

Table S1. Procedure codes for Immune Checkpoint Inhibitors (ICIs)

ICI procedure codes		
HCPCS	C9027	Injection, pembrolizumab, 1 mg (deprecated 2015)
HCPCS	C9453	Injection, nivolumab, 1 mg (deprecated 2015)
HCPCS	C9483	Injection, atezolizumab, 10 mg (deprecated 2017)
HCPCS	C9491	Injection, avelumab, 10 mg (deprecated 2017)
HCPCS	C9492	Injection, durvalumab, 10 mg (deprecated 2018)
HCPCS	J9022	Injection, atezolizumab, 10 mg
HCPCS	J9023	Injection, avelumab, 10 mg
HCPCS	J9228	Injection, ipilimumab, 1 mg
HCPCS	J9271	Injection, pembrolizumab, 1 mg
HCPCS	J9299	Injection, nivolumab, 1 mg
General chemotherapy administration procedure codes		
CPT	96401	Chemotherapy administration, subcutaneous or intramuscular; non-hormonal anti-neoplastic
CPT	96405	Chemotherapy administration; intralesional, up to and including 7 lesions
CPT	96409	Chemotherapy administration; intravenous, push technique, single or initial substance/drug
CPT	96411	Chemotherapy administration; intravenous, push technique, each additional substance/drug (List separately in addition to code for primary procedure)
CPT	96413	Chemotherapy administration, intravenous infusion technique; up to 1 hour, single or initial substance/drug

CPT	96415	Chemotherapy administration, intravenous infusion technique; each additional hour (List separately in addition to code for primary procedure)
CPT	96416	Chemotherapy administration, intravenous infusion technique; initiation of prolonged chemotherapy infusion (more than 8 hours), requiring use of a portable or implantable pump
CPT	96417	Chemotherapy administration, intravenous infusion technique; each additional sequential infusion (different substance/drug), up to 1 hour (List separately in addition to code for primary procedure)
HCPCS	G0498	Chemotherapy administration, intravenous infusion technique; initiation of infusion in the office/clinic setting using office/clinic pump/supplies, with continuation of the infusion in the community setting (e.g., home, domiciliary, rest home or assisted living) using a portable pump provided by the office/clinic, includes follow up office/clinic visit at the conclusion of the infusion
HCPCS	Q0084	Chemotherapy administration by infusion technique only, per visit
HCPCS	J9999	Antineoplastic drugs, not otherwise classified

