		
1	M	Male	20,567	42.5%	0.042	0.013
2			20,255	41.8%		
1	2028-9	Asian	1,196	2.5%	0.003	0.019
2			1,055	2.2%		

Diagnosis

Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances		676	1.4%	0.004	0.019
2	Z65			574	1.2%		
1	E66	Overweight and obesity		17,989	37.1%	0.942	<0.001
2				17,978	37.1%		
1	Z68.3	Body mass index [BMI] 30-39, adult		4,050	8.4%	<0.001	0.029
2				3,670	7.6%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult		3,782	7.8%	<0.001	0.032
2				3,380	7.0%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult		156	0.3%	0.293	0.007
2				138	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult		171	0.4%	0.345	0.006
2				154	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult		282	0.6%	0.019	0.015
2				229	0.5%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult		332	0.7%	0.302	0.007
2				306	0.6%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult		386	0.8%	0.027	0.014
2				327	0.7%		
1	F10	Alcohol related disorders		563	1.2%	0.018	0.015
2				487	1.0%		

1	Z80	Family history of primary malignant neoplasm	1,992	4.1%	0.009	0.017
2			1,834	3.8%		
1	Z15.0	Genetic susceptibility to malignant neoplasm	22	0.0%	0.527	0.004
2			18	0.0%		
1	Z12	Encounter for screening for malignant neoplasms	11,930	24.6%	0.002	0.020
2			11,522	23.8%		
1	Z85	Personal history of malignant neoplasm	1,232	2.5%	0.003	0.019
2			1,090	2.2%		
1	Z98.84	Bariatric surgery status	614	1.3%	0.795	0.002
2			605	1.2%		
1	F17	Nicotine dependence	3,576	7.4%	<0.001	0.032
2			3,185	6.6%		
1	E66.0	Obesity due to excess calories	8,912	18.4%	0.967	<0.001
2			8,907	18.4%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	148	0.3%	0.724	0.002
2			142	0.3%		
1	E66.3	Overweight	976	2.0%	0.040	0.013
2			888	1.8%		
1	E66.8	Other obesity	220	0.5%	0.259	0.007
2			197	0.4%		
1	E66.9	Obesity, unspecified	13,470	27.8%	0.863	0.001
2			13,494	27.9%		
1	Z72.0	Tobacco use	1,044	2.2%	0.157	0.009
2			981	2.0%		
1	Z85.09	Personal history of malignant neoplasm of other digestive organs	10	0.0%	1	<0.001
2			10	0.0%		
1	B96.8 1	Helicobacter pylori [H. pylori] as the cause of diseases classified elsewhere	253	0.5%	0.253	0.007
2			228	0.5%		
1	D13.1	Benign neoplasm of stomach	209	0.4%	0.039	0.013
2			169	0.3%		
1	K31.7	Polyp of stomach and duodenum	259	0.5%	0.300	0.007
2			236	0.5%		
1	D51.0	Vitamin B12 deficiency anemia	139	0.3%	0.088	0.011
2			112	0.2%		

		due to intrinsic factor deficiency					
1	Z80.0	Family history of malignant neoplasm of digestive organs	763	1.6%	0.047	0.013	
2			688	1.4%			
1	D83	Common variable immunodeficiency	18	0.0%	0.601	0.003	
2			15	0.0%			
1	B27	Infectious mononucleosis	44	0.1%	0.753	0.002	
2			47	0.1%			
Procedure							
	Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	10073	Excision Procedures on the Stomach		10	0.0%	1	<0.001
2	52			10	0.0%		
Medication							
	Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10B	Biguanides		26,543	54.8%	0.012	0.016
2	A			26,933	55.6%		
1	A10B	Sulfonylureas		13,757	28.4%	0.015	0.016
2	B			14,099	29.1%		
1	A10B	Alpha glucosidase inhibitors		222	0.5%	0.140	0.009
2	F			192	0.4%		
1	A10B	Thiazolidinediones		4,018	8.3%	0.261	0.007
2	G			4,115	8.5%		
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors		9,089	18.8%	0.349	0.006
2	H			9,203	19.0%		
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors		4,303	8.9%	<0.001	0.036
2	K			3,823	7.9%		
1	A10B	Other blood glucose lowering drugs, excl. insulins		606	1.3%	0.502	0.004
2	X			583	1.2%		

eTable 7. Characteristics of the GLP-1RA/no insulin group and insulin/no GLP-1RA group before and after matched for covariates related to kidney cancer for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 48,983) and group 2 (N = 1,044,745) characteristics before propensity score matching						
Demographics						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	48,983	100%	<0.00	0.420
2			1,044,745	100%	1	
1	2106-3	White	32,592	66.5%	<0.00	0.122
2			633,989	60.7%	1	
1	1002-5	American Indian or Alaska Native	199	0.4%	0.004	0.013
2			3,443	0.3%		
1	UNK	Unknown Race	7,099	14.5%	<0.00	0.025
2			142,470	13.6%	1	
1	F	Female	26,011	53.1%	<0.00	0.151
2			476,110	45.6%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander	205	0.4%	<0.00	0.071
2			10,677	1.0%	1	
1	UN	Unknown Gender	2,252	4.6%	<0.00	0.106
2			27,321	2.6%	1	
1	2186-5	Not Hispanic or Latino	33,188	67.8%	<0.00	0.098
2			659,375	63.1%	1	
1	2135-2	Hispanic or Latino	4,151	8.5%	<0.00	0.019
2			94,136	9.0%	1	
1	2054-5	Black or African American	6,265	12.8%	<0.00	0.120
2			178,267	17.1%	1	
1	M	Male	20,720	42.3%	<0.00	0.191
2			541,314	51.8%	1	
1	2028-9	Asian	1,204	2.5%	<0.00	0.087
2			41,822	4.0%	1	
Diagnosis						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health	686	1.4%	<0.00	0.022
2	Z65	hazards related to socioeconomic and	12,021	1.2%	1	

		psychosocial circumstances				
1	E66	Overweight and obesity	18,401	37.6%	<0.00	0.504
2			166,445	15.9%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	4,204	8.6%	<0.00	0.183
2			43,128	4.1%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,886	7.9%	<0.00	0.208
2			33,396	3.2%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	157	0.3%	0.563	0.003
2			3,510	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	171	0.3%	0.957	<0.001
2			3,632	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	288	0.6%	<0.00	0.026
2			4,209	0.4%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	344	0.7%	<0.00	0.036
2			4,508	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	398	0.8%	<0.00	0.044
2			4,843	0.5%	1	
1	Z80	Family history of primary malignant neoplasm	2,042	4.2%	<0.00	0.136
2			19,398	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	24	0.0%	<0.00	0.019
2			156	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	12,272	25.1%	<0.00	0.402
2			105,217	10.1%	1	
1	Z85	Personal history of malignant neoplasm	1,239	2.5%	<0.00	0.066
2			38,294	3.7%	1	
1	Z98.84	Bariatric surgery status	632	1.3%	<0.00	0.085
2			5,136	0.5%	1	
1	I10	Essential (primary) hypertension	29,049	59.3%	<0.00	0.218
2			506,936	48.5%	1	
1	F17	Nicotine dependence	3,593	7.3%	<0.00	0.070
2			96,860	9.3%	1	

1	2	E66.0	Obesity due to excess calories	9,157	18.7%	<0.00	0.366
				69,998	6.7%	1	
1	2	E66.2	Morbid (severe) obesity with alveolar hypoventilation	150	0.3%	0.118	0.007
				3,643	0.3%		
1	2	E66.3	Overweight	1,010	2.1%	<0.00	0.122
				6,796	0.7%	1	
1	2	E66.8	Other obesity	235	0.5%	<0.00	0.065
				1,298	0.1%	1	
1	2	E66.9	Obesity, unspecified	13,805	28.2%	<0.00	0.433
				118,555	11.3%	1	
1	2	Z72.0	Tobacco use	1,064	2.2%	<0.00	0.064
				13,876	1.3%	1	
1	2	Z80.51	Family history of malignant neoplasm of kidney	18	0.0%	0.011	0.010
				207	0.0%		
1	2	N18	Chronic kidney disease (CKD)	2,631	5.4%	<0.00	0.287
				143,501	13.7%	1	
1	2	N19	Unspecified kidney failure	98	0.2%	<0.00	0.127
				13,506	1.3%	1	
1	2	Z99.2	Dependence on renal dialysis	40	0.1%	<0.00	0.174
				17,914	1.7%	1	
1	2	N17- N19	Acute kidney failure and chronic kidney disease	3,016	6.2%	<0.00	0.368
				187,587	18.0%	1	
1	2	Q85.8 3	Von Hippel-Lindau syndrome	0	0%	0.494	0.004
				10	0.0%		
1	2	Q85.1	Tuberous sclerosis	10	0.0%	<0.00	0.016
				30	0.0%	1	
1	2	D57.1	Sickle-cell disease without crisis	10	0.0%	0.004	0.016
				516	0.0%		
1	2	D30.0	Benign neoplasm of kidney	31	0.1%	0.038	0.009
				451	0.0%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 A10B		27,075	55.3%	<0.00	0.806
2 A		199,802	19.1%	1	
1 A10B		14,077	28.7%	<0.00	0.424
2 B		125,703	12.0%	1	

1	A10B	Alpha glucosidase inhibitors	229	0.5%	<0.001	0.054
2	F		1,718	0.2%		
1	A10B	Thiazolidinediones	4,107	8.4%	<0.001	0.213
2	G		35,435	3.4%		
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors	9,485	19.4%	<0.001	0.481
2	H		44,595	4.3%		
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	4,808	9.8%	<0.001	0.423
2	K		6,447	0.6%		
1	A10B	Other blood glucose lowering drugs, excl. insulins	614	1.3%	<0.001	0.059
2	X		7,048	0.7%		
1	161	acetaminophen	13,013	26.6%	<0.001	0.068
2			309,279	29.6%		

Group 1 (N = 48,322) and group 2 (N = 48,322) characteristics after propensity score matching

Demographics

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1	55.9 +/- 11.8	48,322	100%	<0.001	0.026
2	56.3 +/- 13.7	48,322	100%		
1		32,173	66.6%	<0.001	0.039
2		33,049	68.4%		
1		197	0.4%	1	<0.001
2		197	0.4%		
1		6,946	14.4%	0.002	0.020
2		6,604	13.7%		
1		25,662	53.1%	0.004	0.019
2		26,111	54.0%		
1		203	0.4%	0.015	0.016
2		157	0.3%		
1		2,143	4.4%	0.039	0.013
2		2,013	4.2%		
1		32,743	67.8%	0.012	0.016
2		33,107	68.5%		
1		4,109	8.5%	0.431	0.005
2		4,041	8.4%		
1		6,204	12.8%	0.003	0.019
2		5,901	12.2%		

1			20,517	42.5%			
2	M	Male	20,198	41.8%	0.038	0.013	
1			1,193	2.5%			
2	2028-9	Asian	1,036	2.1%	0.001	0.022	
Diagnosis							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances		675	1.4%	0.049	0.013
2	Z65			605	1.3%		
1	E66	Overweight and obesity		17,884	37.0%	0.947	<0.001
2				17,874	37.0%		
1	Z68.3	Body mass index [BMI] 30-39, adult		4,013	8.3%	0.001	0.021
2				3,732	7.7%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult		3,743	7.7%	<0.001	0.028
2				3,394	7.0%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult		155	0.3%	0.320	0.006
2				138	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult		170	0.4%	0.158	0.009
2				145	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult		278	0.6%	0.077	0.011
2				238	0.5%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult		327	0.7%	0.969	<0.001
2				328	0.7%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult		382	0.8%	0.180	0.009
2				346	0.7%		
1	Z80	Family history of primary malignant neoplasm		1,969	4.1%	0.078	0.011
2				1,862	3.9%		
1	Z15.0	Genetic susceptibility to malignant neoplasm		22	0.0%	0.250	0.007
2				15	0.0%		

1	Z12	Encounter for screening for malignant neoplasms	11,859	24.5%	0.003	0.019
2			11,466	23.7%		
1	Z85	Personal history of malignant neoplasm	1,223	2.5%	0.010	0.017
2			1,100	2.3%		
1	Z98.84	Bariatric surgery status	615	1.3%	0.469	0.005
2			590	1.2%		
1	I10	Essential (primary) hypertension	28,525	59.0%	0.647	0.003
2			28,455	58.9%		
1	F17	Nicotine dependence	3,567	7.4%	<0.00	0.031
2			3,184	6.6%	1	
1	E66.0	Obesity due to excess calories	8,844	18.3%	0.139	0.010
2			8,667	17.9%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	145	0.3%	0.303	0.007
2			128	0.3%		
1	E66.3	Overweight	966	2.0%	0.010	0.017
2			857	1.8%		
1	E66.8	Other obesity	224	0.5%	0.156	0.009
2			195	0.4%		
1	E66.9	Obesity, unspecified	13,394	27.7%	0.199	0.008
2			13,573	28.1%		
1	Z72.0	Tobacco use	1,042	2.2%	0.012	0.016
2			932	1.9%		
1	Z80.51	Family history of malignant neoplasm of kidney	17	0.0%	0.724	0.002
2			15	0.0%		
1	N18	Chronic kidney disease (CKD)	2,624	5.4%	<0.00	0.035
2			2,256	4.7%	1	
1	N19	Unspecified kidney failure	98	0.2%	0.056	0.012
2			73	0.2%		
1	Z99.2	Dependence on renal dialysis	40	0.1%	0.564	0.004
2			35	0.1%		
1	N17-	Acute kidney failure and chronic kidney disease	3,009	6.2%	<0.00	0.041
2	N19		2,548	5.3%	1	
1	Q85.8	Von Hippel-Lindau syndrome	0	0%	--	--
2	3		0	0%		
1	Q85.1	Tuberous sclerosis	10	0.0%	1	<0.001
2			10	0.0%		
1	D57.1	Sickle-cell disease without crisis	10	0.0%	0.827	0.001
2			11	0.0%		

1	D30.0	Benign neoplasm of kidney		31	0.1%	0.276	0.007
2				23	0.0%		
Medication							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10B	Biguanides		26,421	54.7%	0.046	0.013
2	A			26,729	55.3%		
1	A10B	Sulfonylureas		13,668	28.3%	0.014	0.016
2	B			14,012	29.0%		
1	A10B	Alpha glucosidase inhibitors		220	0.5%	0.328	0.006
2	F			200	0.4%		
1	A10B	Thiazolidinediones		4,005	8.3%	0.771	0.002
2	G			4,030	8.3%		
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors		9,006	18.6%	0.661	0.003
2	H			8,953	18.5%		
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors		4,203	8.7%	<0.001	0.047
2	K			3,583	7.4%		
1	A10B	Other blood glucose lowering drugs, excl. insulins		603	1.2%	0.931	0.001
2	X			606	1.3%		
1	161	acetaminophen		12,902	26.7%	<0.001	0.027
2				12,334	25.5%		

eTable 8. Characteristics of the GLP-1RA/no insulin group and insulin/no GLP-1RA group before and after matched for covariates related to liver cancer for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 48,983) and group 2 (N = 1,044,745) characteristics before propensity score matching						
Demographics						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	48,983	100%	<0.00	0.420
2			1,044,745	100%	1	
1	2106-3	White	32,592	66.5%	<0.00	0.122
2			633,989	60.7%	1	
1	1002-5	American Indian or Alaska Native	199	0.4%	0.004	0.013
2			3,443	0.3%		
1	UNK	Unknown Race	7,099	14.5%	<0.00	0.025
2			142,470	13.6%	1	
1	F	Female	26,011	53.1%	<0.00	0.151
2			476,110	45.6%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander	205	0.4%	<0.00	0.071
2			10,677	1.0%	1	
1	UN	Unknown Gender	2,252	4.6%	<0.00	0.106
2			27,321	2.6%	1	
1	2186-5	Not Hispanic or Latino	33,188	67.8%	<0.00	0.098
2			659,375	63.1%	1	
1	2135-2	Hispanic or Latino	4,151	8.5%	<0.00	0.019
2			94,136	9.0%	1	
1	2054-5	Black or African American	6,265	12.8%	<0.00	0.120
2			178,267	17.1%	1	
1	M	Male	20,720	42.3%	<0.00	0.191
2			541,314	51.8%	1	
1	2028-9	Asian	1,204	2.5%	<0.00	0.087
2			41,822	4.0%	1	
Diagnosis						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health	686	1.4%	<0.00	0.022
2	Z65	hazards related to socioeconomic and	12,021	1.2%	1	

		psychosocial circumstances				
1	E66	Overweight and obesity	18,401	37.6%	<0.00	0.504
2			166,445	15.9%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	4,204	8.6%	<0.00	0.183
2			43,128	4.1%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,886	7.9%	<0.00	0.208
2			33,396	3.2%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	157	0.3%	0.563	0.003
2			3,510	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	171	0.3%	0.957	<0.001
2			3,632	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	288	0.6%	<0.00	0.026
2			4,209	0.4%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	344	0.7%	<0.00	0.036
2			4,508	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	398	0.8%	<0.00	0.044
2			4,843	0.5%	1	
1	F10	Alcohol related disorders	563	1.1%	<0.00	0.115
2			28,538	2.7%	1	
1	Z80	Family history of primary malignant neoplasm	2,042	4.2%	<0.00	0.136
2			19,398	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	24	0.0%	<0.00	0.019
2			156	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	12,272	25.1%	<0.00	0.402
2			105,217	10.1%	1	
1	Z85	Personal history of malignant neoplasm	1,239	2.5%	<0.00	0.066
2			38,294	3.7%	1	
1	Z98.84	Bariatric surgery status	632	1.3%	<0.00	0.085
2			5,136	0.5%	1	
1	E88.81	Metabolic syndrome and other insulin resistance	1,536	3.1%	<0.00	0.182
2			6,923	0.7%	1	

1	E78	Disorders of lipoprotein metabolism and other lipidemias	28,438	58.1%	<0.00	0.404
2			399,702	38.3%	1	
1	I10	Essential (primary) hypertension	29,049	59.3%	<0.00	0.218
2			506,936	48.5%	1	
1	K75.8	Nonalcoholic steatohepatitis (NASH)	475	1.0%	<0.00	0.082
2	1		3,277	0.3%	1	
1	F17	Nicotine dependence	3,593	7.3%	<0.00	0.070
2			96,860	9.3%	1	
1	E66.0	Obesity due to excess calories	9,157	18.7%	<0.00	0.366
2			69,998	6.7%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	150	0.3%	0.118	0.007
2			3,643	0.3%		
1	E66.3	Overweight	1,010	2.1%	<0.00	0.122
2			6,796	0.7%	1	
1	E66.8	Other obesity	235	0.5%	<0.00	0.065
2			1,298	0.1%	1	
1	E66.9	Obesity, unspecified	13,805	28.2%	<0.00	0.433
2			118,555	11.3%	1	
1	Z72.0	Tobacco use	1,064	2.2%	<0.00	0.064
2			13,876	1.3%	1	
1	B18	Chronic viral hepatitis	260	0.5%	<0.00	0.075
2			12,879	1.2%	1	
1	K74	Fibrosis and cirrhosis of liver	433	0.9%	<0.00	0.085
2			19,545	1.9%	1	
1	K76.0	Fatty (change of) liver, not elsewhere classified	3,131	6.4%	<0.00	0.207
2			23,105	2.2%	1	
1	K74.3	Primary biliary cirrhosis	20	0.0%	0.006	0.014
2			786	0.1%		
1	E83.11	Hereditary hemochromatosis	40	0.1%	<0.00	0.025
2	0		251	0.0%	1	
1	E70.21	Tyrosinemia	10	0.0%	<0.00	0.013
2			56	0.0%	1	
1	E88.01	Alpha-1-antitrypsin deficiency	16	0.0%	0.197	0.006
2			245	0.0%		
1	E80.1	Porphyria cutanea tarda	10	0.0%	<0.00	0.017
2			27	0.0%	1	

1	E74.0	Glycogen storage disease	10	0.0%	0.227	0.005
2			144	0.0%		
1	E83.00	Disorder of copper metabolism, unspecified	10	0.0%	0.018	0.009
2			99	0.0%		
1	T64	Toxic effect of aflatoxin and other mycotoxin food contaminants	10	0.0%	0.554	0.003
2			176	0.0%		
1	D13.4	Benign neoplasm of liver	35	0.1%	0.002	0.013
2			434	0.0%		

Medication

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10B		27,075	55.3%	<0.00	
2	A		199,802	19.1%	1	0.806
1	A10B		14,077	28.7%	<0.00	
2	B		125,703	12.0%	1	0.424
1	A10B		229	0.5%	<0.00	
2	F		1,718	0.2%	1	0.054
1	A10B		4,107	8.4%	<0.00	
2	G		35,435	3.4%	1	0.213
1	A10B		9,485	19.4%	<0.00	
2	H		44,595	4.3%	1	0.481
1	A10B		4,808	9.8%	<0.00	
2	K		6,447	0.6%	1	0.423
1	A10B		614	1.3%	<0.00	
2	X		7,048	0.7%	1	0.059
1	A14A		60	0.1%	<0.00	
2			379	0.0%	1	0.031

Group 1 (N = 48,397) and group 2 (N = 48,397) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	55.9 +/- 11.7	48,397	100%	0.004	0.018
2		56.2 +/- 13.7	48,397	100%		
1	2106-3		32,208	66.5%	<0.00	
2			33,287	68.8%	1	0.048

1	1002-5	American Indian or Alaska Native	196	0.4%	0.191	0.008
2			171	0.4%		
1	UNK	Unknown Race	6,970	14.4%	<0.00	0.032
2			6,443	13.3%	1	
1	F	Female	25,674	53.0%	<0.00	0.024
2			26,256	54.3%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander	204	0.4%	0.088	0.011
2			171	0.4%		
1	UN	Unknown Gender	2,164	4.5%	<0.00	0.029
2			1,881	3.9%	1	
1	2186-5	Not Hispanic or Latino	32,793	67.8%	<0.00	0.022
2			33,299	68.8%	1	
1	2135-2	Hispanic or Latino	4,114	8.5%	0.042	0.013
2			3,939	8.1%		
1	2054-5	Black or African American	6,219	12.8%	0.027	0.014
2			5,991	12.4%		
1	M	Male	20,559	42.5%	0.052	0.013
2			20,260	41.9%		
1	2028-9	Asian	1,193	2.5%	<0.00	0.025
2			1,012	2.1%	1	

Diagnosis

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	677	1.4%	0.088	0.011
2		616	1.3%		
1	E66	17,951	37.1%	0.398	0.005
2		18,078	37.4%		
1	Z68.3	4,032	8.3%	<0.00	0.028
2		3,671	7.6%		
1	Z68.4	3,768	7.8%	<0.00	0.028
2		3,414	7.1%		
1	Z68.25	156	0.3%	0.109	0.010
2		129	0.3%		

1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	171	0.4%	0.178	0.009
2			147	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	282	0.6%	0.048	0.013
2			237	0.5%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	331	0.7%	0.361	0.006
2			308	0.6%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	385	0.8%	0.182	0.009
2			349	0.7%		
1	F10	Alcohol related disorders	562	1.2%	<0.001	0.026
2			436	0.9%		
1	Z80	Family history of primary malignant neoplasm	1,983	4.1%	0.131	0.010
2			1,891	3.9%		
1	Z15.0	Genetic susceptibility to malignant neoplasm	22	0.0%	0.182	0.009
2			14	0.0%		
1	Z12	Encounter for screening for malignant neoplasms	11,908	24.6%	0.004	0.018
2			11,526	23.8%		
1	Z85	Personal history of malignant neoplasm	1,229	2.5%	<0.001	0.027
2			1,032	2.1%		
1	Z98.84	Bariatric surgery status	611	1.3%	0.142	0.009
2			561	1.2%		
1	E88.81	Metabolic syndrome and other insulin resistance	1,480	3.1%	0.752	0.002
2			1,497	3.1%		
1	E78	Disorders of lipoprotein metabolism and other lipidemias	27,908	57.7%	0.927	0.001
2			27,922	57.7%		
1	I10	Essential (primary) hypertension	28,605	59.1%	0.896	0.001
2			28,625	59.1%		
1	K75.81	Nonalcoholic steatohepatitis (NASH)	445	0.9%	0.374	0.006
2			419	0.9%		
1	F17	Nicotine dependence	3,568	7.4%	<0.001	0.033
2			3,165	6.5%		

1	E66.0	Obesity due to excess calories	8,878	18.3%	0.727	0.002
2			8,836	18.3%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	149	0.3%	0.230	0.008
2			129	0.3%		
1	E66.3	Overweight	975	2.0%	0.080	0.011
2			900	1.9%		
1	E66.8	Other obesity	218	0.5%	0.378	0.006
2			200	0.4%		
1	E66.9	Obesity, unspecified	13,442	27.8%	0.057	0.012
2			13,708	28.3%		
1	Z72.0	Tobacco use	1,039	2.1%	0.262	0.007
2			989	2.0%		
1	B18	Chronic viral hepatitis	259	0.5%	0.030	0.014
2			212	0.4%		
1	K74	Fibrosis and cirrhosis of liver	428	0.9%	0.001	0.021
2			337	0.7%		
1	K76.0	Fatty (change of) liver, not elsewhere classified	3,006	6.2%	0.129	0.010
2			2,893	6.0%		
1	K74.3	Primary biliary cirrhosis	20	0.0%	0.398	0.005
2			15	0.0%		
1	E83.11	Hereditary hemochromatosis	39	0.1%	0.059	0.012
2	0		24	0.0%		
1	E70.21	Tyrosinemia	10	0.0%	1	<0.001
2			10	0.0%		
1	E88.01	Alpha-1-antitrypsin deficiency	16	0.0%	0.862	0.001
2			17	0.0%		
1	E80.1	Porphyria cutanea tarda	10	0.0%	0.002	0.020
2			0	0%		
1	E74.0	Glycogen storage disease	10	0.0%	1	<0.001
2			10	0.0%		
1	E83.00	Disorder of copper metabolism, unspecified	10	0.0%	1	<0.001
2			10	0.0%		
1	T64	Toxic effect of aflatoxin and other mycotoxin food contaminants	10	0.0%	1	<0.001
2			10	0.0%		
1	D13.4	Benign neoplasm of liver	33	0.1%	0.181	0.009
2			23	0.0%		

Medication

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10B		26,497	54.7%	0.002	0.020
2	A	Biguanides	26,968	55.7%		
1	A10B		13,741	28.4%	0.011	0.016
2	B	Sulfonylureas	14,100	29.1%		
1	A10B		223	0.5%	0.774	0.002
2	F	Alpha glucosidase inhibitors	217	0.4%		
1	A10B		4,019	8.3%	0.276	0.007
2	G	Thiazolidinediones	4,113	8.5%		
1	A10B		9,071	18.7%	0.559	0.004
2	H	Dipeptidyl peptidase 4 (DPP-4) inhibitors	9,142	18.9%		
1	A10B		4,271	8.8%	<0.001	0.043
2	K	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	3,699	7.6%		
1	A10B		606	1.3%	0.492	0.004
2	X	Other blood glucose lowering drugs, excl. insulins	630	1.3%		
1	A14A		59	0.1%	0.204	0.008
2	A14A	ANABOLIC STEROIDS	46	0.1%		

eTable 9. Characteristics of the GLP-1RA/no insulin group and insulin/no GLP-1RA group before and after matched for covariates related to ovarian cancer for the study populations of women with T2D and no history of any OAC

Group 1 (N = 26,011) and group 2 (N = 476,110) characteristics before propensity score matching						
Demographics						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	26,011	100%	<0.00	0.469
2			476,110	100%	1	
1	2106-3	White	17,165	66.0%	<0.00	0.138
2			282,423	59.3%	1	
1	1002-5	American Indian or Alaska Native	123	0.5%	0.003	0.018
2			1,701	0.4%		
1	UNK	Unknown Race	2,772	10.7%	<0.00	0.035
2			55,979	11.8%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander	105	0.4%	<0.00	0.075
2			4,943	1.0%	1	
1	UN	Unknown Ethnicity	5,078	19.5%	<0.00	0.156
2			124,092	26.1%	1	
1	2186-5	Not Hispanic or Latino	18,384	70.7%	<0.00	0.142
2			304,990	64.1%	1	
1	2135-2	Hispanic or Latino	2,549	9.8%	0.682	0.003
2			47,028	9.9%		
1	2054-5	Black or African American	4,436	17.1%	<0.00	0.077
2			95,352	20.0%	1	
1	2028-9	Asian	619	2.4%	<0.00	0.098
2			19,593	4.1%	1	
Diagnosis						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55- Z65	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	468	1.8%	<0.00	0.048
2			5,762	1.2%	1	
1	E66	Overweight and obesity	10,477	40.3%	<0.00	0.493
2			87,968	18.5%	1	

1	Z68.3	Body mass index [BMI] 30-39, adult	1,815	7.0%	<0.00	0.146
2			17,667	3.7%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	2,154	8.3%	<0.00	0.183
2			18,645	3.9%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	56	0.2%	0.857	0.001
2			1,000	0.2%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	50	0.2%	0.747	0.002
2			959	0.2%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	87	0.3%	0.003	0.018
2			1,140	0.2%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	107	0.4%	<0.00	0.025
2			1,266	0.3%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	119	0.5%	<0.00	0.028
2			1,376	0.3%	1	
1	F10	Alcohol related disorders	197	0.8%	<0.00	0.058
2			6,405	1.3%	1	
1	Z80	Family history of primary malignant neoplasm	1,430	5.5%	<0.00	0.160
2			11,367	2.4%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	<0.00	0.023
2			100	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	7,877	30.3%	<0.00	0.410
2			65,044	13.7%	1	
1	Z85	Personal history of malignant neoplasm	593	2.3%	<0.00	0.052
2			14,844	3.1%	1	
1	Z98.84	Bariatric surgery status	474	1.8%	<0.00	0.099
2			3,408	0.7%	1	
1	F17	Nicotine dependence	1,905	7.3%	<0.00	0.035
2			39,400	8.3%	1	
1	E66.0	Obesity due to excess calories	5,392	20.7%	<0.00	0.356
2			39,813	8.4%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	82	0.3%	0.029	0.015
2			1,919	0.4%		

1	E66.3	Overweight	535	2.1%	<0.00	0.120
2			3,181	0.7%	1	
1	E66.8	Other obesity	134	0.5%	<0.00	0.064
2			702	0.1%	1	
1	E66.9	Obesity, unspecified	7,879	30.3%	<0.00	0.431
2			61,596	12.9%	1	
1	Z72.0	Tobacco use	572	2.2%	<0.00	0.075
2			5,857	1.2%	1	
1	Z79.89	Hormone	137	0.5%	<0.00	0.037
2	0	replacement therapy	1,374	0.3%	1	
1	Z92.23	Personal history of	10	0.0%	0.233	0.007
2		estrogen therapy	124	0.0%		
1	Z80.3	Family history of	736	2.8%	<0.00	0.127
2		malignant neoplasm	5,122	1.1%	1	
		of breast				
1	E28.2	Polycystic ovarian	979	3.8%	<0.00	0.219
2		syndrome	2,780	0.6%	1	
1	Z80.41	Family history of	104	0.4%	<0.00	0.056
2		malignant neoplasm	554	0.1%	1	
		of ovary				
1	D27	Benign neoplasm of	95	0.4%	<0.00	0.033
2		ovary	902	0.2%	1	

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 A10B		14,271	54.9%	<0.00	0.780
2 A		93,949	19.7%	1	
1 A10B		6,822	26.2%	<0.00	0.373
2 B		56,352	11.8%	1	
1 A10B		112	0.4%	<0.00	0.049
2 F		784	0.2%	1	
1 A10B		1,834	7.1%	<0.00	0.170
2 G		15,689	3.3%	1	
1 A10B		4,637	17.8%	<0.00	0.444
2 H		20,235	4.3%	1	
1 A10B		2,219	8.5%	<0.00	0.391
2 K		2,614	0.5%	1	
1 A10B		297	1.1%	<0.00	0.047
2 X		3,287	0.7%	1	

1	HS200	CONTRACEPTIVE		1,345	5.2%	<0.00	0.237
2		S,SYSTEMIC		5,117	1.1%	1	

Group 1 (N = 25,739) and group 2 (N = 25,739) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	25,739	100%	0.081	0.015
2			25,739	100%		
1	2106-3	White	16,960	65.9%	<0.00	0.039
2			17,436	67.7%		
1	1002-5	American Indian or Alaska Native	123	0.5%	0.323	0.009
2			108	0.4%		
1	UNK	Unknown Race	2,754	10.7%	0.052	0.017
2			2,619	10.2%		
1	2076-8	Native Hawaiian or Other Pacific Islander	105	0.4%	0.092	0.015
2			82	0.3%		
1	UN	Unknown Ethnicity	5,052	19.6%	0.103	0.014
2			4,906	19.1%		
1	2186-5	Not Hispanic or Latino	18,163	70.6%	0.074	0.016
2			18,347	71.3%		
1	2135-2	Hispanic or Latino	2,524	9.8%	0.572	0.005
2			2,486	9.7%		
1	2054-5	Black or African American	4,396	17.1%	0.104	0.014
2			4,258	16.5%		
1	2028-9	Asian	615	2.4%	0.024	0.020
2			539	2.1%		

Diagnosis

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55- Z65	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	461	1.8%	0.143	0.013
2			418	1.6%		
1	E66	Overweight and obesity	10,260	39.9%	0.517	0.006
2			10,332	40.1%		
1	Z68.3	Body mass index [BMI] 30-39, adult	1,779	6.9%	<0.00	0.035
2			1,559	6.1%		

1 2	Z68.4	Body mass index [BMI] 40 or greater, adult	2,100 1,922	8.2% 7.5%	0.003	0.026
1 2	Z68.25	Body mass index [BMI] 25.0-25.9, adult	56 50	0.2% 0.2%	0.560	0.005
1 2	Z68.26	Body mass index [BMI] 26.0-26.9, adult	50 58	0.2% 0.2%	0.441	0.007
1 2	Z68.27	Body mass index [BMI] 27.0-27.9, adult	87 69	0.3% 0.3%	0.149	0.013
1 2	Z68.28	Body mass index [BMI] 28.0-28.9, adult	106 85	0.4% 0.3%	0.128	0.013
1 2	Z68.29	Body mass index [BMI] 29.0-29.9, adult	118 91	0.5% 0.4%	0.061	0.016
1 2	F10	Alcohol related disorders	197 155	0.8% 0.6%	0.025	0.020
1 2	Z80	Family history of primary malignant neoplasm	1,396 1,245	5.4% 4.8%	0.003	0.027
1 2	Z15.0	Genetic susceptibility to malignant neoplasm	17 10	0.1% 0.0%	0.178	0.012
1 2	Z12	Encounter for screening for malignant neoplasms	7,694 7,284	29.9% 28.3%	<0.00 1	0.035
1 2	Z85	Personal history of malignant neoplasm	590 509	2.3% 2.0%	0.014	0.022
1 2	Z98.84	Bariatric surgery status	459 456	1.8% 1.8%	0.920	0.001
1 2	F17	Nicotine dependence	1,889 1,719	7.3% 6.7%	0.003	0.026
1 2	E66.0	Obesity due to excess calories	5,262 5,280	20.4% 20.5%	0.844	0.002
1 2	E66.2	Morbid (severe) obesity with alveolar hypoventilation	81 71	0.3% 0.3%	0.417	0.007
1 2	E66.3	Overweight	512 463	2.0% 1.8%	0.113	0.014

1	E66.8	Other obesity	127	0.5%	0.900	0.001
2			129	0.5%		
1	E66.9	Obesity, unspecified	7,706	29.9%	0.265	0.010
2			7,822	30.4%		
1	Z72.0	Tobacco use	562	2.2%	0.359	0.008
2			532	2.1%		
1	Z79.89	Hormone	134	0.5%	0.094	0.015
2	0	replacement therapy	108	0.4%		
1	Z92.23	Personal history of	10	0.0%	1	<0.001
2		estrogen therapy	10	0.0%		
1	Z80.3	Family history of	720	2.8%	0.021	0.020
2		malignant neoplasm of breast	636	2.5%		
1	E28.2	Polycystic ovarian	938	3.6%	0.380	0.008
2		syndrome	901	3.5%		
1	Z80.41	Family history of	99	0.4%	0.338	0.008
2		malignant neoplasm of ovary	86	0.3%		
1	D27	Benign neoplasm of	94	0.4%	0.104	0.014
2		ovary	73	0.3%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 A10B		14,003	54.4%	0.062	0.016
2 A		14,214	55.2%		
1 A10B		6,697	26.0%	0.489	0.006
2 B		6,766	26.3%		
1 A10B		109	0.4%	0.363	0.008
2 F		96	0.4%		
1 A10B		1,797	7.0%	0.639	0.004
2 G		1,770	6.9%		
1 A10B		4,445	17.3%	0.709	0.003
2 H		4,477	17.4%		
1 A10B		1,970	7.7%	<0.001	0.042
2 K		1,690	6.6%		
1 A10B		292	1.1%	0.706	0.003
2 X		283	1.1%		
1 HS200		1,292	5.0%	0.135	0.013
2		1,219	4.7%		

eTable 10. Characteristics of the GLP-1RA/no insulin group and insulin/no GLP-1RA group before and after matched for covariates related to pancreatic cancer for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 48,983) and group 2 (N = 1,044,745) characteristics before propensity score matching						
Demographics						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	48,983	100%	<0.00	0.420
2			1,044,745	100%	1	
1	2106-3	White	32,592	66.5%	<0.00	0.122
2			633,989	60.7%	1	
1	1002-5	American Indian or Alaska Native	199	0.4%	0.004	0.013
2			3,443	0.3%		
1	UNK	Unknown Race	7,099	14.5%	<0.00	0.025
2			142,470	13.6%	1	
1	F	Female	26,011	53.1%	<0.00	0.151
2			476,110	45.6%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander	205	0.4%	<0.00	0.071
2			10,677	1.0%	1	
1	UN	Unknown Gender	2,252	4.6%	<0.00	0.106
2			27,321	2.6%	1	
1	2186-5	Not Hispanic or Latino	33,188	67.8%	<0.00	0.098
2			659,375	63.1%	1	
1	2135-2	Hispanic or Latino	4,151	8.5%	<0.00	0.019
2			94,136	9.0%	1	
1	2054-5	Black or African American	6,265	12.8%	<0.00	0.120
2			178,267	17.1%	1	
1	M	Male	20,720	42.3%	<0.00	0.191
2			541,314	51.8%	1	
1	2028-9	Asian	1,204	2.5%	<0.00	0.087
2			41,822	4.0%	1	
Diagnosis						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health	686	1.4%	<0.00	0.022
2	Z65	hazards related to socioeconomic and	12,021	1.2%	1	

		psychosocial circumstances				
1	E66	Overweight and obesity	18,401	37.6%	<0.00	0.504
2			166,445	15.9%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	4,204	8.6%	<0.00	0.183
2			43,128	4.1%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,886	7.9%	<0.00	0.208
2			33,396	3.2%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	157	0.3%	0.563	0.003
2			3,510	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	171	0.3%	0.957	<0.001
2			3,632	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	288	0.6%	<0.00	0.026
2			4,209	0.4%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	344	0.7%	<0.00	0.036
2			4,508	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	398	0.8%	<0.00	0.044
2			4,843	0.5%	1	
1	F10	Alcohol related disorders	563	1.1%	<0.00	0.115
2			28,538	2.7%	1	
1	Z80	Family history of primary malignant neoplasm	2,042	4.2%	<0.00	0.136
2			19,398	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	24	0.0%	<0.00	0.019
2			156	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	12,272	25.1%	<0.00	0.402
2			105,217	10.1%	1	
1	Z85	Personal history of malignant neoplasm	1,239	2.5%	<0.00	0.066
2			38,294	3.7%	1	
1	Z98.84	Bariatric surgery status	632	1.3%	<0.00	0.085
2			5,136	0.5%	1	
1	E66.0	Obesity due to excess calories	9,157	18.7%	<0.00	0.366
2			69,998	6.7%	1	

1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	150	0.3%	0.118	0.007
2			3,643	0.3%		
1	E66.3	Overweight	1,010	2.1%	<0.001	0.122
2			6,796	0.7%		
1	E66.8	Other obesity	235	0.5%	<0.001	0.065
2			1,298	0.1%		
1	E66.9	Obesity, unspecified	13,805	28.2%	<0.001	0.433
2			118,555	11.3%		
1	Z85.09	Personal history of malignant neoplasm of other digestive organs	10	0.0%	0.571	0.003
2			256	0.0%		
1	B96.8 1	Helicobacter pylori [H. pylori] as the cause of diseases classified elsewhere	254	0.5%	<0.001	0.021
2			3,973	0.4%		
1	Z80.0	Family history of malignant neoplasm of digestive organs	784	1.6%	<0.001	0.089
2			6,889	0.7%		
1	B18	Chronic viral hepatitis	260	0.5%	<0.001	0.075
2			12,879	1.2%		
1	K86.1	Other chronic pancreatitis	75	0.2%	<0.001	0.093
2			8,232	0.8%		
1	B16	Acute hepatitis B	55	0.1%	0.048	0.010
2			1,537	0.1%		
1	B18.1	Chronic viral hepatitis B without delta-agent	48	0.1%	0.002	0.016
2			1,611	0.2%		
1	Z72.0	Tobacco use	1,064	2.2%	<0.001	0.064
2			13,876	1.3%		
1	D13.6	Benign neoplasm of pancreas	10	0.0%	0.099	0.008
2			360	0.0%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 A10B 2 A		27,075	55.3%	<0.001	0.806
		199,802	19.1%		
1 A10B 2 B		14,077	28.7%	<0.001	0.424
		125,703	12.0%		
1 A10B 2 F		229	0.5%	<0.001	0.054
		1,718	0.2%		

1	A10B	Thiazolidinediones	4,107	8.4%	<0.00	0.213
2	G		35,435	3.4%	1	
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors	9,485	19.4%	<0.00	0.481
2	H		44,595	4.3%	1	
1	A10B	Sodium-glucose co- transporter 2 (SGLT2) inhibitors	4,808	9.8%	<0.00	0.423
2	K		6,447	0.6%	1	
1	A10B	Other blood glucose lowering drugs, excl. insulins	614	1.3%	<0.00	0.059
2	X		7,048	0.7%	1	

Group 1 (N = 48,490) and group 2 (N = 48,490) characteristics after propensity score matching

Demographics

Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	55.9 +/- 11.7	48,490	100%	0.154	0.009
2			56.0 +/- 13.1	48,490	100%		
1	2106-3	White		32,268	66.5%	<0.00	0.043
2			33,234	68.5%			
1	1002-5	American Indian or Alaska Native		197	0.4%	0.352	0.006
2			179	0.4%			
1	UNK	Unknown Race		6,991	14.4%	0.002	0.020
2			6,652	13.7%			
1	F	Female		25,736	53.1%	<0.00	0.022
2			26,279	54.2%			
1	2076-8	Native Hawaiian or Other Pacific Islander		205	0.4%	0.001	0.021
2			145	0.3%			
1	UN	Unknown Gender		2,179	4.5%	0.026	0.014
2			2,038	4.2%			
1	2186-5	Not Hispanic or Latino		32,860	67.8%	0.001	0.022
2			33,363	68.8%			
1	2135-2	Hispanic or Latino		4,119	8.5%	0.034	0.014
2			3,937	8.1%			
1	2054-5	Black or African American		6,223	12.8%	0.003	0.019
2			5,922	12.2%			
1	M	Male		20,575	42.4%	0.009	0.017
2			20,173	41.6%			
1	2028-9	Asian		1,199	2.5%	<0.00	0.022
2			1,036	2.1%			

Diagnosis

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 Z55- 2 Z65	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	679 566	1.4% 1.2%	0.001	0.021
1 E66 2	Overweight and obesity	18,013 17,981	37.1% 37.1%	0.832	0.001
1 Z68.3 2	Body mass index [BMI] 30-39, adult	4,063 3,633	8.4% 7.5%	<0.001	0.033
1 Z68.4 2	Body mass index [BMI] 40 or greater, adult	3,789 3,390	7.8% 7.0%	<0.001	0.031
1 Z68.25 2	Body mass index [BMI] 25.0-25.9, adult	156 150	0.3% 0.3%	0.731	0.002
1 Z68.26 2	Body mass index [BMI] 26.0-26.9, adult	171 149	0.4% 0.3%	0.218	0.008
1 Z68.27 2	Body mass index [BMI] 27.0-27.9, adult	284 233	0.6% 0.5%	0.025	0.014
1 Z68.28 2	Body mass index [BMI] 28.0-28.9, adult	334 283	0.7% 0.6%	0.039	0.013
1 Z68.29 2	Body mass index [BMI] 29.0-29.9, adult	386 351	0.8% 0.7%	0.196	0.008
1 F10 2	Alcohol related disorders	562 460	1.2% 0.9%	0.001	0.021
1 Z80 2	Family history of primary malignant neoplasm	1,995 1,859	4.1% 3.8%	0.025	0.014
1 Z15.0 2	Genetic susceptibility to malignant neoplasm	22 17	0.0% 0.0%	0.423	0.005
1 Z12 2	Encounter for screening for malignant neoplasms	11,955 11,588	24.7% 23.9%	0.006	0.018
1 Z85 2	Personal history of malignant neoplasm	1,230 1,109	2.5% 2.3%	0.011	0.016

1	Z98.84	Bariatric surgery status	613	1.3%	0.068	0.012
2			551	1.1%		
1	E66.0	Obesity due to excess calories	8,924	18.4%	0.315	0.006
2			8,803	18.2%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	149	0.3%	0.477	0.005
2			137	0.3%		
1	E66.3	Overweight	980	2.0%	0.090	0.011
2			907	1.9%		
1	E66.8	Other obesity	223	0.5%	0.186	0.008
2			196	0.4%		
1	E66.9	Obesity, unspecified	13,488	27.8%	0.331	0.006
2			13,624	28.1%		
1	Z85.09	Personal history of malignant neoplasm of other digestive organs	10	0.0%	1	<0.001
2			10	0.0%		
1	B96.8	Helicobacter pylori [H. pylori] as the cause of diseases classified elsewhere	252	0.5%	0.140	0.009
2			1	220		
1	Z80.0	Family history of malignant neoplasm of digestive organs	763	1.6%	0.005	0.018
2			659	1.4%		
1	B18	Chronic viral hepatitis	260	0.5%	0.048	0.013
2			217	0.4%		
1	K86.1	Other chronic pancreatitis	75	0.2%	0.025	0.014
2			105	0.2%		
1	B16	Acute hepatitis B	54	0.1%	0.033	0.014
2			34	0.1%		
1	B18.1	Chronic viral hepatitis B without delta-agent	48	0.1%	0.003	0.019
2			23	0.0%		
1	Z72.0	Tobacco use	1,047	2.2%	0.047	0.013
2			959	2.0%		
1	D13.6	Benign neoplasm of pancreas	10	0.0%	0.827	0.001
2			11	0.0%		
Medication						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10B	Biguanides	26,585	54.8%	0.005	0.018
2	A		27,020	55.7%		

1	A10B	Sulfonylureas	13,771	28.4%	0.143	0.009
2	B		13,977	28.8%		
1	A10B	Alpha glucosidase inhibitors	221	0.5%	0.153	0.009
2	F		192	0.4%		
1	A10B	Thiazolidinediones	4,030	8.3%	0.262	0.007
2	G		4,127	8.5%		
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors	9,110	18.8%	0.283	0.007
2	H		9,241	19.1%		
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	4,335	8.9%	<0.001	0.035
2	K		3,863	8.0%		
1	A10B	Other blood glucose lowering drugs, excl. insulins	607	1.3%	0.066	0.012
2	X		545	1.1%		

eTable 11. Characteristics of the GLP-1RA/no insulin group and insulin/no GLP-1RA group before and after matched for covariates related to thyroid cancer for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 48,983) and group 2 (N = 1,044,745) characteristics before propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1 2	AI Age at Index	55.9 +/- 11.7 61.8 +/- 15.9	48,983 1,044,745	100% 100%	<0.00 1	0.420
1 2	2106-3 White		32,592 633,989	66.5% 60.7%	<0.00 1	0.122
1 2	1002-5 American Indian or Alaska Native		199 3,443	0.4% 0.3%	0.004	0.013
1 2	UNK Unknown Race		7,099 142,470	14.5% 13.6%	<0.00 1	0.025
1 2	F Female		26,011 476,110	53.1% 45.6%	<0.00 1	0.151
1 2	2076-8 Native Hawaiian or Other Pacific Islander		205 10,677	0.4% 1.0%	<0.00 1	0.071
1 2	UN Unknown Gender		2,252 27,321	4.6% 2.6%	<0.00 1	0.106
1 2	2186-5 Not Hispanic or Latino		33,188 659,375	67.8% 63.1%	<0.00 1	0.098
1 2	2135-2 Hispanic or Latino		4,151 94,136	8.5% 9.0%	<0.00 1	0.019
1 2	2054-5 Black or African American		6,265 178,267	12.8% 17.1%	<0.00 1	0.120
1 2	M Male		20,720 541,314	42.3% 51.8%	<0.00 1	0.191
1 2	2028-9 Asian		1,204 41,822	2.5% 4.0%	<0.00 1	0.087

Diagnosis

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1 2	Z55- Z65 Persons with potential health hazards related to socioeconomic and		686 12,021	1.4% 1.2%	<0.00 1	0.022

		psychosocial circumstances				
1	E66	Overweight and obesity	18,401	37.6%	<0.00	0.504
2			166,445	15.9%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	4,204	8.6%	<0.00	0.183
2			43,128	4.1%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,886	7.9%	<0.00	0.208
2			33,396	3.2%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	157	0.3%	0.563	0.003
2			3,510	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	171	0.3%	0.957	<0.001
2			3,632	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	288	0.6%	<0.00	0.026
2			4,209	0.4%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	344	0.7%	<0.00	0.036
2			4,508	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	398	0.8%	<0.00	0.044
2			4,843	0.5%	1	
1	Z80	Family history of primary malignant neoplasm	2,042	4.2%	<0.00	0.136
2			19,398	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	24	0.0%	<0.00	0.019
2			156	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	12,272	25.1%	<0.00	0.402
2			105,217	10.1%	1	
1	Z85	Personal history of malignant neoplasm	1,239	2.5%	<0.00	0.066
2			38,294	3.7%	1	
1	Z98.84	Bariatric surgery status	632	1.3%	<0.00	0.085
2			5,136	0.5%	1	
1	E66.0	Obesity due to excess calories	9,157	18.7%	<0.00	0.366
2			69,998	6.7%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	150	0.3%	0.118	0.007
2			3,643	0.3%		

1	E66.3	Overweight		1,010	2.1%	<0.00	
2				6,796	0.7%	1	0.122
1	E66.8	Other obesity		235	0.5%	<0.00	
2				1,298	0.1%	1	0.065
1	E66.9	Obesity, unspecified		13,805	28.2%	<0.00	
2				118,555	11.3%	1	0.433
1	D34	Benign neoplasm of thyroid gland		65	0.1%	<0.00	
2				765	0.1%	1	0.019
Procedure							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	10278	Hereditary neuroendocrine tumor disorders (eg, medullary thyroid carcinoma, parathyroid carcinoma, malignant pheochromocytoma or paraganglioma)		0	0%	--	--
2	53			0	0%		
1	1001	Radiation		138	0.3%	<0.00	
2				7,649	0.7%	1	0.063
Medication							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10B	Biguanides		27,075	55.3%	<0.00	
2	A			199,802	19.1%	1	0.806
1	A10B	Sulfonylureas		14,077	28.7%	<0.00	
2	B			125,703	12.0%	1	0.424
1	A10B	Alpha glucosidase inhibitors		229	0.5%	<0.00	
2	F			1,718	0.2%	1	0.054
1	A10B	Thiazolidinediones		4,107	8.4%	<0.00	
2	G			35,435	3.4%	1	0.213
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors		9,485	19.4%	<0.00	
2	H			44,595	4.3%	1	0.481
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors		4,808	9.8%	<0.00	
2	K			6,447	0.6%	1	0.423
1	A10B	Other blood glucose lowering drugs, excl. insulins		614	1.3%	<0.00	
2	X			7,048	0.7%	1	0.059

Group 1 (N = 48,527) and group 2 (N = 48,527) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	AI	Age at Index	55.9 +/- 11.7	48,527	100%	0.154	0.009
2			56.0 +/- 13.0	48,527	100%		
1	2106-3	White	32,294	66.5%	<0.001	0.044	
2			33,289	68.6%			
1	1002-5	American Indian or Alaska Native	197	0.4%	0.092	0.011	
2			165	0.3%			
1	UNK	Unknown Race	6,995	14.4%	<0.001	0.023	
2			6,615	13.6%			
1	F	Female	25,749	53.1%	0.003	0.019	
2			26,218	54.0%			
1	2076-8	Native Hawaiian or Other Pacific Islander	205	0.4%	0.028	0.014	
2			163	0.3%			
1	UN	Unknown Gender	2,183	4.5%	0.028	0.014	
2			2,043	4.2%			
1	2186-5	Not Hispanic or Latino	32,880	67.8%	0.002	0.020	
2			33,324	68.7%			
1	2135-2	Hispanic or Latino	4,125	8.5%	0.006	0.018	
2			3,889	8.0%			
1	2054-5	Black or African American	6,231	12.8%	0.077	0.011	
2			6,048	12.5%			
1	M	Male	20,595	42.4%	0.032	0.014	
2			20,266	41.8%			
1	2028-9	Asian	1,196	2.5%	<0.001	0.029	
2			985	2.0%			

Diagnosis

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-Z65	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	682	1.4%	<0.001	0.022
2			560	1.2%		
1	E66	Overweight and obesity	18,048	37.2%	0.478	0.005
2			18,155	37.4%		