Table S2. Patient Characteristics by First ICI treatment

										Fist ICI treatment										p-value
	Atezolizumab		Avelumab		Cemiplimab		Durvalumab		Ipilimumab		Nivolumab		Pembrolizumab		Combo (nip+niv)					
Total, n	201		29		21		56		470		1766		2505		468					
Age at ICI Initiation																	<.0001			
18-44	6	3.0%	1	3.4%	3	14.3%	0	0.0%	76	16.2%	140	7.9%	215	8.6%	86	18.4%				
45-54	17	8.5%	0	0.0%	1	4.8%	1	1.8%	95	20.2%	236	13.4%	321	12.8%	80	17.1%				
55-64	62	30.8%	9	31.0%	5	23.8%	18	32.1%	113	24.0%	546	30.9%	746	29.8%	156	33.3%				
65-74	77	38.3%	11	37.9%	4	19.0%	25	44.6%	127	27.0%	548	31.0%	771	30.8%	116	24.8%				
>=75	39	19.4%	9	31.0%	8	38.1%	12	21.4%	59	12.6%	296	16.8%	452	18.0%	30	6.4%				
Sex																	<.0001			
F	98	48.8%	13	44.8%	3	14.3%	21	37.5%	182	38.7%	749	42.4%	1086	43.4%	189	40.4%				
M	103	51.2%	16	55.2%	18	85.7%	35	62.5%	288	61.3%	1017	57.6%	1419	56.6%	279	59.6%				
Hispanic																	0.0354			
Yes	6	3.0%	0	0.0%	0	0.0%	0	0.0%	8	1.7%	58	3.3%	84	3.4%	10	2.1%				
No	184	91.5%	29	100.0%	20	95.2%	53	94.6%	454	96.6%	1544	87.4%	2316	92.5%	435	92.9%				
Unknown	11	5.5%	0	0.0%	1	4.8%	3	5.4%	8	1.7%	164	9.3%	105	4.2%	14	3.0%				
Race																	<.0001			
American Indian or Alaska Native	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	0.1%	7	0.3%	2	0.4%				
Asian	3	1.5%	0	0.0%	0	0.0%	0	0.0%	2	0.4%	23	1.3%	40	1.6%	4	0.9%				
Black or African American	20	10.0%	1	3.4%	0	0.0%	1	1.8%	4	0.9%	170	9.6%	171	6.8%	15	3.2%				
Native Hawaiian/Other Pacific Islander	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.1%	5	0.2%	0	0.0%				
Unknown	10	5.0%	0	0.0%	2	9.5%	1	1.8%	9	1.9%	84	4.8%	120	4.8%	17	3.6%				
White	168	83.6%	28	96.6%	19	90.5%	54	96.4%	455	96.8%	1486	84.1%	2162	86.3%	430	91.9%				
Charlson Comorbidity Index ¹																	<.0001			
0	51	25.4%	9	31.0%	9	42.9%	12	21.4%	263	56.0%	646	36.6%	903	36.0%	210	44.9%				
1	46	22.9%	9	31.0%	1	4.8%	16	28.6%	132	28.1%	442	25.0%	656	26.2%	113	24.1%				

2	50	24.9%	5	17.2%	1	4.8%	14	25.0%	39	8.3%	276	15.6%	429	17.1%	67	14.3%	
>=3	54	26.9%	6	20.7%	10	47.6%	14	25.0%	36	7.7%	402	22.8%	517	20.6%	78	16.7%	
Comorbidities¹																	
AIDS/HIV	0	0.0%	0	0.0%	1	4.8%	0	0.0%	3	0.6%	18	1.0%	9	0.4%	2	0.4%	0.0275
Cerebrovascular disease	21	10.4%	5	17.2%	3	14.3%	8	14.3%	37	7.9%	170	9.6%	296	11.8%	45	9.6%	0.0911
Congestive heart failure	10	5.0%	0	0.0%	0	0.0%	1	1.8%	3	0.6%	62	3.5%	21	0.8%	68	14.5%	0.0069
Chronic pulmonary disease	70	34.8%	6	20.7%	4	19.0%	36	64.3%	59	12.6%	543	30.7%	685	27.3%	85	18.2%	<.0001
Dementia	0	0.0%	0	0.0%	1	4.8%	0	0.0%	0	0.0%	10	0.6%	20	0.8%	0	0.0%	0.0246
Diabetes without chronic complication	25	12.4%	5	17.2%	3	14.3%	8	14.3%	45	9.6%	148	8.4%	261	10.4%	42	9.0%	0.1528
Diabetes with chronic complication	19	9.5%	2	6.9%	4	19.0%	3	5.4%	11	2.3%	6	0.3%	137	5.5%	24	5.1%	0.0015
Diabetes secondary to drug use	7	3.5%	0	0.0%	1	4.8%	0	0.0%	1	0.2%	21	1.2%	28	1.1%	4	0.9%	0.0149
Any diabetes ²	47	23.4%	7	24.1%	7	33.3%	11	19.6%	56	11.9%	255	14.4%	402	16.0%	67	14.3%	0.001
Hemiplegia/paraplegia	5	2.5%	0	0.0%	0	0.0%	2	3.6%	2	0.4%	34	1.9%	62	2.5%	9	1.9%	0.1671
Metastatic solid tumor	183	91.0%	25	86.2%	16	76.2%	43	76.8%	432	91.9%	1444	81.8%	2168	86.5%	427	91.2%	<.0001
Myocardial infarction	6	3.0%	1	3.4%	0	0.0%	1	1.8%	3	0.6%	57	3.2%	69	2.8%	9	1.9%	0.1135
Mild liver disease	56	27.9%	6	20.7%	2	9.5%	7	12.5%	83	17.7%	378	21.4%	528	21.1%	110	23.5%	0.0405
Peptic ulcer disease	4	2.0%	2	6.9%	0	0.0%	2	3.6%	5	1.1%	52	2.9%	72	2.9%	6	1.3%	0.0889
Peripheral vascular disease	31	15.4%	2	6.9%	2	9.5%	10	17.9%	28	6.0%	250	14.2%	339	13.5%	38	8.1%	<.0001
Renal disease	36	17.9%	4	13.8%	7	33.3%	4	7.1%	13	2.8%	228	12.9%	270	10.8%	55	11.8%	<.0001
Rheumatic disease	7	3.5%	0	0.0%	0	0.0%	3	5.4%	5	1.1%	40	2.3%	75	3.0%	12	2.6%	0.166
Moderate/severe liver disease	2	1.0%	1	3.4%	1	4.8%	0	0.0%	4	0.9%	63	3.6%	72	2.9%	6	1.3%	0.0075
Hypertension	108	53.7%	16	55.2%	10	47.6%	33	58.9%	144	30.6%	870	49.3%	1161	46.3%	184	39.3%	<.0001
Primary Cancer Site³																	
Esophageal	3	1.5%	0	0.0%	0	0.0%	4	7.1%	0	0.0%	18	1.0%	74	3.0%	1	0.2%	<.0001
Gastric	3	1.5%	1	3.4%	0	0.0%	2	3.6%	6	1.3%	20	1.1%	95	3.8%	3	0.6%	<.0001