1	Z68.3	Body mass index [BMI] 30-39, adult	4,070	8.4%	<0.00 1	0.023
2			3,762	7.8%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,792	7.8%	<0.00 1	0.027
2			3,443	7.1%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	156	0.3%	0.775	0.002
2			151	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	171	0.4%	0.957	<0.001
2			172	0.4%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	285	0.6%	0.005	0.018
2			222	0.5%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	335	0.7%	0.019	0.015
2			277	0.6%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	385	0.8%	0.101	0.011
2			341	0.7%		
1	Z80	Family history of primary malignant neoplasm	1,997	4.1%	0.105	0.010
2			1,898	3.9%		
1	Z15.0	Genetic susceptibility to malignant neoplasm	22	0.0%	0.055	0.012
2			11	0.0%		
1	Z12	Encounter for screening for malignant neoplasms	11,975	24.7%	0.005	0.018
2			11,599	23.9%		
1	Z85	Personal history of malignant neoplasm	1,232	2.5%	<0.00 1	0.027
2			1,034	2.1%		
1	Z98.84	Bariatric surgery status	614	1.3%	0.954	<0.001
2			616	1.3%		
1	E66.0	Obesity due to excess calories	8,948	18.4%	0.486	0.004
2			8,864	18.3%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	147	0.3%	0.816	0.001
2			151	0.3%		
1	E66.3	Overweight	982	2.0%	0.009	0.017
2			870	1.8%		
1	E66.8	Other obesity	226	0.5%	0.011	0.016
2			175	0.4%		

1	E66.9	Obesity, unspecified		13,514	27.8%	0.017	0.015
2				13,850	28.5%		
1	D34	Benign neoplasm of thyroid gland		62	0.1%	0.580	0.004
2				56	0.1%		
Procedure							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	10278	Hereditary neuroendocrine tumor disorders (eg, medullary thyroid carcinoma, parathyroid carcinoma, malignant pheochromocytoma or paraganglioma)		0	0%	--	--
2	53			0	0%		
1	1001	Radiation		138	0.3%	0.320	0.006
2				155	0.3%		
Medication							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10B	Biguanides		26,621	54.9%	0.036	0.013
2	A			26,945	55.5%		
1	A10B	Sulfonylureas		13,798	28.4%	0.010	0.017
2	B			14,163	29.2%		
1	A10B	Alpha glucosidase inhibitors		222	0.5%	0.074	0.011
2	F			186	0.4%		
1	A10B	Thiazolidinediones		4,033	8.3%	0.243	0.007
2	G			4,134	8.5%		
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors		9,131	18.8%	0.501	0.004
2	H			9,213	19.0%		
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors		4,366	9.0%	<0.001	0.029
2	K			3,968	8.2%		
1	A10B	Other blood glucose lowering drugs, excl. insulins		607	1.3%	0.092	0.011
2	X			550	1.1%		

eTable 12. Characteristics of the GLP-1RA/no insulin group and insulin/no GLP-1RA group before and after matched for covariates related to meningioma for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 48,983) and group 2 (N = 1,044,745) characteristics before propensity score matching						
Demographics						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	48,983	100%	<0.00	0.420
2			1,044,745	100%	1	
1	2106-3	White	32,592	66.5%	<0.00	0.122
2			633,989	60.7%	1	
1	1002-5	American Indian or Alaska Native	199	0.4%	0.004	0.013
2			3,443	0.3%		
1	UNK	Unknown Race	7,099	14.5%	<0.00	0.025
2			142,470	13.6%	1	
1	F	Female	26,011	53.1%	<0.00	0.151
2			476,110	45.6%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander	205	0.4%	<0.00	0.071
2			10,677	1.0%	1	
1	UN	Unknown Gender	2,252	4.6%	<0.00	0.106
2			27,321	2.6%	1	
1	2186-5	Not Hispanic or Latino	33,188	67.8%	<0.00	0.098
2			659,375	63.1%	1	
1	2135-2	Hispanic or Latino	4,151	8.5%	<0.00	0.019
2			94,136	9.0%	1	
1	2054-5	Black or African American	6,265	12.8%	<0.00	0.120
2			178,267	17.1%	1	
1	M	Male	20,720	42.3%	<0.00	0.191
2			541,314	51.8%	1	
1	2028-9	Asian	1,204	2.5%	<0.00	0.087
2			41,822	4.0%	1	
Diagnosis						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health	686	1.4%	<0.00	0.022
2	Z65	hazards related to socioeconomic and	12,021	1.2%	1	

		psychosocial circumstances				
1	E66	Overweight and obesity	18,401	37.6%	<0.00	0.504
2			166,445	15.9%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	4,204	8.6%	<0.00	0.183
2			43,128	4.1%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,886	7.9%	<0.00	0.208
2			33,396	3.2%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	157	0.3%	0.563	0.003
2			3,510	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	171	0.3%	0.957	<0.001
2			3,632	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	288	0.6%	<0.00	0.026
2			4,209	0.4%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	344	0.7%	<0.00	0.036
2			4,508	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	398	0.8%	<0.00	0.044
2			4,843	0.5%	1	
1	Z80	Family history of primary malignant neoplasm	2,042	4.2%	<0.00	0.136
2			19,398	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	24	0.0%	<0.00	0.019
2			156	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	12,272	25.1%	<0.00	0.402
2			105,217	10.1%	1	
1	Z85	Personal history of malignant neoplasm	1,239	2.5%	<0.00	0.066
2			38,294	3.7%	1	
1	Z98.84	Bariatric surgery status	632	1.3%	<0.00	0.085
2			5,136	0.5%	1	
1	E66.0	Obesity due to excess calories	9,157	18.7%	<0.00	0.366
2			69,998	6.7%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	150	0.3%	0.118	0.007
2			3,643	0.3%		

1	E66.3	Overweight	1,010	2.1%	<0.00	0.122
2			6,796	0.7%	1	
1	E66.8	Other obesity	235	0.5%	<0.00	0.065
2			1,298	0.1%	1	
1	E66.9	Obesity, unspecified	13,805	28.2%	<0.00	0.433
2			118,555	11.3%	1	
1	Z79.89	Hormone	147	0.3%	<0.00	0.032
2	0	replacement therapy	1,533	0.1%	1	
1	Z92.23	Personal history of	10	0.0%	0.116	0.006
2		estrogen therapy	128	0.0%		
1	D32	Benign neoplasm of	90	0.2%	<0.00	0.025
2		meninges	3,214	0.3%	1	
1	S00-	Injuries to the head	2,121	4.3%	<0.00	0.060
2	S09		58,791	5.6%	1	
1	Z80.3	Family history of	804	1.6%	<0.00	0.103
2		malignant neoplasm of breast	5,952	0.6%	1	

Procedure

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1		138	0.3%	<0.00	0.063
2	1001	7,649	0.7%	1	

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10B	27,075	55.3%	<0.00	0.806
2	A	199,802	19.1%	1	
1	A10B	14,077	28.7%	<0.00	0.424
2	B	125,703	12.0%	1	
1	A10B	229	0.5%	<0.00	0.054
2	F	1,718	0.2%	1	
1	A10B	4,107	8.4%	<0.00	0.213
2	G	35,435	3.4%	1	
1	A10B	9,485	19.4%	<0.00	0.481
2	H	44,595	4.3%	1	
1	A10B	4,808	9.8%	<0.00	0.423
2	K	6,447	0.6%	1	
1	A10B	614	1.3%	<0.00	0.059
2	X	7,048	0.7%	1	

1	HS200	CONTRACEPTIVE		1,436	2.9%	<0.00	
2		S,SYSTEMIC		5,500	0.5%	1	0.185

Group 1 (N = 48,518) and group 2 (N = 48,518) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	48,518	100%	0.361	0.006
2			48,518	100%		
1	2106-3	White	32,296	66.6%	<0.00	0.042
2			33,257	68.5%	1	
1	1002-5	American Indian or Alaska Native	197	0.4%	0.300	0.007
2			177	0.4%		
1	UNK	Unknown Race	6,995	14.4%	0.001	0.022
2			6,626	13.7%		
1	F	Female	25,736	53.0%	0.001	0.022
2			26,259	54.1%		
1	2076-8	Native Hawaiian or Other Pacific Islander	205	0.4%	0.007	0.017
2			154	0.3%		
1	UN	Unknown Gender	2,182	4.5%	0.010	0.017
2			2,018	4.2%		
1	2186-5	Not Hispanic or Latino	32,879	67.8%	0.019	0.015
2			33,219	68.5%		
1	2135-2	Hispanic or Latino	4,118	8.5%	0.669	0.003
2			4,081	8.4%		
1	2054-5	Black or African American	6,222	12.8%	0.003	0.019
2			5,915	12.2%		
1	M	Male	20,600	42.5%	0.020	0.015
2			20,241	41.7%		
1	2028-9	Asian	1,195	2.5%	0.006	0.017
2			1,067	2.2%		

Diagnosis

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	681	1.4%	0.002	0.020
2	Z65		570	1.2%		

1	E66	Overweight and obesity	18,033	37.2%	0.889	0.001
2			18,054	37.2%		
1	Z68.3	Body mass index [BMI] 30-39, adult	4,068	8.4%	<0.001	0.028
2			3,696	7.6%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,789	7.8%	<0.001	0.029
2			3,420	7.0%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	156	0.3%	0.352	0.006
2			140	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	171	0.4%	0.317	0.006
2			153	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	283	0.6%	0.043	0.013
2			237	0.5%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	334	0.7%	0.077	0.011
2			290	0.6%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	386	0.8%	0.238	0.008
2			354	0.7%		
1	Z80	Family history of primary malignant neoplasm	1,995	4.1%	0.016	0.016
2			1,848	3.8%		
1	Z15.0	Genetic susceptibility to malignant neoplasm	23	0.0%	0.024	0.015
2			10	0.0%		
1	Z12	Encounter for screening for malignant neoplasms	11,961	24.7%	0.011	0.016
2			11,622	24.0%		
1	Z85	Personal history of malignant neoplasm	1,232	2.5%	0.002	0.020
2			1,084	2.2%		
1	Z98.84	Bariatric surgery status	614	1.3%	0.160	0.009
2			566	1.2%		
1	E66.0	Obesity due to excess calories	8,936	18.4%	0.642	0.003
2			8,880	18.3%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	149	0.3%	0.036	0.013
2			115	0.2%		
1	E66.3	Overweight	981	2.0%	0.030	0.014
2			888	1.8%		

1	E66.8	Other obesity	222	0.5%	0.499	0.004
2			208	0.4%		
1	E66.9	Obesity, unspecified	13,501	27.8%	0.506	0.004
2			13,594	28.0%		
1	Z79.89	Hormone	146	0.3%	0.180	0.009
2	0	replacement therapy	124	0.3%		
1	Z92.23	Personal history of	10	0.0%	0.532	0.004
2		estrogen therapy	13	0.0%		
1	D32	Benign neoplasm of	90	0.2%	0.397	0.005
2		meninges	79	0.2%		
1	S00-	Injuries to the head	2,108	4.3%	<0.00	0.032
2	S09		1,800	3.7%		
1	Z80.3	Family history of	783	1.6%	0.354	0.006
2		malignant neoplasm of breast	747	1.5%		

Procedure

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1		138	0.3%	0.006	0.018
2		96	0.2%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10B	26,612	54.8%	0.006	0.018
2		A	27,037		
1	A10B	13,794	28.4%	0.036	0.013
2		B	14,089		
1	A10B	221	0.5%	0.092	0.011
2		F	187		
1	A10B	4,037	8.3%	0.262	0.007
2		G	4,134		
1	A10B	9,126	18.8%	0.831	0.001
2		H	9,152		
1	A10B	4,364	9.0%	<0.00	0.036
2		K	3,874		
1	A10B	606	1.2%	0.663	0.003
2		X	591		
1	HS200	1,385	2.9%	0.028	0.014
2			1,273		

eTable 13. Characteristics of the GLP-1RA/no insulin group and insulin/no GLP-1RA group before and after matched for covariates related to multiple myeloma for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 48,983) and group 2 (N = 1,044,745) characteristics before propensity score matching

Demographics						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	48,983	100%	<0.00	0.420
2			1,044,745	100%	1	
1	2106-3	White	32,592	66.5%	<0.00	0.122
2			633,989	60.7%	1	
1	1002-5	American Indian or Alaska Native	199	0.4%	0.004	0.013
2			3,443	0.3%		
1	UNK	Unknown Race	7,099	14.5%	<0.00	0.025
2			142,470	13.6%	1	
1	F	Female	26,011	53.1%	<0.00	0.151
2			476,110	45.6%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander	205	0.4%	<0.00	0.071
2			10,677	1.0%	1	
1	UN	Unknown Gender	2,252	4.6%	<0.00	0.106
2			27,321	2.6%	1	
1	2186-5	Not Hispanic or Latino	33,188	67.8%	<0.00	0.098
2			659,375	63.1%	1	
1	2135-2	Hispanic or Latino	4,151	8.5%	<0.00	0.019
2			94,136	9.0%	1	
1	2054-5	Black or African American	6,265	12.8%	<0.00	0.120
2			178,267	17.1%	1	
1	M	Male	20,720	42.3%	<0.00	0.191
2			541,314	51.8%	1	
1	2028-9	Asian	1,204	2.5%	<0.00	0.087
2			41,822	4.0%	1	
Diagnosis						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and	686	1.4%	<0.00	0.022
2	Z65		12,021	1.2%	1	

		psychosocial circumstances				
1	E66	Overweight and obesity	18,401	37.6%	<0.00	0.504
2			166,445	15.9%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	4,204	8.6%	<0.00	0.183
2			43,128	4.1%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,886	7.9%	<0.00	0.208
2			33,396	3.2%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	157	0.3%	0.563	0.003
2			3,510	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	171	0.3%	0.957	<0.001
2			3,632	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	288	0.6%	<0.00	0.026
2			4,209	0.4%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	344	0.7%	<0.00	0.036
2			4,508	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	398	0.8%	<0.00	0.044
2			4,843	0.5%	1	
1	Z80	Family history of primary malignant neoplasm	2,042	4.2%	<0.00	0.136
2			19,398	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	24	0.0%	<0.00	0.019
2			156	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	12,272	25.1%	<0.00	0.402
2			105,217	10.1%	1	
1	Z85	Personal history of malignant neoplasm	1,239	2.5%	<0.00	0.066
2			38,294	3.7%	1	
1	Z98.84	Bariatric surgery status	632	1.3%	<0.00	0.085
2			5,136	0.5%	1	
1	E66.0	Obesity due to excess calories	9,157	18.7%	<0.00	0.366
2			69,998	6.7%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	150	0.3%	0.118	0.007
2			3,643	0.3%		

1	E66.3	Overweight	1,010	2.1%	<0.00	0.122
2			6,796	0.7%	1	
1	E66.8	Other obesity	235	0.5%	<0.00	0.065
2			1,298	0.1%	1	
1	E66.9	Obesity, unspecified	13,805	28.2%	<0.00	0.433
2			118,555	11.3%	1	
1	Z80.7	Family history of other malignant neoplasms of lymphoid, hematopoietic and related tissues	20	0.0%	0.206	0.005
2			319	0.0%		
1	D47.2	Monoclonal gammopathy	96	0.2%	0.016	0.012
2			2,627	0.3%		
1	C90.3	Solitary plasmacytoma	10	0.0%	<0.00	0.014
2			50	0.0%	1	
1	D45	Polycythemia vera	82	0.2%	0.030	0.009
2			1,367	0.1%		
1	D46	Myelodysplastic syndromes	19	0.0%	<0.00	0.048
2			2,139	0.2%	1	
1	D47	Other neoplasms of uncertain behavior of lymphoid, hematopoietic and related tissue	281	0.6%	0.001	0.016
2			7,366	0.7%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 A10B		27,075	55.3%	<0.00	0.806
2 A		199,802	19.1%	1	
1 A10B		14,077	28.7%	<0.00	0.424
2 B		125,703	12.0%	1	
1 A10B		229	0.5%	<0.00	0.054
2 F		1,718	0.2%	1	
1 A10B		4,107	8.4%	<0.00	0.213
2 G		35,435	3.4%	1	
1 A10B		9,485	19.4%	<0.00	0.481
2 H		44,595	4.3%	1	
1 A10B		4,808	9.8%	<0.00	0.423
2 K		6,447	0.6%	1	

1	A10B	Other blood glucose	614	1.3%	<0.00	0.059
2	X	lowering drugs, excl. insulins	7,048	0.7%	1	

Group 1 (N = 48,527) and group 2 (N = 48,527) characteristics after propensity score matching

Demographics

Group	Mean ± SD	Patients	% of Group	P-Value	SMD	
1 2	AI	Age at Index	55.9 +/- 11.7 56.1 +/- 13.0	48,527 48,527	100% 100%	0.057 0.012
1 2	2106-3	White		32,296 33,417	66.6% 68.9%	<0.00 1 0.049
1 2	1002-5	American Indian or Alaska Native		197 150	0.4% 0.3%	0.011 0.016
1 2	UNK	Unknown Race		6,995 6,585	14.4% 13.6%	<0.00 1 0.024
1 2	F	Female		25,751 26,135	53.1% 53.9%	0.013 0.016
1 2	2076-8	Native Hawaiian or Other Pacific Islander		205 147	0.4% 0.3%	0.002 0.020
1 2	UN	Unknown Gender		2,183 2,029	4.5% 4.2%	0.015 0.016
1 2	2186-5	Not Hispanic or Latino		32,881 33,326	67.8% 68.7%	0.002 0.020
1 2	2135-2	Hispanic or Latino		4,122 3,926	8.5% 8.1%	0.023 0.015
1 2	2054-5	Black or African American		6,230 5,926	12.8% 12.2%	0.003 0.019
1 2	M	Male		20,593 20,363	42.4% 42.0%	0.135 0.010
1 2	2028-9	Asian		1,197 1,015	2.5% 2.1%	<0.00 1 0.025

Diagnosis

Group	Mean ± SD	Patients	% of Group	P-Value	SMD	
1 2	Z55- Z65	Persons with potential health hazards related to socioeconomic and psychosocial circumstances		682 582	1.4% 1.2%	0.005 0.018

1	E66	Overweight and obesity	18,046	37.2%	0.770	0.002
2			18,090	37.3%		
1	Z68.3	Body mass index [BMI] 30-39, adult	4,072	8.4%	<0.001	0.025
2			3,739	7.7%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,794	7.8%	<0.001	0.029
2			3,424	7.1%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	156	0.3%	0.218	0.008
2			135	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	171	0.4%	0.545	0.004
2			160	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	284	0.6%	0.010	0.017
2			226	0.5%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	334	0.7%	0.036	0.013
2			282	0.6%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	385	0.8%	0.002	0.020
2			305	0.6%		
1	Z80	Family history of primary malignant neoplasm	1,997	4.1%	0.004	0.018
2			1,823	3.8%		
1	Z15.0	Genetic susceptibility to malignant neoplasm	22	0.0%	0.086	0.011
2			12	0.0%		
1	Z12	Encounter for screening for malignant neoplasms	11,973	24.7%	0.003	0.019
2			11,574	23.9%		
1	Z85	Personal history of malignant neoplasm	1,232	2.5%	<0.001	0.024
2			1,052	2.2%		
1	Z98.84	Bariatric surgery status	614	1.3%	0.178	0.009
2			568	1.2%		
1	E66.0	Obesity due to excess calories	8,943	18.4%	0.791	0.002
2			8,911	18.4%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	147	0.3%	0.566	0.004
2			157	0.3%		
1	E66.3	Overweight	984	2.0%	0.002	0.020
2			850	1.8%		

1	E66.8	Other obesity	226	0.5%	0.011	0.016
2			175	0.4%		
1	E66.9	Obesity, unspecified	13,515	27.9%	0.189	0.008
2			13,699	28.2%		
1	Z80.7	Family history of other malignant neoplasms of lymphoid, hematopoietic and related tissues	19	0.0%	0.873	0.001
2			20	0.0%		
1	D47.2	Monoclonal gammopathy	96	0.2%	0.053	0.012
2			71	0.1%		
1	C90.3	Solitary plasmacytoma	10	0.0%	1	<0.001
2			10	0.0%		
1	D45	Polycythemia vera	79	0.2%	0.874	0.001
2			81	0.2%		
1	D46	Myelodysplastic syndromes	19	0.0%	0.002	0.020
2			43	0.1%		
1	D47	Other neoplasms of uncertain behavior of lymphoid, hematopoietic and related tissue	278	0.6%	0.077	0.011
2			238	0.5%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 A10B		26,622	54.9%	0.006	0.017
2 A		27,044	55.7%		
1 A10B		13,797	28.4%	0.027	0.014
2 B		14,109	29.1%		
1 A10B		222	0.5%	0.031	0.014
2 F		179	0.4%		
1 A10B		4,037	8.3%	0.487	0.004
2 G		4,097	8.4%		
1 A10B		9,133	18.8%	0.092	0.011
2 H		9,339	19.2%		
1 A10B		4,366	9.0%	<0.001	0.033
2 K		3,914	8.1%		
1 A10B		606	1.2%	0.319	0.006
2 X		572	1.2%		

eTable 14. Characteristics of the GLP-1RA/no metformin group and metformin/no GLP-1RA group before and after matched for covariates related to esophageal cancer for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 32,365) and group 2 (N = 856,160) characteristics before propensity score matching							
Demographics							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	59.0 +/- 12.4	32,365	100%	<0.00	0.080
2			60.1 +/- 14.0	856,160	100%	1	
1	2106-3	White		21,231	65.6%	<0.00	0.111
2				515,868	60.3%	1	
1	1002-5	American Indian or Alaska Native		98	0.3%	0.092	0.010
2				3,080	0.4%		
1	UNK	Unknown Race		4,272	13.2%	<0.00	0.021
2				119,036	13.9%	1	
1	F	Female		17,278	53.4%	<0.00	0.134
2				399,923	46.7%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander		172	0.5%	0.001	0.020
2				5,884	0.7%		
1	UN	Unknown Gender		1,670	5.2%	<0.00	0.152
2				19,592	2.3%	1	
1	2186-5	Not Hispanic or Latino		22,299	68.9%	<0.00	0.151
2				528,686	61.8%	1	
1	2135-2	Hispanic or Latino		2,660	8.2%	<0.00	0.084
2				91,303	10.7%	1	
1	2054-5	Black or African American		5,107	15.8%	<0.00	0.021
2				141,606	16.5%	1	
1	M	Male		13,417	41.5%	<0.00	0.192
2				436,645	51.0%	1	
1	2028-9	Asian		681	2.1%	<0.00	0.118
2				35,540	4.2%	1	
Diagnosis							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and		422	1.3%	0.107	0.009
2	Z65			10,310	1.2%		

		psychosocial circumstances				
1	E66	Overweight and obesity	11,418	35.3%	<0.00	0.411
2			149,974	17.5%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	3,285	10.1%	<0.00	0.249
2			32,977	3.9%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,012	9.3%	<0.00	0.278
2			23,535	2.7%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	119	0.4%	0.001	0.018
2			2,293	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	150	0.5%	<0.00	0.029
2			2,433	0.3%	1	
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	209	0.6%	<0.00	0.043
2			2,942	0.3%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	264	0.8%	<0.00	0.055
2			3,317	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	299	0.9%	<0.00	0.059
2			3,753	0.4%	1	
1	F10	Alcohol related disorders	460	1.4%	<0.00	0.076
2			21,150	2.5%	1	
1	Z80	Family history of primary malignant neoplasm	1,222	3.8%	<0.00	0.114
2			16,133	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	<0.00	0.021
2			140	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	6,223	19.2%	<0.00	0.157
2			114,996	13.4%	1	
1	Z85	Personal history of malignant neoplasm	1,111	3.4%	<0.00	0.042
2			23,231	2.7%	1	
1	Z98.84	Bariatric surgery status	534	1.6%	<0.00	0.131
2			2,989	0.3%	1	
1	F17	Nicotine dependence	2,399	7.4%	<0.00	0.059
2			77,335	9.0%	1	

1	E66.0	Obesity due to excess calories	5,910	18.3%	<0.00	0.361
2			56,178	6.6%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	230	0.7%	<0.00	0.069
2			2,051	0.2%	1	
1	E66.3	Overweight	535	1.7%	<0.00	0.066
2			7,794	0.9%	1	
1	E66.8	Other obesity	193	0.6%	<0.00	0.078
2			1,084	0.1%	1	
1	E66.9	Obesity, unspecified	8,150	25.2%	<0.00	0.307
2			113,380	13.2%	1	
1	Z72.0	Tobacco use	588	1.8%	<0.00	0.034
2			11,927	1.4%	1	
1	K21	Gastro-esophageal reflux disease	6,710	20.7%	<0.00	0.194
2			115,166	13.5%	1	
1	K22.7	Barrett's esophagus	244	0.8%	<0.00	0.039
2			3,863	0.5%	1	
1	K22.0	Achalasia of cardia	30	0.1%	0.001	0.016
2			433	0.1%		
1	D69.4	Evans syndrome	0	0%	0.409	0.006
2			18	0.0%		
1	D50.1	Sideropenic dysphagia	57	0.2%	<0.00	0.031
2			573	0.1%	1	
1	S27.81	Injury of esophagus (thoracic part)	10	0.0%	<0.00	0.021
2			33	0.0%	1	
1	C34	Malignant neoplasm of bronchus and lung	99	0.3%	<0.00	0.034
2			4,460	0.5%	1	
1	C06	Malignant neoplasm of other and unspecified parts of mouth	10	0.0%	0.091	0.011
2			451	0.1%		
1	C32	Malignant neoplasm of larynx	13	0.0%	0.005	0.018
2			741	0.1%		
1	B97.7	Papillomavirus as the cause of diseases classified elsewhere	56	0.2%	<0.00	0.018
2			908	0.1%	1	
1	R87.8	High risk human papillomavirus (HPV) DNA test positive from female genital organs	59	0.2%	<0.00	0.019
2			928	0.1%	1	

1	Z80.0	Family history of malignant neoplasm of digestive organs	413	1.3%	<0.00	0.055
2			6,255	0.7%	1	
1	D10	Benign neoplasm of mouth and pharynx	38	0.1%	0.619	0.003
2			1,091	0.1%		
1	D13.0	Benign neoplasm of esophagus	10	0.0%	0.176	0.007
2			171	0.0%		

Medication

Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10B	Sulfonylureas		5,464	16.9%	<0.00	0.269
2	B			69,045	8.1%	1	
1	A10B	Alpha glucosidase inhibitors		124	0.4%	<0.00	0.057
2	F			876	0.1%	1	
1	A10B	Thiazolidinediones		1,960	6.1%	<0.00	0.183
2	G			20,400	2.4%	1	
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors		3,547	11.0%	<0.00	0.370
2	H			17,113	2.0%	1	
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors		1,839	5.7%	<0.00	0.312
2	K			3,371	0.4%	1	
1	A10B	Other blood glucose lowering drugs, excl. insulins		672	2.1%	<0.00	0.146
2	X			3,839	0.4%	1	
1	A10A	INSULINS AND ANALOGUES		14,131	43.7%	<0.00	0.560
2				159,901	18.7%	1	

Group 1 (N = 32,263) and group 2 (N = 32,263) characteristics after propensity score matching

Demographics

Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	59.0 +/- 12.4	32,263	100%	0.721	0.003
2			59.0 +/- 13.2	32,263	100%		
1	2106-3	White		21,161	65.6%	<0.00	0.037
2				21,731	67.4%	1	
1	1002-5	American Indian or Alaska Native		98	0.3%	0.887	0.001
2				100	0.3%		
1	UNK	Unknown Race		4,255	13.2%	0.375	0.007
2				4,179	13.0%		
1	F	Female		17,209	53.3%	0.038	0.016
2				17,472	54.2%		

1	2076-8	Native Hawaiian or Other Pacific Islander	172	0.5%	0.161	0.011
2			147	0.5%		
1	UN	Unknown Gender	1,656	5.1%	0.478	0.006
2			1,696	5.3%		
1	2186-5	Not Hispanic or Latino	22,225	68.9%	0.004	0.023
2			22,564	69.9%		
1	2135-2	Hispanic or Latino	2,651	8.2%	0.019	0.018
2			2,490	7.7%		
1	2054-5	Black or African American	5,092	15.8%	0.001	0.027
2			4,779	14.8%		
1	M	Male	13,398	41.5%	0.015	0.019
2			13,095	40.6%		
1	2028-9	Asian	681	2.1%	0.010	0.020
2			590	1.8%		

Diagnosis

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	419	1.3%	0.003	0.023
2		339	1.1%		
1	E66	11,341	35.2%	0.433	0.006
2		11,246	34.9%		
1	Z68.3	3,247	10.1%	0.763	0.002
2		3,224	10.0%		
1	Z68.4	2,969	9.2%	0.065	0.015
2		2,835	8.8%		
1	Z68.25	118	0.4%	0.463	0.006
2		107	0.3%		
1	Z68.26	149	0.5%	0.036	0.017
2		115	0.4%		
1	Z68.27	207	0.6%	0.169	0.011
2		180	0.6%		

1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	261	0.8%	0.175	0.011
2			231	0.7%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	297	0.9%	0.080	0.014
2			256	0.8%		
1	F10	Alcohol related disorders	459	1.4%	<0.001	0.039
2			323	1.0%		
1	Z80	Family history of primary malignant neoplasm	1,205	3.7%	0.073	0.014
2			1,120	3.5%		
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	0.194	0.010
2			11	0.0%		
1	Z12	Encounter for screening for malignant neoplasms	6,177	19.1%	<0.001	0.050
2			5,550	17.2%		
1	Z85	Personal history of malignant neoplasm	1,106	3.4%	0.141	0.012
2			1,039	3.2%		
1	Z98.84	Bariatric surgery status	520	1.6%	0.827	0.002
2			527	1.6%		
1	F17	Nicotine dependence	2,388	7.4%	<0.001	0.037
2			2,081	6.5%		
1	E66.0	Obesity due to excess calories	5,847	18.1%	0.759	0.002
2			5,817	18.0%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	227	0.7%	0.361	0.007
2			208	0.6%		
1	E66.3	Overweight	529	1.6%	0.105	0.013
2			478	1.5%		
1	E66.8	Other obesity	190	0.6%	1	<0.001
2			190	0.6%		
1	E66.9	Obesity, unspecified	8,097	25.1%	0.181	0.011
2			7,950	24.6%		
1	Z72.0	Tobacco use	584	1.8%	0.019	0.019
2			507	1.6%		
1	K21	Gastro-esophageal reflux disease	6,661	20.6%	0.004	0.023
2			6,366	19.7%		
1	K22.7	Barrett's esophagus	243	0.8%	0.580	0.004
2			231	0.7%		
1	K22.0	Achalasia of cardia	30	0.1%	0.207	0.010
2			21	0.1%		

1	D69.4	Evans syndrome	0	0%	0.002	0.025
2	1		10	0.0%		
1	D50.1	Sideropenic dysphagia	56	0.2%	0.629	0.004
2			51	0.2%		
1	S27.81	Injury of esophagus (thoracic part)	10	0.0%	1	<0.001
2			10	0.0%		
1	C34	Malignant neoplasm of bronchus and lung	99	0.3%	0.561	0.005
2			91	0.3%		
1	C06	Malignant neoplasm of other and unspecified parts of mouth	10	0.0%	0.827	0.002
2			11	0.0%		
1	C32	Malignant neoplasm of larynx	13	0.0%	0.532	0.005
2			10	0.0%		
1	B97.7	Papillomavirus as the cause of diseases classified elsewhere	56	0.2%	0.049	0.016
2			37	0.1%		
1	R87.8	High risk human papillomavirus (HPV) DNA test positive from female genital organs	58	0.2%	0.441	0.006
2	1		50	0.2%		
1	Z80.0	Family history of malignant neoplasm of digestive organs	408	1.3%	0.058	0.015
2			356	1.1%		
1	D10	Benign neoplasm of mouth and pharynx	38	0.1%	0.005	0.022
2			17	0.1%		
1	D13.0	Benign neoplasm of esophagus	10	0.0%	1	<0.001
2			10	0.0%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 A10B		5,424	16.8%	0.422	0.006
2 B	Sulfonylureas	5,348	16.6%		
1 A10B		124	0.4%	0.605	0.004
2 F	Alpha glucosidase inhibitors	116	0.4%		
1 A10B		1,930	6.0%	0.689	0.003
2 G	Thiazolidinediones	1,906	5.9%		
1 A10B		3,465	10.7%	0.301	0.008
2 H	Dipeptidyl peptidase 4 (DPP-4) inhibitors	3,384	10.5%		

1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	1,747	5.4%	0.017	0.019
2	K		1,612	5.0%		
1	A10B	Other blood glucose lowering drugs, excl. insulins	658	2.0%	0.118	0.012
2	X		603	1.9%		
1	A10A	INSULINS AND	14,037	43.5%	0.446	0.006
2		ANALOGUES	13,941	43.2%		

eTable 15. Characteristics of the GLP-1RA/no metformin group and metformin/no GLP-1RA group before and after matched for covariates related to breast cancer for the study populations of women (age 55 and older) with T2D and no history of any OAC

Group 1 (N = 10,497) and group 2 (N = 245,112) characteristics before propensity score matching							
Demographics							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	AI	Age at Index	65.1 +/- 6.8	10,497	100%	<0.00	0.155
2			66.2 +/- 7.2	245,112	100%	1	
1	2106-3	White		7,228	68.9%	<0.00	0.174
2				148,499	60.6%	1	
1	1002-5	American Indian or Alaska Native		25	0.2%	0.148	0.015
2				782	0.3%		
1	UNK	Unknown Race		883	8.4%	<0.00	0.098
2				27,764	11.3%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander		43	0.4%	0.015	0.026
2				1,458	0.6%		
1	UN	Unknown Ethnicity		2,019	19.2%	<0.00	0.179
2				65,536	26.7%	1	
1	2186-5	Not Hispanic or Latino		7,582	72.2%	<0.00	0.188
2				155,608	63.5%	1	
1	2135-2	Hispanic or Latino		896	8.5%	<0.00	0.043
2				23,968	9.8%	1	
1	2054-5	Black or African American		1,881	17.9%	0.055	0.019
2				45,751	18.7%		
1	2028-9	Asian		178	1.7%	<0.00	0.170
2				11,425	4.7%	1	
Diagnosis							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	135	1.3%	0.001	0.032	
2	Z65		2,329	1.0%			
1	E66	Overweight and obesity	3,810	36.3%	<0.00	0.442	
2			42,178	17.2%	1		

1	Z68.3	Body mass index [BMI] 30-39, adult	859	8.2%	<0.00	0.212
2			8,046	3.3%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	948	9.0%	<0.00	0.281
2			6,215	2.5%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	30	0.3%	0.017	0.021
2			448	0.2%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	44	0.4%	<0.00	0.043
2			450	0.2%	1	
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	42	0.4%	0.001	0.030
2			567	0.2%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	51	0.5%	<0.00	0.039
2			611	0.2%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	51	0.5%	0.001	0.029
2			743	0.3%		
1	F10	Alcohol related disorders	67	0.6%	0.009	0.028
2			2,158	0.9%		
1	Z80	Family history of primary malignant neoplasm	527	5.0%	<0.00	0.123
2			6,537	2.7%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	10	0.1%	<0.00	0.031
2			52	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	2,745	26.2%	<0.00	0.152
2			48,467	19.8%	1	
1	Z85	Personal history of malignant neoplasm	369	3.5%	<0.00	0.041
2			6,840	2.8%	1	
1	Z98.84	Bariatric surgery status	212	2.0%	<0.00	0.138
2			1,194	0.5%	1	
1	E66.0	Obesity due to excess calories	1,970	18.8%	<0.00	0.380
2			15,667	6.4%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	85	0.8%	<0.00	0.075
2			642	0.3%	1	
1	E66.3	Overweight	169	1.6%	<0.00	0.070
2			2,054	0.8%	1	

1	E66.8	Other obesity	61	0.6%	<0.00	0.077
2			308	0.1%	1	
1	E66.9	Obesity, unspecified	2,717	25.9%	<0.00	0.330
2			31,871	13.0%	1	
1	O92.7	Other and unspecified disorders of lactation	0	0%	0.513	0.009
2			10	0.0%		
1	Z79.89	Hormone replacement therapy	62	0.6%	0.014	0.023
2	0		1,053	0.4%		
1	Z92.23	Personal history of estrogen therapy	10	0.1%	0.013	0.020
2			105	0.0%		
1	Z98.82	Breast implant status	10	0.1%	<0.00	0.027
2			69	0.0%	1	
1	Z80.3	Family history of malignant neoplasm of breast	253	2.4%	<0.00	0.085
2			3,111	1.3%	1	
1	R92	Abnormal and inconclusive findings on diagnostic imaging of breast	663	6.3%	<0.00	0.041
2			13,119	5.4%	1	
1	D24	Benign neoplasm of breast	57	0.5%	0.875	0.002
2			1,303	0.5%		
1	N60	Benign mammary dysplasia	228	2.2%	0.253	0.011
2			4,931	2.0%		
1	N62	Hypertrophy of breast	30	0.3%	0.286	0.010
2			574	0.2%		
1	N63	Unspecified lump in breast	351	3.3%	0.571	0.006
2			7,951	3.2%		
1	N64	Other disorders of breast	425	4.0%	<0.00	0.050
2			7,633	3.1%	1	
1	N61	Inflammatory disorders of breast	43	0.4%	0.030	0.020
2			716	0.3%		
1	D05	Carcinoma in situ of breast	14	0.1%	0.541	0.006
2			386	0.2%		

Procedure

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1		10	0.1%	<0.00	0.041
2		10	0.0%	1	

1	58300	Insertion of intrauterine device (IUD)	10	0.1%	<0.00 1	0.029
2			61	0.0%		
1	1001	Radiation	28	0.3%	0.092	0.018
2			902	0.4%		

Medication

Group			Mean ± SD	Patients	% of Group	P- Value	SMD
1	A10A	INSULINS AND ANALOGUES		4,577	43.6%	<0.00 1	0.599
2			42,173	17.2%			
1	A10B B	Sulfonylureas		1,853	17.7%	<0.00 1	0.294
2			19,472	7.9%			
1	A10B F	Alpha glucosidase inhibitors		35	0.3%	<0.00 1	0.047
2			272	0.1%			
1	A10B G	Thiazolidinediones		643	6.1%	<0.00 1	0.188
2			5,777	2.4%			
1	A10B H	Dipeptidyl peptidase 4 (DPP-4) inhibitors		1,273	12.1%	<0.00 1	0.388
2			5,583	2.3%			
1	A10B K	Sodium-glucose co- transporter 2 (SGLT2) inhibitors		569	5.4%	<0.00 1	0.305
2			907	0.4%			
1	A10B X	Other blood glucose lowering drugs, excl. insulins		229	2.2%	<0.00 1	0.152
2			1,121	0.5%			
1	HS200	CONTRACEPTIVE S,SYSTEMIC		189	1.8%	<0.00 1	0.048
2			2,971	1.2%			

Group 1 (N = 10,419) and group 2 (N = 10,419) characteristics after propensity score matching

Demographics

Group			Mean ± SD	Patients	% of Group	P- Value	SMD
1	AI	Age at Index	65.2 +/- 6.8	10,419	100%	0.069	0.025
2			65.0 +/- 6.8	10,419	100%		
1	2106-3	White		7,159	68.7%	0.012	0.035
2			7,326	70.3%			
1	1002-5	American Indian or Alaska Native		25	0.2%	0.586	0.008
2			29	0.3%			
1	UNK	Unknown Race		881	8.5%	0.157	0.020
2			825	7.9%			

1	2076-8	Native Hawaiian or Other Pacific Islander	43	0.4%	0.430	0.011
2			36	0.3%		
1	UN	Unknown Ethnicity	2,016	19.3%	0.032	0.030
2			1,895	18.2%		
1	2186-5	Not Hispanic or Latino	7,515	72.1%	0.005	0.039
2			7,696	73.9%		
1	2135-2	Hispanic or Latino	888	8.5%	0.131	0.021
2			828	7.9%		
1	2054-5	Black or African American	1,875	18.0%	0.197	0.018
2			1,804	17.3%		
1	2028-9	Asian	178	1.7%	0.247	0.016
2			157	1.5%		

Diagnosis

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	132	1.3%	0.755	0.004
2	Z65		127	1.2%		
1	E66	Overweight and obesity	3,757	36.1%	0.574	0.008
2			3,796	36.4%		
1	Z68.3	Body mass index [BMI] 30-39, adult	840	8.1%	0.919	0.001
2			844	8.1%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult	921	8.8%	0.246	0.016
2			874	8.4%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	30	0.3%	0.336	0.013
2			23	0.2%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	42	0.4%	0.912	0.002
2			41	0.4%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	40	0.4%	0.662	0.006
2			44	0.4%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	50	0.5%	0.760	0.004
2			47	0.5%		

1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	51	0.5%	0.350	0.013
2			42	0.4%		
1	F10	Alcohol related disorders	65	0.6%	0.044	0.028
2			44	0.4%		
1	Z80	Family history of primary malignant neoplasm	512	4.9%	0.006	0.038
2			429	4.1%		
1	Z15.0	Genetic susceptibility to malignant neoplasm	10	0.1%	1	<0.001
2			10	0.1%		
1	Z12	Encounter for screening for malignant neoplasms	2,695	25.9%	<0.001	0.051
2			2,467	23.7%	1	
1	Z85	Personal history of malignant neoplasm	365	3.5%	0.121	0.021
2			325	3.1%		
1	Z98.84	Bariatric surgery status	200	1.9%	0.920	0.001
2			202	1.9%		
1	E66.0	Obesity due to excess calories	1,930	18.5%	0.972	<0.001
2			1,928	18.5%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	81	0.8%	0.874	0.002
2			79	0.8%		
1	E66.3	Overweight	165	1.6%	0.737	0.005
2			159	1.5%		
1	E66.8	Other obesity	58	0.6%	0.854	0.003
2			60	0.6%		
1	E66.9	Obesity, unspecified	2,678	25.7%	0.716	0.005
2			2,701	25.9%		
1	O92.7	Other and unspecified disorders of lactation	0	0%	--	--
2			0	0%		
1	Z79.89	Hormone replacement therapy	59	0.6%	0.779	0.004
2	0		56	0.5%		
1	Z92.23	Personal history of estrogen therapy	10	0.1%	1	<0.001
2			10	0.1%		
1	Z98.82	Breast implant status	10	0.1%	1	<0.001
2			10	0.1%		
1	Z80.3	Family history of malignant neoplasm of breast	246	2.4%	0.057	0.026
2			206	2.0%		

1	R92	Abnormal and inconclusive findings on diagnostic imaging of breast	653	6.3%	<0.001	0.051
2			530	5.1%		
1	D24	Benign neoplasm of breast	57	0.5%	0.379	0.012
2			48	0.5%		
1	N60	Benign mammary dysplasia	225	2.2%	0.006	0.038
2			171	1.6%		
1	N62	Hypertrophy of breast	29	0.3%	0.685	0.006
2			26	0.2%		
1	N63	Unspecified lump in breast	344	3.3%	0.001	0.048
2			260	2.5%		
1	N64	Other disorders of breast	414	4.0%	0.018	0.033
2			350	3.4%		
1	N61	Inflammatory disorders of breast	41	0.4%	0.238	0.016
2			31	0.3%		
1	D05	Carcinoma in situ of breast	13	0.1%	0.531	0.009
2			10	0.1%		

Procedure

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	C1789	Prosthesis, breast (implantable)	10	0.1%	1	<0.001
2			10	0.1%		
1	58300	Insertion of intrauterine device (IUD)	10	0.1%	1	<0.001
2			10	0.1%		
1	1001	Radiation	28	0.3%	0.680	0.006
2			25	0.2%		

Medication

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10A	INSULINS AND ANALOGUES	4,506	43.2%	0.502	0.009
2			4,458	42.8%		
1	A10B B	Sulfonylureas	1,814	17.4%	0.770	0.004
2			1,830	17.6%		
1	A10B F	Alpha glucosidase inhibitors	35	0.3%	0.714	0.005
2			32	0.3%		
1	A10B G	Thiazolidinediones	624	6.0%	0.274	0.015
2			662	6.4%		

1	A10B	Dipeptidyl peptidase	1,220	11.7%		
2	H	4 (DPP-4) inhibitors	1,222	11.7%	0.966	0.001
1	A10B	Sodium-glucose co-	496	4.8%		
2	K	transporter 2 (SGLT2) inhibitors	428	4.1%	0.022	0.032
1	A10B	Other blood glucose	222	2.1%		
2	X	lowering drugs, excl. insulins	223	2.1%	0.962	0.001
1	HS200	CONTRACEPTIVE	187	1.8%		
2		S,SYSTEMIC	169	1.6%	0.336	0.013

eTable 16. Characteristics of the GLP-1RA/no metformin group and metformin/no GLP-1RA group before and after matched for covariates related to colorectal cancer for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 32,365) and group 2 (N = 856,160) characteristics before propensity score matching							
Demographics							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	AI	Age at Index	59.0 +/- 12.4	32,365	100%	<0.00	0.080
2			60.1 +/- 14.0	856,160	100%	1	
1	2106-3	White		21,231	65.6%	<0.00	0.111
2				515,868	60.3%	1	
1	1002-5	American Indian or Alaska Native		98	0.3%	0.092	0.010
2				3,080	0.4%		
1	UNK	Unknown Race		4,272	13.2%	<0.00	0.021
2				119,036	13.9%	1	
1	F	Female		17,278	53.4%	<0.00	0.134
2				399,923	46.7%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander		172	0.5%	0.001	0.020
2				5,884	0.7%		
1	UN	Unknown Gender		1,670	5.2%	<0.00	0.152
2				19,592	2.3%	1	
1	2186-5	Not Hispanic or Latino		22,299	68.9%	<0.00	0.151
2				528,686	61.8%	1	
1	2135-2	Hispanic or Latino		2,660	8.2%	<0.00	0.084
2				91,303	10.7%	1	
1	2054-5	Black or African American		5,107	15.8%	<0.00	0.021
2				141,606	16.5%	1	
1	M	Male		13,417	41.5%	<0.00	0.192
2				436,645	51.0%	1	
1	2028-9	Asian		681	2.1%	<0.00	0.118
2				35,540	4.2%	1	
Diagnosis							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	Z55-	Persons with potential health hazards related to socioeconomic and	422	1.3%	0.107	0.009	
2	Z65		10,310	1.2%			

		psychosocial circumstances				
1	E66	Overweight and obesity	11,418	35.3%	<0.00	0.411
2			149,974	17.5%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	3,285	10.1%	<0.00	0.249
2			32,977	3.9%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,012	9.3%	<0.00	0.278
2			23,535	2.7%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	119	0.4%	0.001	0.018
2			2,293	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	150	0.5%	<0.00	0.029
2			2,433	0.3%	1	
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	209	0.6%	<0.00	0.043
2			2,942	0.3%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	264	0.8%	<0.00	0.055
2			3,317	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	299	0.9%	<0.00	0.059
2			3,753	0.4%	1	
1	F10	Alcohol related disorders	460	1.4%	<0.00	0.076
2			21,150	2.5%	1	
1	Z80	Family history of primary malignant neoplasm	1,222	3.8%	<0.00	0.114
2			16,133	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	<0.00	0.021
2			140	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	6,223	19.2%	<0.00	0.157
2			114,996	13.4%	1	
1	Z85	Personal history of malignant neoplasm	1,111	3.4%	<0.00	0.042
2			23,231	2.7%	1	
1	Z98.84	Bariatric surgery status	534	1.6%	<0.00	0.131
2			2,989	0.3%	1	
1	F17	Nicotine dependence	2,399	7.4%	<0.00	0.059
2			77,335	9.0%	1	

1	2	E66.0	Obesity due to excess calories	5,910	18.3%	<0.00	0.361
				56,178	6.6%	1	
1	2	E66.2	Morbid (severe) obesity with alveolar hypoventilation	230	0.7%	<0.00	0.069
				2,051	0.2%	1	
1	2	E66.3	Overweight	535	1.7%	<0.00	0.066
				7,794	0.9%	1	
1	2	E66.8	Other obesity	193	0.6%	<0.00	0.078
				1,084	0.1%	1	
1	2	E66.9	Obesity, unspecified	8,150	25.2%	<0.00	0.307
				113,380	13.2%	1	
1	2	K50	Crohn's disease [regional enteritis]	149	0.5%	<0.00	0.038
				2,039	0.2%	1	
1	2	K51	Ulcerative colitis	126	0.4%	<0.00	0.020
				2,339	0.3%	1	
1	2	K63.5	Polyp of colon	1,321	4.1%	<0.00	0.020
				31,663	3.7%	1	
1	2	Z72.0	Tobacco use	588	1.8%	<0.00	0.034
				11,927	1.4%	1	
1	2	Z83.71	Family history of colonic polyps	48	0.1%	<0.00	0.023
				606	0.1%	1	
1	2	E84	Cystic fibrosis	10	0.0%	0.326	0.006
				362	0.0%		
1	2	Q85.8	Other phakomatoses, not elsewhere classified	10	0.0%	0.011	0.012
				117	0.0%		
1	2	Z80.0	Family history of malignant neoplasm of digestive organs	413	1.3%	<0.00	0.055
				6,255	0.7%	1	
1	2	D12	Benign neoplasm of colon, rectum, anus and anal canal	1,692	5.2%	<0.00	0.047
				36,157	4.2%	1	
Procedure							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	10222	Colonoscopy,		1,885	5.8%	<0.00	0.062
2	31	flexible		38,210	4.5%	1	
Medication							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD

1	A10A	INSULINS AND ANALOGUES	14,131	43.7%	<0.00	0.560
2			159,901	18.7%	1	
1	A10B	Sulfonylureas	5,464	16.9%	<0.00	0.269
2	B		69,045	8.1%	1	
1	A10B	Alpha glucosidase inhibitors	124	0.4%	<0.00	0.057
2	F		876	0.1%	1	
1	A10B	Thiazolidinediones	1,960	6.1%	<0.00	0.183
2	G		20,400	2.4%	1	
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors	3,547	11.0%	<0.00	0.370
2	H		17,113	2.0%	1	
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	1,839	5.7%	<0.00	0.312
2	K		3,371	0.4%	1	
1	A10B	Other blood glucose lowering drugs, excl. insulins	672	2.1%	<0.00	0.146
2	X		3,839	0.4%	1	

Group 1 (N = 32,275) and group 2 (N = 32,275) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	32,275	100%	0.287	0.008
2			32,275	100%		
1	2106-3	White	21,169	65.6%	<0.00	0.033
2			21,665	67.1%	1	
1	1002-5	American Indian or Alaska Native	98	0.3%	0.887	0.001
2			100	0.3%		
1	UNK	Unknown Race	4,258	13.2%	0.157	0.011
2			4,137	12.8%		
1	F	Female	17,215	53.3%	0.076	0.014
2			17,440	54.0%		
1	2076-8	Native Hawaiian or Other Pacific Islander	172	0.5%	0.161	0.011
2			147	0.5%		
1	UN	Unknown Gender	1,658	5.1%	0.125	0.012
2			1,745	5.4%		
1	2186-5	Not Hispanic or Latino	22,237	68.9%	0.001	0.026
2			22,623	70.1%		
1	2135-2	Hispanic or Latino	2,652	8.2%	0.002	0.024
2			2,443	7.6%		

1	2054-5	Black or African American	5,093	15.8%	0.015	0.019	
2			4,870	15.1%			
1	M	Male	13,402	41.5%	0.013	0.020	
2			13,090	40.6%			
1	2028-9	Asian	681	2.1%	0.056	0.015	
2			613	1.9%			
Diagnosis							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances		419	1.3%	0.004	0.022
2	Z65			341	1.1%		
1	E66	Overweight and obesity		11,353	35.2%	0.792	0.002
2				11,321	35.1%		
1	Z68.3	Body mass index [BMI] 30-39, adult		3,252	10.1%	0.211	0.010
2				3,157	9.8%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult		2,976	9.2%	0.233	0.009
2				2,889	9.0%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult		119	0.4%	0.100	0.013
2				95	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult		150	0.5%	0.148	0.011
2				126	0.4%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult		209	0.6%	0.767	0.002
2				203	0.6%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult		264	0.8%	0.965	<0.001
2				265	0.8%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult		299	0.9%	0.314	0.008
2				275	0.9%		
1	F10	Alcohol related disorders		458	1.4%	<0.001	0.033
2				339	1.1%		
1	Z80	Family history of primary malignant neoplasm		1,208	3.7%	0.080	0.014
2				1,125	3.5%		

1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	0.130	0.012
2			10	0.0%		
1	Z12	Encounter for screening for malignant neoplasms	6,177	19.1%	<0.001	0.051
2			5,545	17.2%		
1	Z85	Personal history of malignant neoplasm	1,108	3.4%	0.284	0.008
2			1,059	3.3%		
1	Z98.84	Bariatric surgery status	519	1.6%	0.614	0.004
2			503	1.6%		
1	F17	Nicotine dependence	2,390	7.4%	<0.001	0.035
2			2,101	6.5%		
1	E66.0	Obesity due to excess calories	5,854	18.1%	0.967	<0.001
2			5,858	18.2%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	227	0.7%	0.887	0.001
2			224	0.7%		
1	E66.3	Overweight	530	1.6%	0.002	0.025
2			434	1.3%		
1	E66.8	Other obesity	191	0.6%	0.317	0.008
2			172	0.5%		
1	E66.9	Obesity, unspecified	8,109	25.1%	0.287	0.008
2			7,992	24.8%		
1	K50	Crohn's disease [regional enteritis]	147	0.5%	0.336	0.008
2			131	0.4%		
1	K51	Ulcerative colitis	126	0.4%	0.128	0.012
2			103	0.3%		
1	K63.5	Polyp of colon	1,307	4.0%	<0.001	0.041
2			1,060	3.3%		
1	Z72.0	Tobacco use	583	1.8%	0.028	0.017
2			511	1.6%		
1	Z83.71	Family history of colonic polyps	46	0.1%	0.544	0.005
2			52	0.2%		
1	E84	Cystic fibrosis	10	0.0%	0.317	0.008
2			15	0.0%		
1	Q85.8	Other phakomatoses, not elsewhere classified	10	0.0%	1	<0.001
2			10	0.0%		
1	Z80.0	Family history of malignant neoplasm of digestive organs	408	1.3%	0.054	0.015
2			355	1.1%		