Colon	4	2.0%	0	0.0%	0	0.0%	2	3.6%	4	0.9%	47	2.7%	155	6.2%	11	2.4%	<.0001
Liver	11	5.5%	1	3.4%	0	0.0%	0	0.0%	6	1.3%	152	8.6%	150	6.0%	16	3.4%	<.0001
Hodgkin's	0	0.0%	1	3.4%	0	0.0%	0	0.0%	0	0.0%	36	2.0%	13	0.5%	1	0.2%	<.0001
Melanoma	5	2.5%	8	27.6%	6	28.6%	1	1.8%	462	98.3%	445	25.2%	650	25.9%	282	60.3%	<.0001
Lung	101	50.2%	10	34.5%	0	0.0%	53	94.6%	21	4.5%	736	41.7%	963	38.4%	84	17.9%	<.0001
Renal Cell Carcinoma	21	10.4%	1	3.4%	0	0.0%	0	0.0%	2	0.4%	248	14.0%	89	3.6%	106	22.6%	<.0001
Bladder	65	32.3%	0	0.0%	0	0.0%	2	3.6%	1	0.2%	74	4.2%	189	7.5%	8	1.7%	<.0001
Markel Cell Carcinoma	0	0.0%	11	37.9%	0	0.0%	0	0.0%	1	0.2%	7	0.4%	15	0.6%	1	0.2%	<.0001
Head and Neck	10	5.0%	6	20.7%	5	23.8%	1	1.8%	9	1.9%	146	8.3%	219	8.7%	14	3.0%	<.0001
Breast	31	15.4%	2	6.9%	0	0.0%	0	0.0%	11	2.3%	59	3.3%	141	5.6%	10	2.1%	<.0001
Cervix	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	0.4%	10	0.6%	39	1.6%	3	0.6%	0.0187
Primary mediastinal (thymic) large B-cell lymphoma	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.2%	1	0.1%	0	0.0%	0	0.0%	0.6074
Other	9	4.5%	2	6.9%	12	57.1%	0	0.0%	6	1.3%	117	6.6%	291	11.6%	14	3.0%	<.0001
Prior Cancer Treatment																	
Radiation(Y/N)	63	31.3%	15	51.7%	6	28.6%	45	80.4%	108	23.0%	626	35.4%	887	35.4%	123	26.3%	<.0001
Chemotherapy (Y/N)	59	29.4%	4	13.8%	0	0.0%	26	46.4%	26	5.5%	575	32.6%	496	19.8%	38	8.1%	<.0001
Alkylating Agent	45	22.4%	4	13.8%	0	0.0%	26	46.4%	16	3.4%	495	28.0%	407	16.2%	34	7.3%	<.0001
Antimetabolite	23	11.4%	1	3.4%	0	0.0%	3	5.4%	3	0.6%	305	17.3%	235	9.4%	9	1.9%	<.0001
Antimitotic Agent	19	9.5%	2	6.9%	0	0.0%	16	28.6%	5	1.1%	213	12.1%	4	0.2%	194	41.5%	<.0001
Antitumor Antibiotic	18	9.0%	0	0.0%	0	0.0%	1	1.8%	3	0.6%	84	4.8%	92	3.7%	3	0.6%	<.0001
Enzyme Inhibitor	0	0.0%	0	0.0%	0	0.0%	0	0.0%	8	1.7%	0	0.0%	0	0.0%	0	0.0%	0.0173
Plant Alkaloid	15	7.5%	2	6.9%	0	0.0%	10	17.9%	0	0.0%	75	4.2%	36	1.4%	28	6.0%	<.0001
Proteasome Inhibitor	0	0.0%	0	0.0%	0	0.0%	0	0.0%	4	0.9%	0	0.0%	6	0.2%	0	0.0%	0.8914
Topoisomerase I Inhibitor	4	2.0%	0	0.0%	0	0.0%	0	0.0%	1	0.2%	25	1.4%	34	1.4%	8	1.7%	0.3982
Chemotherapy - non specific	1	0.5%	0	0.0%	0	0.0%	0	0.0%	6	1.3%	6	0.3%	24	1.0%	1	0.2%	0.159