1	D12	Benign neoplasm of colon, rectum, anus and anal canal		1,675	5.2%	<0.001	0.048
2				1,345	4.2%		
Procedure							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	10222	Colonoscopy, flexible		1,869	5.8%	<0.001	0.047
2	31			1,530	4.7%		
Medication							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10A	INSULINS AND ANALOGUES		14,048	43.5%	0.116	0.012
2				13,850	42.9%		
1	A10B	Sulfonylureas		5,426	16.8%	0.186	0.010
2	B			5,301	16.4%		
1	A10B	Alpha glucosidase inhibitors		124	0.4%	1	<0.001
2	F			124	0.4%		
1	A10B	Thiazolidinediones		1,931	6.0%	0.817	0.002
2	G			1,945	6.0%		
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors		3,474	10.8%	0.261	0.009
2	H			3,386	10.5%		
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors		1,756	5.4%	0.019	0.019
2	K			1,623	5.0%		
1	A10B	Other blood glucose lowering drugs, excl. insulins		660	2.0%	0.846	0.002
2	X			667	2.1%		

eTable 17. Characteristics of the GLP-1RA/no metformin group and metformin/no GLP-1RA group before and after matched for covariates related to endometrial cancer for the study populations of women with T2D and no history of any OAC

Group 1 (N = 17,278) and group 2 (N = 399,923) characteristics before propensity score matching							
Demographics							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	AI	Age at Index	57.7 +/- 12.8	17,278	100%	<0.00	0.160
2			60.0 +/- 14.7	399,923	100%	1	
1	2106-3	White		11,336	65.6%	<0.00	0.158
2				231,828	58.0%	1	
1	1002-5	American Indian or Alaska Native		59	0.3%	0.334	0.008
2				1,552	0.4%		
1	UNK	Unknown Race		1,563	9.0%	<0.00	0.107
2				49,384	12.3%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander		80	0.5%	<0.00	0.033
2				2,869	0.7%	1	
1	UN	Unknown Ethnicity		3,145	18.2%	<0.00	0.188
2				103,904	26.0%	1	
1	2186-5	Not Hispanic or Latino		12,481	72.2%	<0.00	0.219
2				247,896	62.0%	1	
1	2135-2	Hispanic or Latino		1,652	9.6%	<0.00	0.080
2				48,123	12.0%	1	
1	2054-5	Black or African American		3,476	20.1%	0.723	0.003
2				80,016	20.0%		
1	2028-9	Asian		311	1.8%	<0.00	0.149
2				17,483	4.4%	1	
Diagnosis							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	270	1.6%	0.003	0.022	
2	Z65		5,204	1.3%			
1	E66	Overweight and obesity	6,461	37.4%	<0.00	0.399	
2			78,874	19.7%	1		

1	Z68.3	Body mass index [BMI] 30-39, adult	1,360	7.9%	<0.00	0.203
2			13,007	3.3%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	1,671	9.7%	<0.00	0.264
2			12,991	3.2%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	39	0.2%	0.039	0.015
2			643	0.2%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	52	0.3%	<0.00	0.031
2			616	0.2%	1	
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	59	0.3%	<0.00	0.029
2			760	0.2%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	69	0.4%	<0.00	0.033
2			862	0.2%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	76	0.4%	<0.00	0.031
2			1,029	0.3%	1	
1	Z80	Family history of primary malignant neoplasm	821	4.8%	<0.00	0.124
2			9,798	2.4%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	15	0.1%	<0.00	0.027
2			91	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	4,113	23.8%	<0.00	0.149
2			71,089	17.8%	1	
1	Z85	Personal history of malignant neoplasm	492	2.8%	<0.00	0.032
2			9,342	2.3%	1	
1	Z98.84	Bariatric surgery status	378	2.2%	<0.00	0.145
2			2,056	0.5%	1	
1	E66.0	Obesity due to excess calories	3,456	20.0%	<0.00	0.354
2			31,701	7.9%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	132	0.8%	<0.00	0.070
2			1,060	0.3%	1	
1	E66.3	Overweight	280	1.6%	<0.00	0.064
2			3,619	0.9%	1	
1	E66.8	Other obesity	118	0.7%	<0.00	0.084
2			574	0.1%	1	

1	E66.9	Obesity, unspecified	4,568	26.4%	<0.00	0.291
2			59,095	14.8%	1	
1	Z72.3	Lack of physical exercise	10	0.1%	0.110	0.011
2			138	0.0%		
1	Z72.4	Inappropriate diet and eating habits	30	0.2%	<0.00	0.050
2			73	0.0%	1	
1	Z79.89	Hormone replacement therapy	85	0.5%	<0.00	0.025
2	0		1,319	0.3%	1	
1	Z92.23	Personal history of estrogen therapy	10	0.1%	0.030	0.014
2			115	0.0%		
1	E28.2	Polycystic ovarian syndrome	264	1.5%	<0.00	0.060
2			3,504	0.9%	1	
1	Z80.41	Family history of malignant neoplasm of ovary	50	0.3%	<0.00	0.032
2			568	0.1%	1	
1	Z80.49	Family history of malignant neoplasm of other genital organs	27	0.2%	<0.00	0.027
2			261	0.1%	1	
1	N85.0	Endometrial hyperplasia	94	0.5%	<0.00	0.026
2			1,487	0.4%	1	
1	D25	Leiomyoma of uterus	470	2.7%	0.026	0.017
2			9,804	2.5%		
1	D26	Other benign neoplasms of uterus	20	0.1%	0.703	0.003
2			505	0.1%		
1	D27	Benign neoplasm of ovary	39	0.2%	0.871	0.001
2			879	0.2%		
1	Z80.3	Family history of malignant neoplasm of breast	390	2.3%	<0.00	0.081
2			4,796	1.2%	1	

Procedure

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1		122	0.7%	<0.00	0.062
2		1,090	0.3%	1	
1		43	0.2%	0.047	0.016
2		1,352	0.3%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
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1	A10A	INSULINS AND ANALOGUES	7,387	42.8%	<0.00	0.558
2			72,077	18.0%	1	
1	A10B	Sulfonylureas	2,808	16.3%	<0.00	0.261
2	B		31,308	7.8%	1	
1	A10B	Alpha glucosidase inhibitors	60	0.3%	<0.00	0.050
2	F		436	0.1%	1	
1	A10B	Thiazolidinediones	974	5.6%	<0.00	0.172
2	G		9,195	2.3%	1	
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors	1,906	11.0%	<0.00	0.374
2	H		7,852	2.0%	1	
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	918	5.3%	<0.00	0.305
2	K		1,296	0.3%	1	
1	A10B	Other blood glucose lowering drugs, excl. insulins	349	2.0%	<0.00	0.142
2	X		1,821	0.5%	1	
1	HS200	CONTRACEPTIVE S,SYSTEMIC	718	4.2%	<0.00	0.084
2			10,566	2.6%	1	
1	10324	tamoxifen	17	0.1%	0.246	0.008
2			295	0.1%		

Group 1 (N = 17,168) and group 2 (N = 17,168) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	17,168	100%	0.118	0.017
2			17,168	100%		
1	2106-3	White	11,256	65.6%	0.001	0.036
2			11,549	67.3%		
1	1002-5	American Indian or Alaska Native	59	0.3%	0.926	0.001
2			58	0.3%		
1	UNK	Unknown Race	1,559	9.1%	0.298	0.011
2			1,504	8.8%		
1	2076-8	Native Hawaiian or Other Pacific Islander	80	0.5%	0.937	0.001
2			79	0.5%		
1	UN	Unknown Ethnicity	3,140	18.3%	0.044	0.022
2			2,997	17.5%		
1	2186-5	Not Hispanic or Latino	12,387	72.2%	0.001	0.036
2			12,659	73.7%		

1	2135-2	Hispanic or Latino	1,641	9.6%	0.016	0.026	
2			1,512	8.8%			
1	2054-5	Black or African American	3,454	20.1%	0.071	0.019	
2			3,321	19.3%			
1	2028-9	Asian	310	1.8%	0.025	0.024	
2			257	1.5%			
Diagnosis							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances		268	1.6%	0.151	0.015
2	Z65			236	1.4%		
1	E66	Overweight and obesity		6,388	37.2%	0.615	0.005
2				6,343	36.9%		
1	Z68.3	Body mass index [BMI] 30-39, adult		1,331	7.8%	0.516	0.007
2				1,299	7.6%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult		1,636	9.5%	0.300	0.011
2				1,580	9.2%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult		38	0.2%	0.075	0.019
2				24	0.1%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult		51	0.3%	0.350	0.010
2				42	0.2%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult		58	0.3%	0.851	0.002
2				56	0.3%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult		66	0.4%	0.364	0.010
2				56	0.3%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult		75	0.4%	0.140	0.016
2				58	0.3%		
1	Z80	Family history of primary malignant neoplasm		798	4.6%	0.031	0.023
2				716	4.2%		

1	Z15.0	Genetic susceptibility to malignant neoplasm	15	0.1%	0.433	0.008
2			11	0.1%		
1	Z12	Encounter for screening for malignant neoplasms	4,054	23.6%	<0.001	0.053
2			3,674	21.4%		
1	Z85	Personal history of malignant neoplasm	488	2.8%	0.077	0.019
2			435	2.5%		
1	Z98.84	Bariatric surgery status	365	2.1%	0.624	0.005
2			352	2.1%		
1	E66.0	Obesity due to excess calories	3,402	19.8%	0.978	<0.001
2			3,400	19.8%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	131	0.8%	0.197	0.014
2			111	0.6%		
1	E66.3	Overweight	274	1.6%	0.082	0.019
2			235	1.4%		
1	E66.8	Other obesity	112	0.7%	0.947	0.001
2			113	0.7%		
1	E66.9	Obesity, unspecified	4,514	26.3%	0.319	0.011
2			4,433	25.8%		
1	Z72.3	Lack of physical exercise	10	0.1%	1	<0.001
2			10	0.1%		
1	Z72.4	Inappropriate diet and eating habits	25	0.1%	0.500	0.007
2			30	0.2%		
1	Z79.890	Hormone replacement therapy	83	0.5%	0.190	0.014
2			67	0.4%		
1	Z92.23	Personal history of estrogen therapy	10	0.1%	1	<0.001
2			10	0.1%		
1	E28.2	Polycystic ovarian syndrome	260	1.5%	0.445	0.008
2			243	1.4%		
1	Z80.41	Family history of malignant neoplasm of ovary	47	0.3%	0.835	0.002
2			45	0.3%		
1	Z80.49	Family history of malignant neoplasm of other genital organs	27	0.2%	0.386	0.009
2			21	0.1%		
1	N85.0	Endometrial hyperplasia	93	0.5%	0.548	0.006
2			85	0.5%		
1	D25	Leiomyoma of uterus	465	2.7%	0.025	0.024
2			400	2.3%		

1	D26	Other benign neoplasms of uterus	20	0.1%	0.505	0.007	
2			16	0.1%			
1	D27	Benign neoplasm of ovary	38	0.2%	0.133	0.016	
2			26	0.2%			
1	Z80.3	Family history of malignant neoplasm of breast	380	2.2%	0.036	0.023	
2			325	1.9%			
Procedure							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	58300	Insertion of intrauterine device (IUD)		118	0.7%	0.792	0.003
2				114	0.7%		
1	1001	Radiation		43	0.3%	0.578	0.006
2				38	0.2%		
Medication							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10A	INSULINS AND ANALOGUES		7,290	42.5%	0.686	0.004
2				7,253	42.2%		
1	A10B	Sulfonylureas		2,753	16.0%	0.941	0.001
2	B			2,748	16.0%		
1	A10B	Alpha glucosidase inhibitors		59	0.3%	0.570	0.006
2	F			53	0.3%		
1	A10B	Thiazolidinediones		949	5.5%	0.340	0.010
2	G			909	5.3%		
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors		1,827	10.6%	0.650	0.005
2	H			1,853	10.8%		
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors		817	4.8%	0.021	0.025
2	K			728	4.2%		
1	A10B	Other blood glucose lowering drugs, excl. insulins		328	1.9%	0.639	0.005
2	X			340	2.0%		
1	HS200	CONTRACEPTIVE S,SYSTEMIC		704	4.1%	0.023	0.024
2				623	3.6%		
1	10324	tamoxifen		17	0.1%	0.862	0.002
2				16	0.1%		

eTable 18. Characteristics of the GLP-1RA/no metformin group and metformin/no GLP-1RA group before and after matched for covariates related to gallbladder cancer for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 32,365) and group 2 (N = 856,160) characteristics before propensity score matching							
Demographics							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	AI	Age at Index	59.0 +/- 12.4	32,365	100%	<0.00	0.080
2			60.1 +/- 14.0	856,160	100%	1	
1	2106-3	White		21,231	65.6%	<0.00	0.111
2				515,868	60.3%	1	
1	UNK	Unknown Race		4,272	13.2%	<0.00	0.021
2				119,036	13.9%	1	
1	F	Female		17,278	53.4%	<0.00	0.134
2				399,923	46.7%	1	
1	UN	Unknown Gender		1,670	5.2%	<0.00	0.152
2				19,592	2.3%	1	
1	2186-5	Not Hispanic or Latino		22,299	68.9%	<0.00	0.151
2				528,686	61.8%	1	
1	2135-2	Hispanic or Latino		2,660	8.2%	<0.00	0.084
2				91,303	10.7%	1	
1	2054-5	Black or African American		5,107	15.8%	<0.00	0.021
2				141,606	16.5%	1	
1	M	Male		13,417	41.5%	<0.00	0.192
2				436,645	51.0%	1	
1	2028-9	Asian		681	2.1%	<0.00	0.118
2				35,540	4.2%	1	
Diagnosis							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	422	1.3%	0.107	0.009	
2	Z65		10,310	1.2%			
1	E66	Overweight and obesity	11,418	35.3%	<0.00	0.411	
2			149,974	17.5%	1		
1	Z68.3	Body mass index [BMI] 30-39, adult	3,285	10.1%	<0.00	0.249	
2			32,977	3.9%	1		

1 2	Z68.4	Body mass index [BMI] 40 or greater, adult	3,012 23,535	9.3% 2.7%	<0.00 1	0.278
1 2	Z68.25	Body mass index [BMI] 25.0-25.9, adult	119 2,293	0.4% 0.3%	0.001	0.018
1 2	Z68.26	Body mass index [BMI] 26.0-26.9, adult	150 2,433	0.5% 0.3%	<0.00 1	0.029
1 2	Z68.27	Body mass index [BMI] 27.0-27.9, adult	209 2,942	0.6% 0.3%	<0.00 1	0.043
1 2	Z68.28	Body mass index [BMI] 28.0-28.9, adult	264 3,317	0.8% 0.4%	<0.00 1	0.055
1 2	Z68.29	Body mass index [BMI] 29.0-29.9, adult	299 3,753	0.9% 0.4%	<0.00 1	0.059
1 2	F10	Alcohol related disorders	460 21,150	1.4% 2.5%	<0.00 1	0.076
1 2	Z80	Family history of primary malignant neoplasm	1,222 16,133	3.8% 1.9%	<0.00 1	0.114
1 2	Z15.0	Genetic susceptibility to malignant neoplasm	18 140	0.1% 0.0%	<0.00 1	0.021
1 2	Z12	Encounter for screening for malignant neoplasms	6,223 114,996	19.2% 13.4%	<0.00 1	0.157
1 2	Z85	Personal history of malignant neoplasm	1,111 23,231	3.4% 2.7%	<0.00 1	0.042
1 2	Z98.84	Bariatric surgery status	534 2,989	1.6% 0.3%	<0.00 1	0.131
1 2	F17	Nicotine dependence	2,399 77,335	7.4% 9.0%	<0.00 1	0.059
1 2	E66.0	Obesity due to excess calories	5,910 56,178	18.3% 6.6%	<0.00 1	0.361
1 2	E66.2	Morbid (severe) obesity with alveolar hypoventilation	230 2,051	0.7% 0.2%	<0.00 1	0.069
1 2	E66.3	Overweight	535 7,794	1.7% 0.9%	<0.00 1	0.066

1	E66.8	Other obesity	193	0.6%	<0.00	0.078
2			1,084	0.1%	1	
1	E66.9	Obesity, unspecified	8,150	25.2%	<0.00	0.307
2			113,380	13.2%	1	
1	Z72.0	Tobacco use	588	1.8%	<0.00	0.034
2			11,927	1.4%	1	
1	K80	Cholelithiasis	871	2.7%	<0.00	0.039
2			17,909	2.1%	1	
1	K82.8	Other specified diseases of gallbladder	129	0.4%	<0.00	0.026
2			2,130	0.2%	1	
1	Q44.4	Choledochal cyst	10	0.0%	0.119	0.008
2			160	0.0%		
1	Q44.5	Other congenital malformations of bile ducts	10	0.0%	0.684	0.002
2			232	0.0%		
1	K82.4	Cholesterolosis of gallbladder	55	0.2%	0.006	0.014
2			998	0.1%		
1	K83.0	Primary sclerosing cholangitis	10	0.0%	<0.00	0.020
2	1		36	0.0%	1	
1	A01.0	Typhoid fever	10	0.0%	<0.00	0.023
2			17	0.0%	1	
1	Z85.09	Personal history of malignant neoplasm of other digestive organs	10	0.0%	0.032	0.010
2			133	0.0%		
1	D13.5	Benign neoplasm of extrahepatic bile ducts	12	0.0%	0.944	<0.001
2			311	0.0%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 A10A	INSULINS AND ANALOGUES	14,131	43.7%	<0.00	0.560
2		159,901	18.7%	1	
1 A10B	Sulfonylureas	5,464	16.9%	<0.00	0.269
2 B		69,045	8.1%	1	
1 A10B	Alpha glucosidase inhibitors	124	0.4%	<0.00	0.057
2 F		876	0.1%	1	
1 A10B	Thiazolidinediones	1,960	6.1%	<0.00	0.183
2 G		20,400	2.4%	1	
1 A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors	3,547	11.0%	<0.00	0.370
2 H		17,113	2.0%	1	

1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	1,839	5.7%	<0.001	0.312
2	K		3,371	0.4%		
1	A10B	Other blood glucose lowering drugs, excl. insulins	672	2.1%	<0.001	0.146
2	X		3,839	0.4%		

Group 1 (N = 32,261) and group 2 (N = 32,261) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	32,261	100%	0.493	0.005
2			32,261	100%		
1	2106-3	White	21,159	65.6%	<0.001	0.034
2			21,672	67.2%		
1	UNK	Unknown Race	4,253	13.2%	0.237	0.009
2			4,152	12.9%		
1	F	Female	17,211	53.3%	0.134	0.012
2			17,401	53.9%		
1	UN	Unknown Gender	1,654	5.1%	0.210	0.010
2			1,725	5.3%		
1	2186-5	Not Hispanic or Latino	22,225	68.9%	0.011	0.020
2			22,522	69.8%		
1	2135-2	Hispanic or Latino	2,653	8.2%	0.032	0.017
2			2,505	7.8%		
1	2054-5	Black or African American	5,095	15.8%	0.002	0.024
2			4,817	14.9%		
1	M	Male	13,396	41.5%	0.037	0.016
2			13,135	40.7%		
1	2028-9	Asian	681	2.1%	0.011	0.020
2			591	1.8%		

Diagnosis

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55- Z65	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	420	1.3%	0.021	0.018
2			356	1.1%		
1	E66	Overweight and obesity	11,341	35.2%	0.863	0.001
2			11,362	35.2%		

1	Z68.3	Body mass index [BMI] 30-39, adult	3,255	10.1%	0.675	0.003
2			3,223	10.0%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult	2,967	9.2%	0.081	0.014
2			2,840	8.8%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	119	0.4%	0.645	0.004
2			112	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	149	0.5%	0.049	0.015
2			117	0.4%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	209	0.6%	0.073	0.014
2			174	0.5%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	263	0.8%	0.372	0.007
2			243	0.8%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	298	0.9%	0.516	0.005
2			314	1.0%		
1	F10	Alcohol related disorders	459	1.4%	<0.00 1	0.029
2			356	1.1%		
1	Z80	Family history of primary malignant neoplasm	1,210	3.8%	0.004	0.022
2			1,076	3.3%		
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	0.869	0.001
2			19	0.1%		
1	Z12	Encounter for screening for malignant neoplasms	6,177	19.1%	<0.00 1	0.049
2			5,562	17.2%		
1	Z85	Personal history of malignant neoplasm	1,106	3.4%	0.220	0.010
2			1,050	3.3%		
1	Z98.84	Bariatric surgery status	517	1.6%	0.099	0.013
2			571	1.8%		
1	F17	Nicotine dependence	2,392	7.4%	<0.00 1	0.034
2			2,115	6.6%		
1	E66.0	Obesity due to excess calories	5,850	18.1%	0.967	<0.001
2			5,854	18.1%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	228	0.7%	0.474	0.006
2			213	0.7%		

1	E66.3	Overweight	531	1.6%	0.065	0.015
2			473	1.5%		
1	E66.8	Other obesity	191	0.6%	0.918	0.001
2			189	0.6%		
1	E66.9	Obesity, unspecified	8,099	25.1%	0.957	<0.001
2			8,093	25.1%		
1	Z72.0	Tobacco use	585	1.8%	0.001	0.026
2			477	1.5%		
1	K80	Cholelithiasis	866	2.7%	0.007	0.021
2			758	2.3%		
1	K82.8	Other specified	127	0.4%	0.565	0.005
2		diseases of gallbladder	118	0.4%		
1	Q44.4	Choledochal cyst	10	0.0%	1	<0.001
2			10	0.0%		
1	Q44.5	Other congenital	10	0.0%	1	<0.001
2		malformations of bile ducts	10	0.0%		
1	K82.4	Cholesterolosis of gallbladder	55	0.2%	0.370	0.007
2			46	0.1%		
1	K83.0	Primary sclerosing cholangitis	10	0.0%	1	<0.001
2	1		10	0.0%		
1	A01.0	Typhoid fever	10	0.0%	1	<0.001
2			10	0.0%		
1	Z85.09	Personal history of malignant neoplasm	10	0.0%	1	<0.001
2		of other digestive organs	10	0.0%		
1	D13.5	Benign neoplasm of extrahepatic bile	12	0.0%	0.670	0.003
2		ducts	10	0.0%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD	
1	A10A	INSULINS AND ANALOGUES	14,038	43.5%	0.313	0.008
2			13,911	43.1%		
1	A10B	Sulfonylureas	5,421	16.8%	0.583	0.004
2	B		5,369	16.6%		
1	A10B	Alpha glucosidase inhibitors	122	0.4%	0.602	0.004
2	F		114	0.4%		
1	A10B	Thiazolidinediones	1,932	6.0%	0.549	0.005
2	G		1,896	5.9%		

1	A10B	Dipeptidyl peptidase	3,467	10.7%		
2	H	4 (DPP-4) inhibitors	3,412	10.6%	0.483	0.006
1	A10B	Sodium-glucose co-	1,746	5.4%		
2	K	transporter 2 (SGLT2) inhibitors	1,578	4.9%	0.003	0.024
1	A10B	Other blood glucose	657	2.0%		
2	X	lowering drugs, excl. insulins	650	2.0%	0.845	0.002

eTable 19. Characteristics of the GLP-1RA/no metformin group and metformin/no GLP-1RA group before and after matched for covariates related to stomach cancer for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 32,365) and group 2 (N = 856,160) characteristics before propensity score matching							
Demographics							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	AI	Age at Index	59.0 +/- 12.4	32,365	100%	<0.00	0.080
2			60.1 +/- 14.0	856,160	100%	1	
1	2106-3	White		21,231	65.6%	<0.00	0.111
2				515,868	60.3%	1	
1	1002-5	American Indian or Alaska Native		98	0.3%	0.092	0.010
2				3,080	0.4%		
1	UNK	Unknown Race		4,272	13.2%	<0.00	0.021
2				119,036	13.9%	1	
1	F	Female		17,278	53.4%	<0.00	0.134
2				399,923	46.7%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander		172	0.5%	0.001	0.020
2				5,884	0.7%		
1	UN	Unknown Gender		1,670	5.2%	<0.00	0.152
2				19,592	2.3%	1	
1	2186-5	Not Hispanic or Latino		22,299	68.9%	<0.00	0.151
2				528,686	61.8%	1	
1	2135-2	Hispanic or Latino		2,660	8.2%	<0.00	0.084
2				91,303	10.7%	1	
1	2054-5	Black or African American		5,107	15.8%	<0.00	0.021
2				141,606	16.5%	1	
1	M	Male		13,417	41.5%	<0.00	0.192
2				436,645	51.0%	1	
1	2028-9	Asian		681	2.1%	<0.00	0.118
2				35,540	4.2%	1	
Diagnosis							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	Z55-	Persons with potential health hazards related to socioeconomic and	422	1.3%	0.107	0.009	
2	Z65		10,310	1.2%			

		psychosocial circumstances				
1	E66	Overweight and obesity	11,418	35.3%	<0.00	0.411
2			149,974	17.5%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	3,285	10.1%	<0.00	0.249
2			32,977	3.9%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,012	9.3%	<0.00	0.278
2			23,535	2.7%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	119	0.4%	0.001	0.018
2			2,293	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	150	0.5%	<0.00	0.029
2			2,433	0.3%	1	
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	209	0.6%	<0.00	0.043
2			2,942	0.3%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	264	0.8%	<0.00	0.055
2			3,317	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	299	0.9%	<0.00	0.059
2			3,753	0.4%	1	
1	F10	Alcohol related disorders	460	1.4%	<0.00	0.076
2			21,150	2.5%	1	
1	Z80	Family history of primary malignant neoplasm	1,222	3.8%	<0.00	0.114
2			16,133	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	<0.00	0.021
2			140	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	6,223	19.2%	<0.00	0.157
2			114,996	13.4%	1	
1	Z85	Personal history of malignant neoplasm	1,111	3.4%	<0.00	0.042
2			23,231	2.7%	1	
1	Z98.84	Bariatric surgery status	534	1.6%	<0.00	0.131
2			2,989	0.3%	1	
1	F17	Nicotine dependence	2,399	7.4%	<0.00	0.059
2			77,335	9.0%	1	

1	E66.0	Obesity due to excess calories	5,910	18.3%	<0.00	0.361
2			56,178	6.6%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	230	0.7%	<0.00	0.069
2			2,051	0.2%	1	
1	E66.3	Overweight	535	1.7%	<0.00	0.066
2			7,794	0.9%	1	
1	E66.8	Other obesity	193	0.6%	<0.00	0.078
2			1,084	0.1%	1	
1	E66.9	Obesity, unspecified	8,150	25.2%	<0.00	0.307
2			113,380	13.2%	1	
1	Z72.0	Tobacco use	588	1.8%	<0.00	0.034
2			11,927	1.4%	1	
1	Z85.09	Personal history of malignant neoplasm of other digestive organs	10	0.0%	0.032	0.010
2			133	0.0%		
1	B96.8	Helicobacter pylori [H. pylori] as the cause of diseases classified elsewhere	141	0.4%	0.259	0.006
2	1		3,386	0.4%		
1	D13.1	Benign neoplasm of stomach	163	0.5%	<0.00	0.038
2			2,312	0.3%	1	
1	K31.7	Polyp of stomach and duodenum	216	0.7%	<0.00	0.052
2			2,635	0.3%	1	
1	D51.0	Vitamin B12 deficiency anemia due to intrinsic factor deficiency	103	0.3%	<0.00	0.028
2			1,532	0.2%	1	
1	Z80.0	Family history of malignant neoplasm of digestive organs	413	1.3%	<0.00	0.055
2			6,255	0.7%	1	
1	D83	Common variable immunodeficiency	21	0.1%	<0.00	0.019
2			206	0.0%	1	
1	B27	Infectious mononucleosis	30	0.1%	<0.00	0.017
2			409	0.0%	1	
Procedure						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	10073	Excision Procedures on the Stomach	10	0.0%	<0.00	0.016
2	52		76	0.0%	1	
Medication						

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10A	INSULINS AND ANALOGUES	14,131	43.7%	<0.00	0.560
2			159,901	18.7%	1	
1	A10B	Sulfonylureas	5,464	16.9%	<0.00	0.269
2	B		69,045	8.1%	1	
1	A10B	Alpha glucosidase inhibitors	124	0.4%	<0.00	0.057
2	F		876	0.1%	1	
1	A10B	Thiazolidinediones	1,960	6.1%	<0.00	0.183
2	G		20,400	2.4%	1	
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors	3,547	11.0%	<0.00	0.370
2	H		17,113	2.0%	1	
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	1,839	5.7%	<0.00	0.312
2	K		3,371	0.4%	1	
1	A10B	Other blood glucose lowering drugs, excl. insulins	672	2.1%	<0.00	0.146
2	X		3,839	0.4%	1	

Group 1 (N = 32,268) and group 2 (N = 32,268) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	59.0 +/- 12.4	32,268	100%	0.025
2			58.8 +/- 13.3	32,268	100%	
1	2106-3	White	21,162	65.6%	<0.00	0.028
2			21,585	66.9%	1	
1	1002-5	American Indian or Alaska Native	98	0.3%	0.724	0.003
2			103	0.3%		
1	UNK	Unknown Race	4,259	13.2%	0.344	0.007
2			4,178	12.9%		
1	F	Female	17,213	53.3%	0.008	0.021
2			17,550	54.4%		
1	2076-8	Native Hawaiian or Other Pacific Islander	172	0.5%	0.702	0.003
2			165	0.5%		
1	UN	Unknown Gender	1,659	5.1%	0.657	0.003
2			1,684	5.2%		
1	2186-5	Not Hispanic or Latino	22,225	68.9%	<0.00	0.029
2			22,662	70.2%	1	

1	2135-2	Hispanic or Latino	2,654	8.2%	0.007	0.021
2			2,468	7.6%		
1	2054-5	Black or African American	5,092	15.8%	0.017	0.019
2			4,873	15.1%		
1	M	Male	13,396	41.5%	0.004	0.023
2			13,034	40.4%		
1	2028-9	Asian	681	2.1%	0.005	0.022
2			582	1.8%		

Diagnosis

Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances		419	1.3%	0.001	0.026
2	Z65			328	1.0%		
1	E66	Overweight and obesity		11,344	35.2%	0.433	0.006
2				11,249	34.9%		
1	Z68.3	Body mass index [BMI] 30-39, adult		3,252	10.1%	0.144	0.012
2				3,141	9.7%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult		2,970	9.2%	0.099	0.013
2				2,850	8.8%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult		119	0.4%	0.116	0.012
2				96	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult		150	0.5%	0.011	0.020
2				109	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult		209	0.6%	0.127	0.012
2				179	0.6%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult		263	0.8%	0.076	0.014
2				224	0.7%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult		299	0.9%	0.036	0.017
2				250	0.8%		
1	F10	Alcohol related disorders		459	1.4%	<0.001	0.030
2				352	1.1%		

1	Z80	Family history of primary malignant neoplasm	1,210	3.7%	0.011	0.020
2			1,090	3.4%		
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	1	<0.001
2			18	0.1%		
1	Z12	Encounter for screening for malignant neoplasms	6,175	19.1%	<0.001	0.048
2			5,575	17.3%		
1	Z85	Personal history of malignant neoplasm	1,105	3.4%	0.237	0.009
2			1,051	3.3%		
1	Z98.84	Bariatric surgery status	519	1.6%	0.755	0.002
2			529	1.6%		
1	F17	Nicotine dependence	2,392	7.4%	<0.001	0.031
2			2,137	6.6%		
1	E66.0	Obesity due to excess calories	5,850	18.1%	0.690	0.003
2			5,811	18.0%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	228	0.7%	0.208	0.010
2			202	0.6%		
1	E66.3	Overweight	531	1.6%	0.041	0.016
2			467	1.4%		
1	E66.8	Other obesity	190	0.6%	0.400	0.007
2			174	0.5%		
1	E66.9	Obesity, unspecified	8,103	25.1%	0.555	0.005
2			8,038	24.9%		
1	Z72.0	Tobacco use	585	1.8%	0.004	0.023
2			491	1.5%		
1	Z85.09	Personal history of malignant neoplasm of other digestive organs	10	0.0%	1	<0.001
2			10	0.0%		
1	B96.8	Helicobacter pylori [H. pylori] as the cause of diseases classified elsewhere	141	0.4%	0.004	0.022
2			97	0.3%		
1	D13.1	Benign neoplasm of stomach	163	0.5%	0.092	0.013
2			134	0.4%		
1	K31.7	Polyp of stomach and duodenum	213	0.7%	0.175	0.011
2			186	0.6%		
1	D51.0	Vitamin B12 deficiency anemia	103	0.3%	0.216	0.010
2			86	0.3%		

		due to intrinsic factor deficiency					
1	Z80.0	Family history of malignant neoplasm of digestive organs	409	1.3%	0.019	0.018	
2			345	1.1%			
1	D83	Common variable immunodeficiency	21	0.1%	0.631	0.004	
2			18	0.1%			
1	B27	Infectious mononucleosis	30	0.1%	0.793	0.002	
2			28	0.1%			
Procedure							
	Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	10073	Excision Procedures on the Stomach		10	0.0%	1	<0.001
2	52			10	0.0%		
Medication							
	Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10A	INSULINS AND ANALOGUES		14,042	43.5%	0.727	0.003
2					13,998		
1	A10B	Sulfonylureas		5,424	16.8%	0.120	0.012
2			B		5,277		
1	A10B	Alpha glucosidase inhibitors		124	0.4%	0.359	0.007
2			F		110		
1	A10B	Thiazolidinediones		1,932	6.0%	0.921	0.001
2			G		1,926		
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors		3,470	10.8%	0.145	0.011
2			H		3,356		
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors		1,751	5.4%	0.015	0.019
2			K		1,614		
1	A10B	Other blood glucose lowering drugs, excl. insulins		660	2.0%	0.912	0.001
2			X		664		

eTable 20. Characteristics of the GLP-1RA/no metformin group and metformin/no GLP-1RA group before and after matched for covariates related to kidney cancer for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 32,365) and group 2 (N = 856,160) characteristics before propensity score matching							
Demographics							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	AI	Age at Index	59.0 +/- 12.4	32,365	100%	<0.00	0.080
2			60.1 +/- 14.0	856,160	100%	1	
1	2106-3	White		21,231	65.6%	<0.00	0.111
2				515,868	60.3%	1	
1	1002-5	American Indian or Alaska Native		98	0.3%	0.092	0.010
2				3,080	0.4%		
1	UNK	Unknown Race		4,272	13.2%	<0.00	0.021
2				119,036	13.9%	1	
1	F	Female		17,278	53.4%	<0.00	0.134
2				399,923	46.7%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander		172	0.5%	0.001	0.020
2				5,884	0.7%		
1	UN	Unknown Gender		1,670	5.2%	<0.00	0.152
2				19,592	2.3%	1	
1	2186-5	Not Hispanic or Latino		22,299	68.9%	<0.00	0.151
2				528,686	61.8%	1	
1	2135-2	Hispanic or Latino		2,660	8.2%	<0.00	0.084
2				91,303	10.7%	1	
1	2054-5	Black or African American		5,107	15.8%	<0.00	0.021
2				141,606	16.5%	1	
1	M	Male		13,417	41.5%	<0.00	0.192
2				436,645	51.0%	1	
1	2028-9	Asian		681	2.1%	<0.00	0.118
2				35,540	4.2%	1	
Diagnosis							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	Z55-	Persons with potential health hazards related to socioeconomic and	422	1.3%	0.107	0.009	
2	Z65		10,310	1.2%			

		psychosocial circumstances				
1	E66	Overweight and obesity	11,418	35.3%	<0.00	0.411
2			149,974	17.5%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	3,285	10.1%	<0.00	0.249
2			32,977	3.9%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,012	9.3%	<0.00	0.278
2			23,535	2.7%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	119	0.4%	0.001	0.018
2			2,293	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	150	0.5%	<0.00	0.029
2			2,433	0.3%	1	
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	209	0.6%	<0.00	0.043
2			2,942	0.3%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	264	0.8%	<0.00	0.055
2			3,317	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	299	0.9%	<0.00	0.059
2			3,753	0.4%	1	
1	Z80	Family history of primary malignant neoplasm	1,222	3.8%	<0.00	0.114
2			16,133	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	<0.00	0.021
2			140	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	6,223	19.2%	<0.00	0.157
2			114,996	13.4%	1	
1	Z85	Personal history of malignant neoplasm	1,111	3.4%	<0.00	0.042
2			23,231	2.7%	1	
1	Z98.84	Bariatric surgery status	534	1.6%	<0.00	0.131
2			2,989	0.3%	1	
1	I10	Essential (primary) hypertension	19,775	61.1%	<0.00	0.259
2			413,462	48.3%	1	
1	F17	Nicotine dependence	2,399	7.4%	<0.00	0.059
2			77,335	9.0%	1	

1	E66.0	Obesity due to excess calories	5,910	18.3%	<0.00	0.361
2			56,178	6.6%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	230	0.7%	<0.00	0.069
2			2,051	0.2%	1	
1	E66.3	Overweight	535	1.7%	<0.00	0.066
2			7,794	0.9%	1	
1	E66.8	Other obesity	193	0.6%	<0.00	0.078
2			1,084	0.1%	1	
1	E66.9	Obesity, unspecified	8,150	25.2%	<0.00	0.307
2			113,380	13.2%	1	
1	Z72.0	Tobacco use	588	1.8%	<0.00	0.034
2			11,927	1.4%	1	
1	Z80.51	Family history of malignant neoplasm of kidney	12	0.0%	0.002	0.014
2			129	0.0%		
1	N18	Chronic kidney disease (CKD)	6,496	20.1%	<0.00	0.504
2			35,429	4.1%	1	
1	N19	Unspecified kidney failure	530	1.6%	<0.00	0.133
2			2,836	0.3%	1	
1	Z99.2	Dependence on renal dialysis	548	1.7%	<0.00	0.167
2			979	0.1%	1	
1	N17- N19	Acute kidney failure and chronic kidney disease	7,323	22.6%	<0.00	0.466
2			56,470	6.6%	1	
1	Q85.8 3	Von Hippel-Lindau syndrome	0	0%	0.539	0.005
2			10	0.0%		
1	Q85.1	Tuberous sclerosis	0	0%	0.237	0.009
2			37	0.0%		
1	D57.1	Sickle-cell disease without crisis	10	0.0%	0.783	0.002
2			289	0.0%		
1	D30.0	Benign neoplasm of kidney	33	0.1%	<0.00	0.026
2			301	0.0%	1	

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1	INSULINS AND ANALOGUES	14,131	43.7%	<0.00	0.560
2		159,901	18.7%	1	
1	A10B B	5,464	16.9%	<0.00	0.269
2		69,045	8.1%	1	

1	A10B	Alpha glucosidase inhibitors	124	0.4%	<0.001	0.057
2	F		876	0.1%		
1	A10B	Thiazolidinediones	1,960	6.1%	<0.001	0.183
2	G		20,400	2.4%		
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors	3,547	11.0%	<0.001	0.370
2	H		17,113	2.0%		
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	1,839	5.7%	<0.001	0.312
2	K		3,371	0.4%		
1	A10B	Other blood glucose lowering drugs, excl. insulins	672	2.1%	<0.001	0.146
2	X		3,839	0.4%		
1	161	acetaminophen	10,835	33.5%	<0.001	0.123
2			238,323	27.8%		

Group 1 (N = 32,162) and group 2 (N = 32,162) characteristics after propensity score matching

Demographics

Group	Mean ± SD	Patients	% of Group	P-Value	SMD	
1 2	AI	Age at Index	59.0 +/- 12.4 59.0 +/- 13.7	32,162 32,162	100% 100%	0.912 0.001
1 2	2106-3	White		21,094 21,683	65.6% 67.4%	<0.001 0.039
1 2	1002-5	American Indian or Alaska Native		98 102	0.3% 0.3%	0.777 0.002
1 2	UNK	Unknown Race		4,244 4,043	13.2% 12.6%	0.018 0.019
1 2	F	Female		17,170 17,352	53.4% 54.0%	0.150 0.011
1 2	2076-8	Native Hawaiian or Other Pacific Islander		172 153	0.5% 0.5%	0.291 0.008
1 2	UN	Unknown Gender		1,648 1,693	5.1% 5.3%	0.424 0.006
1 2	2186-5	Not Hispanic or Latino		22,153 22,767	68.9% 70.8%	<0.001 0.042
1 2	2135-2	Hispanic or Latino		2,642 2,283	8.2% 7.1%	<0.001 0.042
1 2	2054-5	Black or African American		5,076 4,856	15.8% 15.1%	0.016 0.019

1				13,344	41.5%		
2	M	Male		13,117	40.8%	0.069	0.014
1				677	2.1%		
2	2028-9	Asian		581	1.8%	0.006	0.022
Diagnosis							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances		417	1.3%	0.092	0.013
2	Z65			370	1.2%		
1	E66	Overweight and obesity		11,266	35.0%	0.293	0.008
2				11,139	34.6%		
1	Z68.3	Body mass index [BMI] 30-39, adult		3,223	10.0%	0.399	0.007
2				3,159	9.8%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult		2,929	9.1%	0.690	0.003
2				2,900	9.0%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult		118	0.4%	0.132	0.012
2				96	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult		148	0.5%	0.099	0.013
2				121	0.4%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult		207	0.6%	0.012	0.020
2				159	0.5%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult		259	0.8%	0.656	0.004
2				249	0.8%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult		296	0.9%	0.587	0.004
2				283	0.9%		
1	Z80	Family history of primary malignant neoplasm		1,195	3.7%	0.213	0.010
2				1,136	3.5%		
1	Z15.0	Genetic susceptibility to malignant neoplasm		18	0.1%	0.369	0.007
2				13	0.0%		

1	Z12	Encounter for screening for malignant neoplasms	6,128	19.1%	<0.001	0.048
2			5,534	17.2%		
1	Z85	Personal history of malignant neoplasm	1,096	3.4%	0.039	0.016
2			1,003	3.1%		
1	Z98.84	Bariatric surgery status	510	1.6%	0.899	0.001
2			506	1.6%		
1	I10	Essential (primary) hypertension	19,593	60.9%	<0.001	0.033
2			19,079	59.3%		
1	F17	Nicotine dependence	2,384	7.4%	<0.001	0.033
2			2,112	6.6%		
1	E66.0	Obesity due to excess calories	5,798	18.0%	0.712	0.003
2			5,762	17.9%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	226	0.7%	0.068	0.014
2			189	0.6%		
1	E66.3	Overweight	529	1.6%	0.105	0.013
2			478	1.5%		
1	E66.8	Other obesity	190	0.6%	0.290	0.008
2			170	0.5%		
1	E66.9	Obesity, unspecified	8,037	25.0%	0.333	0.008
2			7,931	24.7%		
1	Z72.0	Tobacco use	579	1.8%	0.028	0.017
2			507	1.6%		
1	Z80.51	Family history of malignant neoplasm of kidney	12	0.0%	0.670	0.003
2			10	0.0%		
1	N18	Chronic kidney disease (CKD)	6,366	19.8%	0.649	0.004
2			6,320	19.7%		
1	N19	Unspecified kidney failure	510	1.6%	0.567	0.005
2			492	1.5%		
1	Z99.2	Dependence on renal dialysis	514	1.6%	0.236	0.009
2			477	1.5%		
1	N17-N19	Acute kidney failure and chronic kidney disease	7,189	22.4%	0.426	0.006
2			7,105	22.1%		
1	Q85.8	Von Hippel-Lindau syndrome	0	0%	--	--
2			0	0%		
1	Q85.1	Tuberous sclerosis	0	0%	--	--
2			0	0%		
1	D57.1	Sickle-cell disease without crisis	10	0.0%	0.827	0.002
2			11	0.0%		

1	D30.0	Benign neoplasm of kidney		33	0.1%		
2				21	0.1%	0.102	0.013
Medication							
	Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10A	INSULINS AND ANALOGUES		13,947	43.4%		
2				13,899	43.2%	0.702	0.003
1	A10B	Sulfonylureas		5,373	16.7%		
2	B			5,299	16.5%	0.433	0.006
1	A10B	Alpha glucosidase inhibitors		120	0.4%		
2	F			100	0.3%	0.177	0.011
1	A10B	Thiazolidinediones		1,907	5.9%		
2	G			1,800	5.6%	0.070	0.014
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors		3,406	10.6%		
2	H			3,241	10.1%	0.033	0.017
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors		1,696	5.3%		
2	K			1,560	4.9%	0.014	0.019
1	A10B	Other blood glucose lowering drugs, excl. insulins		650	2.0%		
2	X			569	1.8%	0.019	0.018
1	161	acetaminophen		10,744	33.4%		
2				10,591	32.9%	0.200	0.010

eTable 21. Characteristics of the GLP-1RA/no metformin group and metformin/no GLP-1RA group before and after matched for covariates related to liver cancer for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 32,365) and group 2 (N = 856,160) characteristics before propensity score matching

Demographics							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	AI	Age at Index	59.0 +/- 12.4	32,365	100%	<0.00	0.080
2			60.1 +/- 14.0	856,160	100%	1	
1	2106-3	White		21,231	65.6%	<0.00	0.111
2				515,868	60.3%	1	
1	1002-5	American Indian or Alaska Native		98	0.3%	0.092	0.010
2				3,080	0.4%		
1	UNK	Unknown Race		4,272	13.2%	<0.00	0.021
2				119,036	13.9%	1	
1	F	Female		17,278	53.4%	<0.00	0.134
2				399,923	46.7%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander		172	0.5%	0.001	0.020
2				5,884	0.7%		
1	UN	Unknown Gender		1,670	5.2%	<0.00	0.152
2				19,592	2.3%	1	
1	2186-5	Not Hispanic or Latino		22,299	68.9%	<0.00	0.151
2				528,686	61.8%	1	
1	2135-2	Hispanic or Latino		2,660	8.2%	<0.00	0.084
2				91,303	10.7%	1	
1	2054-5	Black or African American		5,107	15.8%	<0.00	0.021
2				141,606	16.5%	1	
1	M	Male		13,417	41.5%	<0.00	0.192
2				436,645	51.0%	1	
1	2028-9	Asian		681	2.1%	<0.00	0.118
2				35,540	4.2%	1	
Diagnosis							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	Z55-	Persons with potential health hazards related to socioeconomic and	422	1.3%	0.107	0.009	
2	Z65		10,310	1.2%			

		psychosocial circumstances				
1	E66	Overweight and obesity	11,418	35.3%	<0.00	0.411
2			149,974	17.5%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	3,285	10.1%	<0.00	0.249
2			32,977	3.9%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,012	9.3%	<0.00	0.278
2			23,535	2.7%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	119	0.4%	0.001	0.018
2			2,293	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	150	0.5%	<0.00	0.029
2			2,433	0.3%	1	
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	209	0.6%	<0.00	0.043
2			2,942	0.3%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	264	0.8%	<0.00	0.055
2			3,317	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	299	0.9%	<0.00	0.059
2			3,753	0.4%	1	
1	F10	Alcohol related disorders	460	1.4%	<0.00	0.076
2			21,150	2.5%	1	
1	Z80	Family history of primary malignant neoplasm	1,222	3.8%	<0.00	0.114
2			16,133	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	<0.00	0.021
2			140	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	6,223	19.2%	<0.00	0.157
2			114,996	13.4%	1	
1	Z85	Personal history of malignant neoplasm	1,111	3.4%	<0.00	0.042
2			23,231	2.7%	1	
1	Z98.84	Bariatric surgery status	534	1.6%	<0.00	0.131
2			2,989	0.3%	1	
1	E88.81	Metabolic syndrome and other insulin resistance	705	2.2%	<0.00	0.098
2			8,208	1.0%	1	

1	E78	Disorders of lipoprotein metabolism and other lipidemias	18,042	55.7%	<0.00	0.320
2			341,946	39.9%	1	
1	I10	Essential (primary) hypertension	19,775	61.1%	<0.00	0.259
2			413,462	48.3%	1	
1	K75.8	Nonalcoholic steatohepatitis (NASH)	305	0.9%	<0.00	0.096
2	1		1,860	0.2%	1	
1	F17	Nicotine dependence	2,399	7.4%	<0.00	0.059
2			77,335	9.0%	1	
1	E66.0	Obesity due to excess calories	5,910	18.3%	<0.00	0.361
2			56,178	6.6%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	230	0.7%	<0.00	0.069
2			2,051	0.2%	1	
1	E66.3	Overweight	535	1.7%	<0.00	0.066
2			7,794	0.9%	1	
1	E66.8	Other obesity	193	0.6%	<0.00	0.078
2			1,084	0.1%	1	
1	E66.9	Obesity, unspecified	8,150	25.2%	<0.00	0.307
2			113,380	13.2%	1	
1	Z72.0	Tobacco use	588	1.8%	<0.00	0.034
2			11,927	1.4%	1	
1	Z72.3	Lack of physical exercise	20	0.1%	0.001	0.015
2			251	0.0%		
1	Z72.4	Inappropriate diet and eating habits	43	0.1%	<0.00	0.044
2			118	0.0%	1	
1	B18	Chronic viral hepatitis	352	1.1%	0.001	0.018
2			7,813	0.9%		
1	K74	Fibrosis and cirrhosis of liver	681	2.1%	<0.00	0.097
2			7,900	0.9%	1	
1	K76.0	Fatty (change of) liver, not elsewhere classified	1,474	4.6%	<0.00	0.110
2			21,684	2.5%	1	
1	K74.3	Primary biliary cirrhosis	28	0.1%	<0.00	0.022
2			287	0.0%	1	
1	E83.11	Hereditary hemochromatosis	24	0.1%	<0.00	0.019
2	0		266	0.0%	1	
1	E70.21	Tyrosinemia	10	0.0%	<0.00	0.019
2			46	0.0%	1	

1	E88.01	Alpha-1-antitrypsin deficiency	15	0.0%	<0.001	0.020
2			104	0.0%		
1	E80.1	Porphyria cutanea tarda	10	0.0%	<0.001	0.022
2			20	0.0%		
1	E74.0	Glycogen storage disease	10	0.0%	<0.001	0.017
2			60	0.0%		
1	E83.00	Disorder of copper metabolism, unspecified	10	0.0%	<0.001	0.017
2			61	0.0%		
1	T64	Toxic effect of aflatoxin and other mycotoxin food contaminants	10	0.0%	0.031	0.010
2			132	0.0%		
1	D13.4	Benign neoplasm of liver	16	0.0%	0.199	0.007
2			305	0.0%		

Medication

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10A	INSULINS AND ANALOGUES	14,131	43.7%	<0.001	0.560
2			159,901	18.7%		
1	A10B	Sulfonylureas	5,464	16.9%	<0.001	0.269
2			B	69,045		
1	A10B	Alpha glucosidase inhibitors	124	0.4%	<0.001	0.057
2			F	876		
1	A10B	Thiazolidinediones	1,960	6.1%	<0.001	0.183
2			G	20,400		
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors	3,547	11.0%	<0.001	0.370
2			H	17,113		
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	1,839	5.7%	<0.001	0.312
2			K	3,371		
1	A10B	Other blood glucose lowering drugs, excl. insulins	672	2.1%	<0.001	0.146
2			X	3,839		
1	A14A	ANABOLIC STEROIDS	17	0.1%	0.629	0.003
2			399	0.0%		

Group 1 (N = 32,267) and group 2 (N = 32,267) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
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1	AI	Age at Index	59.0 +/- 12.4	32,267	100%	0.088	0.013
2			58.8 +/- 13.4	32,267	100%		
1	2106-3	White		21,161	65.6%	<0.00	0.035
2				21,688	67.2%	1	
1	1002-5	American Indian or Alaska Native		98	0.3%	0.887	0.001
2				100	0.3%		
1	UNK	Unknown Race		4,256	13.2%	0.211	0.010
2				4,149	12.9%		
1	F	Female		17,218	53.4%	0.240	0.009
2				17,367	53.8%		
1	2076-8	Native Hawaiian or Other Pacific Islander		172	0.5%	0.957	<0.001
2				173	0.5%		
1	UN	Unknown Gender		1,658	5.1%	0.098	0.013
2				1,752	5.4%		
1	2186-5	Not Hispanic or Latino		22,227	68.9%	<0.00	0.032
2				22,704	70.4%	1	
1	2135-2	Hispanic or Latino		2,652	8.2%	0.002	0.025
2				2,438	7.6%		
1	2054-5	Black or African American		5,095	15.8%	0.003	0.023
2				4,824	15.0%		
1	M	Male		13,391	41.5%	0.052	0.015
2				13,148	40.7%		
1	2028-9	Asian		681	2.1%	0.008	0.021
2				588	1.8%		

Diagnosis

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 Z55-2 Z65	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	417	1.3%	0.025	0.018
2		355	1.1%		
1 E66	Overweight and obesity	11,344	35.2%	0.504	0.005
2		11,263	34.9%		
1 Z68.3	Body mass index [BMI] 30-39, adult	3,251	10.1%	0.804	0.002
2		3,270	10.1%		
1 Z68.4	Body mass index [BMI] 40 or greater, adult	2,968	9.2%	0.108	0.013
2		2,851	8.8%		