Other irAEs developed within 1 year of ICI initiation⁴

Hematologic	109	54.2%	13	44.8%	5	23.8%	19	33.9%	177	37.7%	758	42.9%	1140	45.5%	172	36.8%	<.0001
Pulmonary (pneumonitis)	55	27.4%	9	31.0%	1	4.8%	28	50.0%	79	16.8%	436	24.7%	629	25.1%	110	23.5%	<.0001
Endocrine	88	43.8%	11	37.9%	7	33.3%	19	33.9%	228	48.5%	770	43.6%	1103	44.0%	252	53.8%	0.0011
Renal (acute kidney injury)	56	27.9%	6	20.7%	0	0.0%	9	16.1%	107	22.8%	360	20.4%	553	22.1%	127	27.1%	0.0036
Neurological	68	33.8%	10	34.5%	4	19.0%	13	23.2%	87	18.5%	409	23.2%	739	29.5%	103	22.0%	<.0001
Hepatic	44	21.9%	6	20.7%	2	9.5%	11	19.6%	95	20.2%	286	16.2%	510	20.4%	137	29.3%	<.0001
Gastrointestinal	44	21.9%	8	27.6%	2	9.5%	5	8.9%	144	30.6%	384	21.7%	553	22.1%	131	28.0%	<.0001
Skin(vitiligo)	3	1.5%	0	0.0%	0	0.0%	1	1.8%	78	16.6%	102	5.8%	180	7.2%	55	11.8%	<.0001