1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	118	0.4%	0.043	0.016
2			89	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	149	0.5%	0.057	0.015
2			118	0.4%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	208	0.6%	0.064	0.015
2			172	0.5%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	262	0.8%	0.175	0.011
2			232	0.7%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	298	0.9%	0.804	0.002
2			292	0.9%		
1	F10	Alcohol related disorders	460	1.4%	<0.001	0.033
2			343	1.1%		
1	Z80	Family history of primary malignant neoplasm	1,207	3.7%	0.012	0.020
2			1,089	3.4%		
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	0.369	0.007
2			13	0.0%		
1	Z12	Encounter for screening for malignant neoplasms	6,179	19.1%	<0.001	0.055
2			5,497	17.0%		
1	Z85	Personal history of malignant neoplasm	1,106	3.4%	0.011	0.020
2			992	3.1%		
1	Z98.84	Bariatric surgery status	519	1.6%	0.950	<0.001
2			521	1.6%		
1	E88.81	Metabolic syndrome and other insulin resistance	695	2.2%	0.048	0.016
2			624	1.9%		
1	E78	Disorders of lipoprotein metabolism and other lipidemias	17,957	55.7%	<0.001	0.032
2			17,449	54.1%		
1	I10	Essential (primary) hypertension	19,692	61.0%	<0.001	0.036
2			19,128	59.3%		
1	K75.81	Nonalcoholic steatohepatitis (NASH)	293	0.9%	0.622	0.004
2			305	0.9%		

1	F17	Nicotine dependence	2,394	7.4%	<0.001	0.039
2			2,074	6.4%	1	
1	E66.0	Obesity due to excess calories	5,852	18.1%	0.894	0.001
2			5,865	18.2%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	227	0.7%	0.887	0.001
2			224	0.7%		
1	E66.3	Overweight	534	1.7%	0.012	0.020
2			456	1.4%		
1	E66.8	Other obesity	189	0.6%	0.759	0.002
2			195	0.6%		
1	E66.9	Obesity, unspecified	8,104	25.1%	0.206	0.010
2			7,965	24.7%		
1	Z72.0	Tobacco use	584	1.8%	0.033	0.017
2			514	1.6%		
1	Z72.3	Lack of physical exercise	20	0.1%	0.068	0.014
2			10	0.0%		
1	Z72.4	Inappropriate diet and eating habits	42	0.1%	0.018	0.019
2			23	0.1%		
1	B18	Chronic viral hepatitis	350	1.1%	0.054	0.015
2			301	0.9%		
1	K74	Fibrosis and cirrhosis of liver	666	2.1%	0.697	0.003
2			652	2.0%		
1	K76.0	Fatty (change of) liver, not elsewhere classified	1,454	4.5%	0.004	0.023
2			1,304	4.0%		
1	K74.3	Primary biliary cirrhosis	27	0.1%	0.438	0.006
2			33	0.1%		
1	E83.11	Hereditary hemochromatosis	24	0.1%	0.354	0.007
2	0		18	0.1%		
1	E70.21	Tyrosinemia	10	0.0%	1	<0.001
2			10	0.0%		
1	E88.01	Alpha-1-antitrypsin deficiency	14	0.0%	0.853	0.001
2			15	0.0%		
1	E80.1	Porphyria cutanea tarda	10	0.0%	1	<0.001
2			10	0.0%		
1	E74.0	Glycogen storage disease	10	0.0%	1	<0.001
2			10	0.0%		
1	E83.00	Disorder of copper metabolism, unspecified	10	0.0%	1	<0.001
2			10	0.0%		

1	T64	Toxic effect of aflatoxin and other mycotoxin food contaminants	10	0.0%	1	<0.001
2			10	0.0%		
1	D13.4	Benign neoplasm of liver	16	0.0%	0.715	0.003
2			14	0.0%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 A10A	INSULINS AND ANALOGUES	14,044	43.5%	0.703	0.003
2		14,092	43.7%		
1 A10B	Sulfonylureas	5,425	16.8%	0.077	0.014
2 B		5,258	16.3%		
1 A10B	Alpha glucosidase inhibitors	122	0.4%	0.949	0.001
2 F		123	0.4%		
1 A10B	Thiazolidinediones	1,933	6.0%	0.164	0.011
2 G		1,850	5.7%		
1 A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors	3,476	10.8%	0.054	0.015
2 H		3,326	10.3%		
1 A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	1,749	5.4%	0.001	0.027
2 K		1,559	4.8%		
1 A10B	Other blood glucose lowering drugs, excl. insulins	656	2.0%	0.737	0.003
2 X		644	2.0%		
1 A14A	ANABOLIC STEROIDS	17	0.1%	0.217	0.010
2		25	0.1%		

eTable 22. Characteristics of the GLP-1RA/no metformin group and metformin/no GLP-1RA group before and after matched for covariates related to ovarian cancer for the study populations of women with T2D and no history of any OAC

Group 1 (N = 17,278) and group 2 (N = 399,923) characteristics before propensity score matching							
Demographics							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	AI	Age at Index	57.7 +/- 12.8	17,278	100%	<0.00	0.160
2			60.0 +/- 14.7	399,923	100%	1	
1	2106-3	White		11,336	65.6%	<0.00	0.158
2				231,828	58.0%	1	
1	1002-5	American Indian or Alaska Native		59	0.3%	0.334	0.008
2				1,552	0.4%		
1	UNK	Unknown Race		1,563	9.0%	<0.00	0.107
2				49,384	12.3%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander		80	0.5%	<0.00	0.033
2				2,869	0.7%	1	
1	UN	Unknown Ethnicity		3,145	18.2%	<0.00	0.188
2				103,904	26.0%	1	
1	2186-5	Not Hispanic or Latino		12,481	72.2%	<0.00	0.219
2				247,896	62.0%	1	
1	2135-2	Hispanic or Latino		1,652	9.6%	<0.00	0.080
2				48,123	12.0%	1	
1	2054-5	Black or African American		3,476	20.1%	0.723	0.003
2				80,016	20.0%		
1	2028-9	Asian		311	1.8%	<0.00	0.149
2				17,483	4.4%	1	
Diagnosis							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	270	1.6%	0.003	0.022	
2	Z65		5,204	1.3%			
1	E66	Overweight and obesity	6,461	37.4%	<0.00	0.399	
2			78,874	19.7%	1		

1	Z68.3	Body mass index [BMI] 30-39, adult	1,360	7.9%	<0.00	0.203
2			13,007	3.3%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	1,671	9.7%	<0.00	0.264
2			12,991	3.2%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	39	0.2%	0.039	0.015
2			643	0.2%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	52	0.3%	<0.00	0.031
2			616	0.2%	1	
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	59	0.3%	<0.00	0.029
2			760	0.2%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	69	0.4%	<0.00	0.033
2			862	0.2%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	76	0.4%	<0.00	0.031
2			1,029	0.3%	1	
1	F10	Alcohol related disorders	128	0.7%	<0.00	0.044
2			4,677	1.2%	1	
1	Z80	Family history of primary malignant neoplasm	821	4.8%	<0.00	0.124
2			9,798	2.4%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	15	0.1%	<0.00	0.027
2			91	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	4,113	23.8%	<0.00	0.149
2			71,089	17.8%	1	
1	Z85	Personal history of malignant neoplasm	492	2.8%	<0.00	0.032
2			9,342	2.3%	1	
1	Z98.84	Bariatric surgery status	378	2.2%	<0.00	0.145
2			2,056	0.5%	1	
1	F17	Nicotine dependence	1,246	7.2%	0.003	0.024
2			31,324	7.8%		
1	E66.0	Obesity due to excess calories	3,456	20.0%	<0.00	0.354
2			31,701	7.9%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	132	0.8%	<0.00	0.070
2			1,060	0.3%	1	

1	E66.3	Overweight	280	1.6%	<0.00	0.064
2			3,619	0.9%	1	
1	E66.8	Other obesity	118	0.7%	<0.00	0.084
2			574	0.1%	1	
1	E66.9	Obesity, unspecified	4,568	26.4%	<0.00	0.291
2			59,095	14.8%	1	
1	Z72.0	Tobacco use	334	1.9%	<0.00	0.056
2			4,947	1.2%	1	
1	Z79.89	Hormone	85	0.5%	<0.00	0.025
2	0	replacement therapy	1,319	0.3%	1	
1	Z92.23	Personal history of	10	0.1%	0.030	0.014
2		estrogen therapy	115	0.0%		
1	Z80.3	Family history of	390	2.3%	<0.00	0.081
2		malignant neoplasm of breast	4,796	1.2%	1	
1	E28.2	Polycystic ovarian	264	1.5%	<0.00	0.060
2		syndrome	3,504	0.9%	1	
1	Z80.41	Family history of	50	0.3%	<0.00	0.032
2		malignant neoplasm of ovary	568	0.1%	1	
1	D27	Benign neoplasm of	39	0.2%	0.871	0.001
2		ovary	879	0.2%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 A10B		145	0.8%	<0.00	0.116
2 A		9,080	2.3%	1	
1 A10B		2,808	16.3%	<0.00	0.261
2 B		31,308	7.8%	1	
1 A10B		60	0.3%	<0.00	0.050
2 F		436	0.1%	1	
1 A10B		974	5.6%	<0.00	0.172
2 G		9,195	2.3%	1	
1 A10B		1,906	11.0%	<0.00	0.374
2 H		7,852	2.0%	1	
1 A10B		918	5.3%	<0.00	0.305
2 K		1,296	0.3%	1	
1 A10B		349	2.0%	<0.00	0.142
2 X		1,821	0.5%	1	

1	HS200	CONTRACEPTIVE		718	4.2%	<0.00	
2		S,SYSTEMIC		10,566	2.6%	1	0.084

Group 1 (N = 17,197) and group 2 (N = 17,197) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	AI	Age at Index	57.8 +/- 12.8	17,197	100%	0.072	0.019
2			57.5 +/- 13.7	17,197	100%		
1	2106-3	White		11,276	65.6%	0.005	0.031
2				11,525	67.0%		
1	1002-5	American Indian or Alaska Native		59	0.3%	0.445	0.008
2				51	0.3%		
1	UNK	Unknown Race		1,560	9.1%	0.041	0.022
2				1,453	8.4%		
1	2076-8	Native Hawaiian or Other Pacific Islander		80	0.5%	0.628	0.005
2				74	0.4%		
1	UN	Unknown Ethnicity		3,140	18.3%	0.015	0.026
2				2,967	17.3%		
1	2186-5	Not Hispanic or Latino		12,416	72.2%	0.002	0.033
2				12,670	73.7%		
1	2135-2	Hispanic or Latino		1,641	9.5%	0.133	0.016
2				1,560	9.1%		
1	2054-5	Black or African American		3,459	20.1%	0.318	0.011
2				3,385	19.7%		
1	2028-9	Asian		311	1.8%	0.567	0.006
2				297	1.7%		

Diagnosis

Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances		269	1.6%	0.096	0.018
2	Z65			232	1.3%		
1	E66	Overweight and obesity		6,398	37.2%	0.421	0.009
2				6,326	36.8%		
1	Z68.3	Body mass index [BMI] 30-39, adult		1,331	7.7%	0.405	0.009
2				1,290	7.5%		

1 2	Z68.4	Body mass index [BMI] 40 or greater, adult	1,643 1,621	9.6% 9.4%	0.686	0.004
1 2	Z68.25	Body mass index [BMI] 25.0-25.9, adult	38 25	0.2% 0.1%	0.101	0.018
1 2	Z68.26	Body mass index [BMI] 26.0-26.9, adult	50 47	0.3% 0.3%	0.760	0.003
1 2	Z68.27	Body mass index [BMI] 27.0-27.9, adult	58 54	0.3% 0.3%	0.705	0.004
1 2	Z68.28	Body mass index [BMI] 28.0-28.9, adult	64 57	0.4% 0.3%	0.524	0.007
1 2	Z68.29	Body mass index [BMI] 29.0-29.9, adult	75 77	0.4% 0.4%	0.871	0.002
1 2	F10	Alcohol related disorders	126 87	0.7% 0.5%	0.007	0.029
1 2	Z80	Family history of primary malignant neoplasm	802 742	4.7% 4.3%	0.118	0.017
1 2	Z15.0	Genetic susceptibility to malignant neoplasm	15 10	0.1% 0.1%	0.317	0.011
1 2	Z12	Encounter for screening for malignant neoplasms	4,067 3,779	23.6% 22.0%	<0.00 1	0.040
1 2	Z85	Personal history of malignant neoplasm	487 441	2.8% 2.6%	0.126	0.017
1 2	Z98.84	Bariatric surgery status	364 367	2.1% 2.1%	0.911	0.001
1 2	F17	Nicotine dependence	1,237 1,126	7.2% 6.5%	0.018	0.026
1 2	E66.0	Obesity due to excess calories	3,409 3,333	19.8% 19.4%	0.302	0.011
1 2	E66.2	Morbid (severe) obesity with alveolar hypoventilation	130 120	0.8% 0.7%	0.526	0.007
1 2	E66.3	Overweight	276 268	1.6% 1.6%	0.730	0.004

1	E66.8	Other obesity	116	0.7%	0.111	0.017
2			93	0.5%		
1	E66.9	Obesity, unspecified	4,520	26.3%	0.104	0.018
2			4,388	25.5%		
1	Z72.0	Tobacco use	330	1.9%	0.158	0.015
2			295	1.7%		
1	Z79.89	Hormone	83	0.5%	0.138	0.016
2	0	replacement therapy	65	0.4%		
1	Z92.23	Personal history of	10	0.1%	1	<0.001
2		estrogen therapy	10	0.1%		
1	Z80.3	Family history of	381	2.2%	0.177	0.015
2		malignant neoplasm	345	2.0%		
		of breast				
1	E28.2	Polycystic ovarian	263	1.5%	0.324	0.011
2		syndrome	241	1.4%		
1	Z80.41	Family history of	48	0.3%	0.755	0.003
2		malignant neoplasm	45	0.3%		
		of ovary				
1	D27	Benign neoplasm of	39	0.2%	1	<0.001
2		ovary	39	0.2%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1 A10B		145	0.8%	0.039	0.022
2 A		112	0.7%		
1 A10B		2,762	16.1%	0.461	0.008
2 B		2,712	15.8%		
1 A10B		59	0.3%	0.139	0.016
2 F		44	0.3%		
1 A10B		946	5.5%	0.377	0.010
2 G		909	5.3%		
1 A10B		1,834	10.7%	0.875	0.002
2 H		1,843	10.7%		
1 A10B		847	4.9%	0.047	0.021
2 K		769	4.5%		
1 A10B		329	1.9%	0.233	0.013
2 X		360	2.1%		
1 HS200		706	4.1%	0.142	0.016
2		653	3.8%		

eTable 23. Characteristics of the GLP-1RA/no metformin group and metformin/no GLP-1RA group before and after matched for covariates related to pancreatic cancer for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 32,365) and group 2 (N = 856,160) characteristics before propensity score matching							
Demographics							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	AI	Age at Index	59.0 +/- 12.4	32,365	100%	<0.00	0.080
2			60.1 +/- 14.0	856,160	100%	1	
1	2106-3	White		21,231	65.6%	<0.00	0.111
2				515,868	60.3%	1	
1	1002-5	American Indian or Alaska Native		98	0.3%	0.092	0.010
2				3,080	0.4%		
1	UNK	Unknown Race		4,272	13.2%	<0.00	0.021
2				119,036	13.9%	1	
1	F	Female		17,278	53.4%	<0.00	0.134
2				399,923	46.7%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander		172	0.5%	0.001	0.020
2				5,884	0.7%		
1	UN	Unknown Gender		1,670	5.2%	<0.00	0.152
2				19,592	2.3%	1	
1	2186-5	Not Hispanic or Latino		22,299	68.9%	<0.00	0.151
2				528,686	61.8%	1	
1	2135-2	Hispanic or Latino		2,660	8.2%	<0.00	0.084
2				91,303	10.7%	1	
1	2054-5	Black or African American		5,107	15.8%	<0.00	0.021
2				141,606	16.5%	1	
1	M	Male		13,417	41.5%	<0.00	0.192
2				436,645	51.0%	1	
1	2028-9	Asian		681	2.1%	<0.00	0.118
2				35,540	4.2%	1	
Diagnosis							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	Z55-	Persons with potential health hazards related to socioeconomic and	422	1.3%	0.107	0.009	
2	Z65		10,310	1.2%			

		psychosocial circumstances				
1	E66	Overweight and obesity	11,418	35.3%	<0.00	0.411
2			149,974	17.5%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	3,285	10.1%	<0.00	0.249
2			32,977	3.9%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,012	9.3%	<0.00	0.278
2			23,535	2.7%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	119	0.4%	0.001	0.018
2			2,293	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	150	0.5%	<0.00	0.029
2			2,433	0.3%	1	
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	209	0.6%	<0.00	0.043
2			2,942	0.3%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	264	0.8%	<0.00	0.055
2			3,317	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	299	0.9%	<0.00	0.059
2			3,753	0.4%	1	
1	F10	Alcohol related disorders	460	1.4%	<0.00	0.076
2			21,150	2.5%	1	
1	Z80	Family history of primary malignant neoplasm	1,222	3.8%	<0.00	0.114
2			16,133	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	<0.00	0.021
2			140	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	6,223	19.2%	<0.00	0.157
2			114,996	13.4%	1	
1	Z85	Personal history of malignant neoplasm	1,111	3.4%	<0.00	0.042
2			23,231	2.7%	1	
1	Z98.84	Bariatric surgery status	534	1.6%	<0.00	0.131
2			2,989	0.3%	1	
1	E66.0	Obesity due to excess calories	5,910	18.3%	<0.00	0.361
2			56,178	6.6%	1	

1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	230	0.7%	<0.00	0.069
2			2,051	0.2%	1	
1	E66.3	Overweight	535	1.7%	<0.00	0.066
2			7,794	0.9%	1	
1	E66.8	Other obesity	193	0.6%	<0.00	0.078
2			1,084	0.1%	1	
1	E66.9	Obesity, unspecified	8,150	25.2%	<0.00	0.307
2			113,380	13.2%	1	
1	Z72.3	Lack of physical exercise	20	0.1%	0.001	0.015
2			251	0.0%		
1	Z72.4	Inappropriate diet and eating habits	43	0.1%	<0.00	0.044
2			118	0.0%	1	
1	Z85.09	Personal history of malignant neoplasm of other digestive organs	10	0.0%	0.032	0.010
2			133	0.0%		
1	B96.8	Helicobacter pylori [H. pylori] as the cause of diseases classified elsewhere	141	0.4%	0.259	0.006
2			3,386	0.4%		
1	Z80.0	Family history of malignant neoplasm of digestive organs	413	1.3%	<0.00	0.055
2			6,255	0.7%	1	
1	B18	Chronic viral hepatitis	352	1.1%	0.001	0.018
2			7,813	0.9%		
1	K86.1	Other chronic pancreatitis	96	0.3%	<0.00	0.031
2			4,175	0.5%	1	
1	B16	Acute hepatitis B	50	0.2%	0.191	0.007
2			1,095	0.1%		
1	B18.1	Chronic viral hepatitis B without delta-agent	58	0.2%	0.036	0.011
2			1,158	0.1%		
1	Z72.0	Tobacco use	588	1.8%	<0.00	0.034
2			11,927	1.4%	1	
1	D13.6	Benign neoplasm of pancreas	10	0.0%	0.616	0.003
2			225	0.0%		
Medication						
Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10A	INSULINS AND ANALOGUES	14,131	43.7%	<0.00	0.560
2			159,901	18.7%	1	

1	A10B	Sulfonylureas	5,464	16.9%	<0.00	0.269
2	B		69,045	8.1%	1	
1	A10B	Alpha glucosidase inhibitors	124	0.4%	<0.00	0.057
2	F		876	0.1%	1	
1	A10B	Thiazolidinediones	1,960	6.1%	<0.00	0.183
2	G		20,400	2.4%	1	
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors	3,547	11.0%	<0.00	0.370
2	H		17,113	2.0%	1	
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	1,839	5.7%	<0.00	0.312
2	K		3,371	0.4%	1	
1	A10B	Other blood glucose lowering drugs, excl. insulins	672	2.1%	<0.00	0.146
2	X		3,839	0.4%	1	

Group 1 (N = 32,271) and group 2 (N = 32,271) characteristics after propensity score matching

Demographics

Group	Mean ± SD	Patients	% of Group	P-Value	SMD	
1 2	AI	Age at Index	59.0 +/- 12.4 58.9 +/- 13.1	32,271 32,271	100% 100%	0.197 0.010
1 2	2106-3	White		21,164 21,603	65.6% 66.9%	<0.00 1 0.029
1 2	1002-5	American Indian or Alaska Native		98 111	0.3% 0.3%	0.368 0.007
1 2	UNK	Unknown Race		4,259 4,244	13.2% 13.2%	0.861 0.001
1 2	F	Female		17,215 17,471	53.3% 54.1%	0.043 0.016
1 2	2076-8	Native Hawaiian or Other Pacific Islander		172 158	0.5% 0.5%	0.440 0.006
1 2	UN	Unknown Gender		1,658 1,746	5.1% 5.4%	0.121 0.012
1 2	2186-5	Not Hispanic or Latino		22,229 22,576	68.9% 70.0%	0.003 0.023
1 2	2135-2	Hispanic or Latino		2,652 2,444	8.2% 7.6%	0.002 0.024
1 2	2054-5	Black or African American		5,093 4,838	15.8% 15.0%	0.005 0.022

1				13,398	41.5%		
2	M	Male		13,054	40.5%	0.006	0.022
1				681	2.1%		
2	2028-9	Asian		604	1.9%	0.030	0.017
Diagnosis							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances		419	1.3%	0.062	0.015
2	Z65			367	1.1%		
1	E66	Overweight and obesity		11,342	35.1%	0.468	0.006
2				11,254	34.9%		
1	Z68.3	Body mass index [BMI] 30-39, adult		3,247	10.1%	0.287	0.008
2				3,166	9.8%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult		2,972	9.2%	0.594	0.004
2				2,933	9.1%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult		119	0.4%	0.031	0.017
2				88	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult		150	0.5%	0.058	0.015
2				119	0.4%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult		208	0.6%	0.224	0.010
2				184	0.6%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult		262	0.8%	0.594	0.004
2				250	0.8%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult		298	0.9%	0.532	0.005
2				283	0.9%		
1	F10	Alcohol related disorders		458	1.4%	<0.001	0.030
2				352	1.1%		
1	Z80	Family history of primary malignant neoplasm		1,207	3.7%	0.004	0.023
2				1,071	3.3%		

1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	0.601	0.004
2			15	0.0%		
1	Z12	Encounter for screening for malignant neoplasms	6,176	19.1%	<0.001	0.048
2			5,576	17.3%		
1	Z85	Personal history of malignant neoplasm	1,108	3.4%	0.246	0.009
2			1,055	3.3%		
1	Z98.84	Bariatric surgery status	520	1.6%	0.422	0.006
2			546	1.7%		
1	E66.0	Obesity due to excess calories	5,853	18.1%	0.632	0.004
2			5,900	18.3%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	227	0.7%	0.335	0.008
2			207	0.6%		
1	E66.3	Overweight	531	1.6%	0.070	0.014
2			474	1.5%		
1	E66.8	Other obesity	188	0.6%	0.758	0.002
2			194	0.6%		
1	E66.9	Obesity, unspecified	8,094	25.1%	0.133	0.012
2			7,929	24.6%		
1	Z72.3	Lack of physical exercise	19	0.1%	0.752	0.002
2			21	0.1%		
1	Z72.4	Inappropriate diet and eating habits	41	0.1%	0.182	0.011
2			54	0.2%		
1	Z85.09	Personal history of malignant neoplasm of other digestive organs	10	0.0%	1	<0.001
2			10	0.0%		
1	B96.8	Helicobacter pylori [H. pylori] as the cause of diseases classified elsewhere	140	0.4%	0.010	0.020
2			100	0.3%		
1	Z80.0	Family history of malignant neoplasm of digestive organs	410	1.3%	0.006	0.021
2			336	1.0%		
1	B18	Chronic viral hepatitis	352	1.1%	0.024	0.018
2			295	0.9%		
1	K86.1	Other chronic pancreatitis	96	0.3%	0.004	0.023
2			60	0.2%		
1	B16	Acute hepatitis B	50	0.2%	0.468	0.006
2			43	0.1%		

1	B18.1	Chronic viral hepatitis B without delta-agent	58	0.2%	0.705	0.003	
2			54	0.2%			
1	Z72.0	Tobacco use	584	1.8%	0.017	0.019	
2			506	1.6%			
1	D13.6	Benign neoplasm of pancreas	10	0.0%	1	<0.001	
2			10	0.0%			
Medication							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10A	INSULINS AND ANALOGUES		14,044	43.5%	0.685	0.003
2				13,993	43.4%		
1	A10B	Sulfonylureas		5,422	16.8%	0.153	0.011
2	B			5,287	16.4%		
1	A10B	Alpha glucosidase inhibitors		121	0.4%	0.647	0.004
2	F			114	0.4%		
1	A10B	Thiazolidinediones		1,930	6.0%	0.894	0.001
2	G			1,922	6.0%		
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors		3,470	10.8%	0.188	0.010
2	H			3,367	10.4%		
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors		1,756	5.4%	0.007	0.021
2	K			1,603	5.0%		
1	A10B	Other blood glucose lowering drugs, excl. insulins		656	2.0%	0.594	0.004
2	X			637	2.0%		

eTable 24. Characteristics of the GLP-1RA/no metformin group and metformin/no GLP-1RA group before and after matched for covariates related to thyroid cancer for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 32,365) and group 2 (N = 856,160) characteristics before propensity score matching							
Demographics							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	AI	Age at Index	59.0 +/- 12.4	32,365	100%	<0.00	0.080
2			60.1 +/- 14.0	856,160	100%	1	
1	2106-3	White		21,231	65.6%	<0.00	0.111
2				515,868	60.3%	1	
1	1002-5	American Indian or Alaska Native		98	0.3%	0.092	0.010
2				3,080	0.4%		
1	UNK	Unknown Race		4,272	13.2%	<0.00	0.021
2				119,036	13.9%	1	
1	F	Female		17,278	53.4%	<0.00	0.134
2				399,923	46.7%	1	
1	2076-8	Native Hawaiian or Other Pacific Islander		172	0.5%	0.001	0.020
2				5,884	0.7%		
1	UN	Unknown Gender		1,670	5.2%	<0.00	0.152
2				19,592	2.3%	1	
1	2186-5	Not Hispanic or Latino		22,299	68.9%	<0.00	0.151
2				528,686	61.8%	1	
1	2135-2	Hispanic or Latino		2,660	8.2%	<0.00	0.084
2				91,303	10.7%	1	
1	2054-5	Black or African American		5,107	15.8%	<0.00	0.021
2				141,606	16.5%	1	
1	M	Male		13,417	41.5%	<0.00	0.192
2				436,645	51.0%	1	
1	2028-9	Asian		681	2.1%	<0.00	0.118
2				35,540	4.2%	1	
Diagnosis							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	Z55-	Persons with potential health		422	1.3%	0.107	0.009
2	Z65	hazards related to socioeconomic and		10,310	1.2%		

		psychosocial circumstances				
1	E66	Overweight and obesity	11,418	35.3%	<0.00	0.411
2			149,974	17.5%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	3,285	10.1%	<0.00	0.249
2			32,977	3.9%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,012	9.3%	<0.00	0.278
2			23,535	2.7%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	119	0.4%	0.001	0.018
2			2,293	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	150	0.5%	<0.00	0.029
2			2,433	0.3%	1	
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	209	0.6%	<0.00	0.043
2			2,942	0.3%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	264	0.8%	<0.00	0.055
2			3,317	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	299	0.9%	<0.00	0.059
2			3,753	0.4%	1	
1	Z80	Family history of primary malignant neoplasm	1,222	3.8%	<0.00	0.114
2			16,133	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	<0.00	0.021
2			140	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	6,223	19.2%	<0.00	0.157
2			114,996	13.4%	1	
1	Z85	Personal history of malignant neoplasm	1,111	3.4%	<0.00	0.042
2			23,231	2.7%	1	
1	Z98.84	Bariatric surgery status	534	1.6%	<0.00	0.131
2			2,989	0.3%	1	
1	E66.0	Obesity due to excess calories	5,910	18.3%	<0.00	0.361
2			56,178	6.6%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	230	0.7%	<0.00	0.069
2			2,051	0.2%	1	

1	E66.3	Overweight	535	1.7%	<0.00	0.066	
2			7,794	0.9%	1		
1	E66.8	Other obesity	193	0.6%	<0.00	0.078	
2			1,084	0.1%	1		
1	E66.9	Obesity, unspecified	8,150	25.2%	<0.00	0.307	
2			113,380	13.2%	1		
1	D34	Benign neoplasm of thyroid gland	46	0.1%	<0.00	0.017	
2			715	0.1%	1		
Procedure							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	10278	Hereditary neuroendocrine tumor disorders (eg, medullary thyroid carcinoma, parathyroid carcinoma, malignant pheochromocytoma or paraganglioma)		0	0%	--	--
2	53			0	0%		
1	1001	Radiation		114	0.4%	<0.00	0.027
2				4,550	0.5%	1	
Medication							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10A	INSULINS AND ANALOGUES		14,131	43.7%	<0.00	0.560
2				159,901	18.7%	1	
1	A10B	Sulfonylureas		5,464	16.9%	<0.00	0.269
2	B			69,045	8.1%	1	
1	A10B	Alpha glucosidase inhibitors		124	0.4%	<0.00	0.057
2	F			876	0.1%	1	
1	A10B	Thiazolidinediones		1,960	6.1%	<0.00	0.183
2	G			20,400	2.4%	1	
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors		3,547	11.0%	<0.00	0.370
2	H			17,113	2.0%	1	
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors		1,839	5.7%	<0.00	0.312
2	K			3,371	0.4%	1	
1	A10B	Other blood glucose lowering drugs, excl. insulins		672	2.1%	<0.00	0.146
2	X			3,839	0.4%	1	

Group 1 (N = 32,259) and group 2 (N = 32,259) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	32,259	100%	0.810	0.002
2			32,259	100%		
1	2106-3	White	21,154	65.6%	<0.001	0.033
2			21,663	67.2%		
1	1002-5	American Indian or Alaska Native	98	0.3%	0.463	0.006
2			88	0.3%		
1	UNK	Unknown Race	4,259	13.2%	0.375	0.007
2			4,183	13.0%		
1	F	Female	17,209	53.3%	0.340	0.008
2			17,330	53.7%		
1	2076-8	Native Hawaiian or Other Pacific Islander	171	0.5%	0.078	0.014
2			140	0.4%		
1	UN	Unknown Gender	1,659	5.1%	0.085	0.014
2			1,757	5.4%		
1	2186-5	Not Hispanic or Latino	22,219	68.9%	<0.001	0.028
2			22,637	70.2%		
1	2135-2	Hispanic or Latino	2,651	8.2%	0.001	0.025
2			2,430	7.5%		
1	2054-5	Black or African American	5,093	15.8%	0.016	0.019
2			4,871	15.1%		
1	M	Male	13,391	41.5%	0.080	0.014
2			13,172	40.8%		
1	2028-9	Asian	681	2.1%	0.014	0.019
2			594	1.8%		

Diagnosis

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-Z65	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	420	1.3%	0.001	0.027
2			328	1.0%		
1	E66	Overweight and obesity	11,340	35.2%	0.279	0.009
2			11,209	34.7%		

1	Z68.3	Body mass index [BMI] 30-39, adult	3,247	10.1%	0.269	0.009
2			3,163	9.8%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult	2,969	9.2%	0.076	0.014
2			2,840	8.8%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	118	0.4%	0.173	0.011
2			98	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	149	0.5%	0.022	0.018
2			112	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	207	0.6%	0.029	0.017
2			165	0.5%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	261	0.8%	0.160	0.011
2			230	0.7%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	296	0.9%	0.653	0.004
2			307	1.0%		
1	Z80	Family history of primary malignant neoplasm	1,204	3.7%	0.024	0.018
2			1,098	3.4%		
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	0.130	0.012
2			10	0.0%		
1	Z12	Encounter for screening for malignant neoplasms	6,173	19.1%	<0.00 1	0.039
2			5,681	17.6%		
1	Z85	Personal history of malignant neoplasm	1,106	3.4%	0.212	0.010
2			1,049	3.3%		
1	Z98.84	Bariatric surgery status	518	1.6%	0.659	0.003
2			504	1.6%		
1	E66.0	Obesity due to excess calories	5,849	18.1%	0.340	0.008
2			5,756	17.8%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	228	0.7%	0.055	0.015
2			189	0.6%		
1	E66.3	Overweight	532	1.6%	0.008	0.021
2			450	1.4%		
1	E66.8	Other obesity	191	0.6%	0.640	0.004
2			182	0.6%		

1	E66.9	Obesity, unspecified	8,095	25.1%	0.111	0.013	
2			7,920	24.6%			
1	D34	Benign neoplasm of thyroid gland	45	0.1%	0.216	0.010	
2			34	0.1%			
Procedure							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	10278	Hereditary neuroendocrine tumor disorders (eg, medullary thyroid carcinoma, parathyroid carcinoma, malignant pheochromocytoma or paraganglioma)		0	0%	--	--
2	53			0	0%		
1	1001	Radiation		114	0.4%	0.213	0.010
2				96	0.3%		
Medication							
Group			Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10A	INSULINS AND ANALOGUES		14,033	43.5%	0.515	0.005
2				13,951	43.2%		
1	A10B	Sulfonylureas		5,417	16.8%	0.422	0.006
2	B			5,341	16.6%		
1	A10B	Alpha glucosidase inhibitors		123	0.4%	0.514	0.005
2	F			113	0.4%		
1	A10B	Thiazolidinediones		1,926	6.0%	0.403	0.007
2	G			1,876	5.8%		
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors		3,469	10.8%	0.639	0.004
2	H			3,506	10.9%		
1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors		1,740	5.4%	0.080	0.014
2	K			1,641	5.1%		
1	A10B	Other blood glucose lowering drugs, excl. insulins		654	2.0%	0.463	0.006
2	X			628	1.9%		

eTable 25. Characteristics of the GLP-1RA/no metformin group and metformin/no GLP-1RA group before and after matched for covariates related to meningioma for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 32,365) and group 2 (N = 856,160) characteristics before propensity score matching							
Demographics							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	AI	Age at Index	59.0 +/- 12.4	32,365	100%	<0.001	0.080
2			60.1 +/- 14.0	856,160	100%		
1	2106-3	White		21,231	65.6%	<0.001	0.111
2				515,868	60.3%		
1	1002-5	American Indian or Alaska Native		98	0.3%	0.092	0.010
2				3,080	0.4%		
1	UNK	Unknown Race		4,272	13.2%	<0.001	0.021
2				119,036	13.9%		
1	F	Female		17,278	53.4%	<0.001	0.134
2				399,923	46.7%		
1	2076-8	Native Hawaiian or Other Pacific Islander		172	0.5%	0.001	0.020
2				5,884	0.7%		
1	UN	Unknown Gender		1,670	5.2%	<0.001	0.152
2				19,592	2.3%		
1	2186-5	Not Hispanic or Latino		22,299	68.9%	<0.001	0.151
2				528,686	61.8%		
1	2135-2	Hispanic or Latino		2,660	8.2%	<0.001	0.084
2				91,303	10.7%		
1	2054-5	Black or African American		5,107	15.8%	<0.001	0.021
2				141,606	16.5%		
1	M	Male		13,417	41.5%	<0.001	0.192
2				436,645	51.0%		
1	2028-9	Asian		681	2.1%	<0.001	0.118
2				35,540	4.2%		
Diagnosis							
Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	Z55-	Persons with potential health		422	1.3%	0.107	0.009
2	Z65	hazards related to socioeconomic and		10,310	1.2%		

		psychosocial circumstances				
1	E66	Overweight and obesity	11,418	35.3%	<0.00	0.411
2			149,974	17.5%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	3,285	10.1%	<0.00	0.249
2			32,977	3.9%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,012	9.3%	<0.00	0.278
2			23,535	2.7%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	119	0.4%	0.001	0.018
2			2,293	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	150	0.5%	<0.00	0.029
2			2,433	0.3%	1	
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	209	0.6%	<0.00	0.043
2			2,942	0.3%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	264	0.8%	<0.00	0.055
2			3,317	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	299	0.9%	<0.00	0.059
2			3,753	0.4%	1	
1	Z80	Family history of primary malignant neoplasm	1,222	3.8%	<0.00	0.114
2			16,133	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	<0.00	0.021
2			140	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	6,223	19.2%	<0.00	0.157
2			114,996	13.4%	1	
1	Z85	Personal history of malignant neoplasm	1,111	3.4%	<0.00	0.042
2			23,231	2.7%	1	
1	Z98.84	Bariatric surgery status	534	1.6%	<0.00	0.131
2			2,989	0.3%	1	
1	E66.0	Obesity due to excess calories	5,910	18.3%	<0.00	0.361
2			56,178	6.6%	1	
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	230	0.7%	<0.00	0.069
2			2,051	0.2%	1	

1	E66.3	Overweight	535	1.7%	<0.00	0.066
2			7,794	0.9%	1	
1	E66.8	Other obesity	193	0.6%	<0.00	0.078
2			1,084	0.1%	1	
1	E66.9	Obesity, unspecified	8,150	25.2%	<0.00	0.307
2			113,380	13.2%	1	
1	Z79.89	Hormone	94	0.3%	<0.00	0.027
2	0	replacement therapy	1,381	0.2%	1	
1	Z92.23	Personal history of	10	0.0%	0.011	0.012
2		estrogen therapy	117	0.0%		
1	D32	Benign neoplasm of	84	0.3%	0.573	0.003
2		meninges	2,087	0.2%		
1	S00-	Injuries to the head	1,546	4.8%	0.333	0.006
2	S09		41,909	4.9%		
1	Z80.3	Family history of	438	1.4%	<0.00	0.073
2		malignant neoplasm	5,375	0.6%	1	
		of breast				

Procedure

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1		114	0.4%	<0.00	0.027
2	1001	4,550	0.5%	1	

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD	
1	A10A	INSULINS AND	14,131	43.7%	<0.00	0.560
2		ANALOGUES	159,901	18.7%	1	
1	A10B	Sulfonylureas	5,464	16.9%	<0.00	0.269
2	B		69,045	8.1%	1	
1	A10B	Alpha glucosidase	124	0.4%	<0.00	0.057
2	F	inhibitors	876	0.1%	1	
1	A10B	Thiazolidinediones	1,960	6.1%	<0.00	0.183
2	G		20,400	2.4%	1	
1	A10B	Dipeptidyl peptidase	3,547	11.0%	<0.00	0.370
2	H	4 (DPP-4) inhibitors	17,113	2.0%	1	
1	A10B	Sodium-glucose co-	1,839	5.7%	<0.00	0.312
2	K	transporter 2	3,371	0.4%	1	
		(SGLT2) inhibitors				
1	A10B	Other blood glucose	672	2.1%	<0.00	0.146
2	X	lowering drugs, excl.	3,839	0.4%	1	
		insulins				

1	HS200	CONTRACEPTIVE		1,069	3.3%	<0.00	
2		S,SYSTEMIC		17,029	2.0%	1	0.082

Group 1 (N = 32,263) and group 2 (N = 32,263) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	AI	Age at Index	32,263	100%	0.166	0.011
2			32,263	100%		
1	2106-3	White	21,158	65.6%	<0.00	0.038
2			21,735	67.4%	1	
1	1002-5	American Indian or Alaska Native	98	0.3%	0.887	0.001
2			100	0.3%		
1	UNK	Unknown Race	4,255	13.2%	0.219	0.010
2			4,150	12.9%		
1	F	Female	17,216	53.4%	0.116	0.012
2			17,415	54.0%		
1	2076-8	Native Hawaiian or Other Pacific Islander	172	0.5%	0.265	0.009
2			152	0.5%		
1	UN	Unknown Gender	1,655	5.1%	0.163	0.011
2			1,734	5.4%		
1	2186-5	Not Hispanic or Latino	22,224	68.9%	0.014	0.019
2			22,513	69.8%		
1	2135-2	Hispanic or Latino	2,653	8.2%	0.002	0.024
2			2,442	7.6%		
1	2054-5	Black or African American	5,095	15.8%	0.001	0.025
2			4,800	14.9%		
1	M	Male	13,392	41.5%	0.026	0.018
2			13,114	40.6%		
1	2028-9	Asian	681	2.1%	0.003	0.024
2			576	1.8%		

Diagnosis

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health hazards related to socioeconomic and psychosocial circumstances	420	1.3%	0.086	0.014
2	Z65		372	1.2%		

1	E66	Overweight and obesity	11,346	35.2%	0.723	0.003
2			11,303	35.0%		
1	Z68.3	Body mass index [BMI] 30-39, adult	3,247	10.1%	0.170	0.011
2			3,143	9.7%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult	2,968	9.2%	0.557	0.005
2			2,925	9.1%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	118	0.4%	0.132	0.012
2			96	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	149	0.5%	0.005	0.022
2			104	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	208	0.6%	0.019	0.018
2			163	0.5%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	261	0.8%	0.061	0.015
2			220	0.7%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	297	0.9%	0.149	0.011
2			263	0.8%		
1	Z80	Family history of primary malignant neoplasm	1,206	3.7%	0.029	0.017
2			1,103	3.4%		
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	0.194	0.010
2			11	0.0%		
1	Z12	Encounter for screening for malignant neoplasms	6,176	19.1%	<0.001	0.050
2			5,548	17.2%		
1	Z85	Personal history of malignant neoplasm	1,105	3.4%	0.294	0.008
2			1,057	3.3%		
1	Z98.84	Bariatric surgery status	518	1.6%	0.197	0.010
2			560	1.7%		
1	E66.0	Obesity due to excess calories	5,856	18.2%	0.328	0.008
2			5,952	18.4%		
1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	228	0.7%	0.289	0.008
2			206	0.6%		
1	E66.3	Overweight	532	1.6%	0.014	0.019
2			455	1.4%		

1	E66.8	Other obesity	191	0.6%	0.464	0.006
2			177	0.5%		
1	E66.9	Obesity, unspecified	8,098	25.1%	0.330	0.008
2			7,991	24.8%		
1	Z79.89	Hormone	93	0.3%	0.071	0.014
2	0	replacement therapy	70	0.2%		
1	Z92.23	Personal history of	10	0.0%	1	<0.001
2		estrogen therapy	10	0.0%		
1	D32	Benign neoplasm of	84	0.3%	0.336	0.008
2		meninges	72	0.2%		
1	S00-	Injuries to the head	1,533	4.8%	<0.001	0.031
2	S09		1,329	4.1%		
1	Z80.3	Family history of	431	1.3%	0.312	0.008
2		malignant neoplasm of breast	402	1.2%		

Procedure

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1		114	0.4%	0.067	0.014
2		88	0.3%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10A	14,036	43.5%	0.221	0.010
2		13,882	43.0%		
1	A10B	5,418	16.8%	0.112	0.013
2		B	5,268		
1	A10B	122	0.4%	0.416	0.006
2		F	135		
1	A10B	1,933	6.0%	0.228	0.009
2		G	1,861		
1	A10B	3,468	10.7%	0.693	0.003
2		H	3,437		
1	A10B	1,745	5.4%	0.022	0.018
2		K	1,616		
1	A10B	657	2.0%	0.234	0.009
2		X	615		
1	HS200	1,058	3.3%	0.002	0.024
2			923		

eTable 26. Characteristics of the GLP-1RA/no metformin group and metformin/no GLP-1RA group before and after matched for covariates related to multiple myeloma for the study populations of patients with T2D and no history of any OAC

Group 1 (N = 32,365) and group 2 (N = 856,160) characteristics before propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1 2	AI Age at Index	59.0 +/- 12.4 60.1 +/- 14.0	32,365 856,160	100% 100%	<0.00 1	0.080
1 2	2106-3 White		21,231 515,868	65.6% 60.3%	<0.00 1	0.111
1 2	1002-5 American Indian or Alaska Native		98 3,080	0.3% 0.4%	0.092	0.010
1 2	UNK Unknown Race		4,272 119,036	13.2% 13.9%	<0.00 1	0.021
1 2	F Female		17,278 399,923	53.4% 46.7%	<0.00 1	0.134
1 2	2076-8 Native Hawaiian or Other Pacific Islander		172 5,884	0.5% 0.7%	0.001	0.020
1 2	UN Unknown Gender		1,670 19,592	5.2% 2.3%	<0.00 1	0.152
1 2	2186-5 Not Hispanic or Latino		22,299 528,686	68.9% 61.8%	<0.00 1	0.151
1 2	2135-2 Hispanic or Latino		2,660 91,303	8.2% 10.7%	<0.00 1	0.084
1 2	2054-5 Black or African American		5,107 141,606	15.8% 16.5%	<0.00 1	0.021
1 2	M Male		13,417 436,645	41.5% 51.0%	<0.00 1	0.192
1 2	2028-9 Asian		681 35,540	2.1% 4.2%	<0.00 1	0.118

Diagnosis

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1 2	Z55- Z65 Persons with potential health hazards related to		422 10,310	1.3% 1.2%	0.107	0.009

		socioeconomic and psychosocial circumstances				
1	E66	Overweight and obesity	11,418	35.3%	<0.00	0.411
2			149,974	17.5%	1	
1	Z68.3	Body mass index [BMI] 30-39, adult	3,285	10.1%	<0.00	0.249
2			32,977	3.9%	1	
1	Z68.4	Body mass index [BMI] 40 or greater, adult	3,012	9.3%	<0.00	0.278
2			23,535	2.7%	1	
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	119	0.4%	0.001	0.018
2			2,293	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	150	0.5%	<0.00	0.029
2			2,433	0.3%	1	
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	209	0.6%	<0.00	0.043
2			2,942	0.3%	1	
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	264	0.8%	<0.00	0.055
2			3,317	0.4%	1	
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	299	0.9%	<0.00	0.059
2			3,753	0.4%	1	
1	Z80	Family history of primary malignant neoplasm	1,222	3.8%	<0.00	0.114
2			16,133	1.9%	1	
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	<0.00	0.021
2			140	0.0%	1	
1	Z12	Encounter for screening for malignant neoplasms	6,223	19.2%	<0.00	0.157
2			114,996	13.4%	1	
1	Z85	Personal history of malignant neoplasm	1,111	3.4%	<0.00	0.042
2			23,231	2.7%	1	
1	Z98.84	Bariatric surgery status	534	1.6%	<0.00	0.131
2			2,989	0.3%	1	
1	E66.0	Obesity due to excess calories	5,910	18.3%	<0.00	0.361
2			56,178	6.6%	1	

1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	230	0.7%	<0.00	0.069
2			2,051	0.2%	1	
1	E66.3	Overweight	535	1.7%	<0.00	0.066
2			7,794	0.9%	1	
1	E66.8	Other obesity	193	0.6%	<0.00	0.078
2			1,084	0.1%	1	
1	E66.9	Obesity, unspecified	8,150	25.2%	<0.00	0.307
2			113,380	13.2%	1	
1	Z80.7	Family history of other malignant neoplasms of lymphoid, hematopoietic and related tissues	15	0.0%	0.010	0.012
2			201	0.0%		
1	D47.2	Monoclonal gammopathy	111	0.3%	<0.00	0.037
2			1,346	0.2%	1	
1	C90.3	Solitary plasmacytoma	10	0.0%	<0.00	0.021
2			30	0.0%	1	
1	D45	Polycythemia vera	67	0.2%	0.001	0.017
2			1,167	0.1%		
1	D46	Myelodysplastic syndromes	31	0.1%	0.952	<0.001
2			811	0.1%		
1	D47	Other neoplasms of uncertain behavior of lymphoid, hematopoietic and related tissue	234	0.7%	<0.00	0.027
2			4,409	0.5%	1	

Medication

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	A10A	INSULINS AND ANALOGUES	14,131	43.7%	<0.00	0.560
2			159,901	18.7%	1	
1	A10B	Sulfonylureas	5,464	16.9%	<0.00	0.269
2			B	69,045	8.1%	
1	A10B	Alpha glucosidase inhibitors	124	0.4%	<0.00	0.057
2			F	876	0.1%	
1	A10B	Thiazolidinediones	1,960	6.1%	<0.00	0.183
2			G	20,400	2.4%	
1	A10B	Dipeptidyl peptidase 4 (DPP-4) inhibitors	3,547	11.0%	<0.00	0.370
2			H	17,113	2.0%	

1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	1,839	5.7%	<0.001	0.312
2	K		3,371	0.4%		
1	A10B	Other blood glucose lowering drugs, excl. insulins	672	2.1%	<0.001	0.146
2	X		3,839	0.4%		

Group 1 (N = 32,256) and group 2 (N = 32,256) characteristics after propensity score matching

Demographics

Group		Mean ± SD	Patients	% of Group	P-Value	SMD	
1	AI	Age at Index	59.0 +/- 12.4	32,256	100%	0.248	0.009
2			58.9 +/- 13.1	32,256	100%		
1	2106-3	White	21,155	65.6%	<0.001	0.034	
2			21,672	67.2%			
1	1002-5	American Indian or Alaska Native	98	0.3%	1	<0.001	
2			98	0.3%			
1	UNK	Unknown Race	4,252	13.2%	0.057	0.015	
2			4,090	12.7%			
1	F	Female	17,214	53.4%	0.215	0.010	
2			17,371	53.9%			
1	2076-8	Native Hawaiian or Other Pacific Islander	172	0.5%	0.101	0.013	
2			143	0.4%			
1	UN	Unknown Gender	1,652	5.1%	0.695	0.003	
2			1,674	5.2%			
1	2186-5	Not Hispanic or Latino	22,221	68.9%	0.001	0.025	
2			22,596	70.1%			
1	2135-2	Hispanic or Latino	2,652	8.2%	0.005	0.022	
2			2,460	7.6%			
1	2054-5	Black or African American	5,095	15.8%	0.016	0.019	
2			4,873	15.1%			
1	M	Male	13,390	41.5%	0.152	0.011	
2			13,211	41.0%			
1	2028-9	Asian	681	2.1%	0.210	0.010	
2			636	2.0%			

Diagnosis

Group		Mean ± SD	Patients	% of Group	P-Value	SMD
1	Z55-	Persons with potential health	419	1.3%	0.002	0.025
2	Z65		333	1.0%		

		hazards related to socioeconomic and psychosocial circumstances				
1	E66	Overweight and obesity	11,336	35.1%	0.668	0.003
2			11,284	35.0%		
1	Z68.3	Body mass index [BMI] 30-39, adult	3,244	10.1%	0.263	0.009
2			3,159	9.8%		
1	Z68.4	Body mass index [BMI] 40 or greater, adult	2,968	9.2%	0.311	0.008
2			2,894	9.0%		
1	Z68.25	Body mass index [BMI] 25.0-25.9, adult	119	0.4%	0.017	0.019
2			85	0.3%		
1	Z68.26	Body mass index [BMI] 26.0-26.9, adult	150	0.5%	0.002	0.024
2			101	0.3%		
1	Z68.27	Body mass index [BMI] 27.0-27.9, adult	208	0.6%	0.016	0.019
2			162	0.5%		
1	Z68.28	Body mass index [BMI] 28.0-28.9, adult	262	0.8%	0.044	0.016
2			218	0.7%		
1	Z68.29	Body mass index [BMI] 29.0-29.9, adult	297	0.9%	0.237	0.009
2			269	0.8%		
1	Z80	Family history of primary malignant neoplasm	1,203	3.7%	0.083	0.014
2			1,121	3.5%		
1	Z15.0	Genetic susceptibility to malignant neoplasm	18	0.1%	0.194	0.010
2			11	0.0%		
1	Z12	Encounter for screening for malignant neoplasms	6,176	19.1%	<0.001	0.043
2			5,635	17.5%		
1	Z85	Personal history of malignant neoplasm	1,107	3.4%	0.040	0.016
2			1,014	3.1%		
1	Z98.84	Bariatric surgery status	517	1.6%	0.457	0.006
2			541	1.7%		
1	E66.0	Obesity due to excess calories	5,848	18.1%	0.706	0.003
2			5,885	18.2%		

1	E66.2	Morbid (severe) obesity with alveolar hypoventilation	227	0.7%	0.503	0.005
2			213	0.7%		
1	E66.3	Overweight	531	1.6%	0.038	0.016
2			466	1.4%		
1	E66.8	Other obesity	190	0.6%	0.096	0.013
2			159	0.5%		
1	E66.9	Obesity, unspecified	8,093	25.1%	0.598	0.004
2			8,035	24.9%		
1	Z80.7	Family history of other malignant neoplasms of lymphoid, hematopoietic and related tissues	15	0.0%	0.857	0.001
2			16	0.0%		
1	D47.2	Monoclonal gammopathy	110	0.3%	0.582	0.004
2			102	0.3%		
1	C90.3	Solitary plasmacytoma	10	0.0%	1	<0.001
2			10	0.0%		
1	D45	Polycythemia vera	64	0.2%	0.357	0.007
2			54	0.2%		
1	D46	Myelodysplastic syndromes	31	0.1%	0.090	0.013
2			19	0.1%		
1	D47	Other neoplasms of uncertain behavior of lymphoid, hematopoietic and related tissue	233	0.7%	0.123	0.012
2			201	0.6%		

Medication

Group	Mean ± SD	Patients	% of Group	P-Value	SMD	
1 2	A10A	INSULINS AND ANALOGUES	14,032 13,985	43.5% 43.4%	0.709	0.003
1 2	A10B B	Sulfonylureas	5,412 5,332	16.8% 16.5%	0.398	0.007
1 2	A10B F	Alpha glucosidase inhibitors	121 121	0.4% 0.4%	1	<0.001
1 2	A10B G	Thiazolidinediones	1,930 1,898	6.0% 5.9%	0.594	0.004
1 2	A10B H	Dipeptidyl peptidase 4 (DPP-4) inhibitors	3,465 3,454	10.7% 10.7%	0.889	0.001

1	A10B	Sodium-glucose co-transporter 2 (SGLT2) inhibitors	1,742	5.4%	0.052	0.015
2	K		1,632	5.1%		
1	A10B	Other blood glucose lowering drugs, excl. insulins	654	2.0%	0.911	0.001
2	X		650	2.0%		