1. Comorbidities and Charlson Cormobidity Index (CCI) were calculated based on diagnoses before or on the day of ICI initiation. ICD 9 and 10 codes used to calculate the CCI were from Quan et al. (2005). Primary cancer diagnoses were not included in the calculation of the index but metastatic/secondary cancers were included. Hierarchy coding was applied to prevent duplicated accounting. For instance, if a person had diagnoses of both a mild and a severe form of the disease (e.g. mild and moderate/severe liver disease, diabetes with and without chronic complications), the patient was only scored on the more severe disease in the CCI.
2. Any diabetes included patients who had any of the following diagnoses, diabetes without chronic complicaiton, diabetes with chronic complication, or diabetes secondary to drug use, prior to or on the day of ICI initiation.
3. Primary can sites are based on diagnoses of primary cancers (excluding secondary diagnoses) before ICI initiation or 30 days after. Site variables are not mutually exclusive and patients may have multiple cancer sites.
4. Other irAEs included hematologic [anemia, thrombocytopenia, leukopenia], pneumonitis, endocrine [hypothyroidism, hyperthyroidism, hypophysitis/PGA, Hyper/hypo-parathyroidism, diabetes type I, dysfunctional uterine bleeding/infertility], renal [acute kidney injury/AKI], neurological [encephalitis/myelitis/encephalomyelitis, neuritis, meningitis], hepatic [hepatitis], gastrointestinal (GI) [colitis, pancreatitis, mucositis] and skin [vitiligo]).

Table S3 Patient Characteristics by Primary Cancer Site

	Primary Cancer Site ¹													
	Lung		Melanoma		RCC		Urothelial		Head & Neck		MCC		Liver	
Total, <i>n</i>	1968		1861		467		339		410		35		336	
Age at ICI Initiation														
18-44	74	3.8%	286	15.4%	20	4.3%	6	1.8%	24	5.9%	0	0.0%	23	6.8%
45-54	188	9.6%	301	16.2%	64	13.7%	32	9.4%	61	14.9%	1	2.9%	42	12.5%
55-64	662	33.6%	470	25.3%	139	29.8%	83	24.5%	138	33.7%	2	5.7%	118	35.1%
65-74	686	34.9%	513	27.6%	158	33.8%	115	33.9%	117	28.5%	16	45.7%	107	31.8%
≥75	358	18.2%	291	15.6%	86	18.4%	103	30.4%	70	17.1%	16	45.7%	46	13.7%
Sex														
F	957	48.6%	707	38.0%	151	32.3%	99	29.2%	97	23.7%	10	28.6%	123	36.6%
M	1011	51.4%	1154	62.0%	316	67.7%	240	70.8%	313	76.3%	25	71.4%	213	63.4%
Hispanic														
Yes	48	2.4%	39	2.1%	22	4.7%	13	3.8%	15	3.7%	2	5.7%	17	5.1%
No	1782	90.5%	1761	94.6%	425	91.0%	310	91.4%	365	89.0%	31	88.6%	295	87.8%
Unknown	138	7.0%	61	3.3%	20	4.3%	16	4.7%	30	7.3%	2	5.7%	24	7.1%
Race														
American Indian or Alaska Native	3	0.2%	2	0.1%	2	0.4%	1	0.3%	2	0.5%	0	0.0%	11	3.3%
Asian	29	1.5%	7	0.4%	5	1.1%	21	6.2%	8	2.0%	0	0.0%	44	13.1%
Black or African American	233	11.8%	10	0.5%	36	7.7%	0	0.0%	27	6.6%	0	0.0%	0	0.0%
Native Hawaiian/Other Pacific Islander	3	0.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Unknown	67	3.4%	51	2.7%	26	5.6%	21	6.2%	22	5.4%	4	11.4%	19	5.7%
White	1633	83.0%	1791	96.2%	398	85.2%	296	87.3%	351	85.6%	31	88.6%	262	78.0%
Charlson Comorbidity Index²														
0	564	28.7%	979	52.6%	120	25.7%	85	25.1%	142	34.6%	4	11.4%	22	6.5%
1	568	28.9%	465	25.0%	84	18.0%	60	17.7%	116	28.3%	13	37.1%	101	30.1%

2	384	19.5%	222	11.9%	85	18.2%	70	20.6%	63	15.4%	12	34.3%	51	15.2%
≥3	452	23.0%	195	10.5%	178	38.1%	124	36.6%	89	21.7%	6	17.1%	162	48.2%
Comorbidities²														
AIDS/HIV	13	0.7%	10	0.5%	3	0.6%	1	0.3%	3	0.7%	1	2.9%	4	1.2%
Cerebrovascular disease	266	13.5%	175	9.4%	36	7.7%	33	9.7%	59	14.4%	8	22.9%	37	11.0%
Congestive heart failure	78	4.0%	29	1.6%	25	5.4%	18	5.3%	13	3.2%	35	100.0%	14	4.2%
Chronic pulmonary disease	910	46.2%	256	13.8%	94	20.1%	84	24.8%	110	26.8%	6	17.1%	89	26.5%
Dementia	12	0.6%	6	0.3%	3	0.6%	3	0.9%	4	1.0%	36	102.9%	2	0.6%
Diabetes without chronic complication	207	10.5%	157	8.4%	47	10.1%	35	10.3%	51	12.4%	7	20.0%	45	13.4%
Diabetes with chronic complication	113	5.7%	55	3.0%	58	12.4%	39	11.5%	19	4.6%	2	5.7%	31	9.2%
Diabetes secondary to drug use	27	2.5%	12	0.6%	6	1.3%	6	1.8%	3	0.7%	1	2.9%	6	1.8%
Any diabetes ³	324	16.5%	215	11.6%	105	22.5%	74	21.8%	70	17.1%	10	28.6%	76	22.6%
Hemiplegia/paraplegia	49	2.5%	20	1.1%	15	3.2%	9	2.7%	14	3.4%	0	0.0%	3	0.9%
Metastatic solid tumor	1682	85.5%	1697	91.2%	428	91.6%	307	90.6%	377	92.0%	26	74.3%	267	12.0%
Myocardial infarction	67	3.4%	35	1.9%	16	3.4%	18	5.3%	11	2.7%	1	2.9%	12	3.6%
Mild liver disease	397	20.2%	358	19.2%	136	29.1%	73	21.5%	78	19.0%	5	14.3%	183	54.5%
Peptic ulcer disease	53	2.7%	21	1.1%	14	3.0%	8	2.4%	11	2.7%	1	2.9%	19	5.7%
Peripheral vascular disease	337	17.1%	156	8.4%	71	15.2%	59	17.4%	75	18.3%	3	8.6%	52	15.5%
Renal disease	187	9.5%	94	5.1%	191	40.9%	131	38.6%	42	10.2%	9	25.7%	35	10.4%
Rheumatic disease	59	3.0%	47	2.5%	12	2.6%	9	2.7%	9	2.2%	4	11.4%	11	3.3%
Moderate/severe liver disease	20	1.0%	13	0.7%	5	1.1%	9	2.7%	5	1.2%	0	0.0%	102	30.4%
Hypertension	985	50.1%	669	35.9%	318	68.1%	208	61.4%	200	48.8%	22	62.9%	193	57.4%
Prior Cancer Treatment														
Radiation(Y/N)	906	46.0%	346	18.6%	139	29.8%	97	28.6%	248	60.5%	16	45.7%	104	31.0%
Chemotherapy (Y/N)	601	30.5%	57	3.1%	55	11.8%	114	33.6%	152	37.1%	3	8.6%	112	33.3%

Alkylating Agent	561	28.5%	37	2.0%	34	7.3%	86	25.4%	138	33.7%	2	5.7%	60	17.9%
Antimetabolite	289	14.7%	16	0.9%	31	6.6%	78	23.0%	46	11.2%	1	2.9%	43	12.8%
Antimitotic Agent	260	13.2%	15	0.8%	15	3.2%	19	5.6%	55	13.4%	1	2.9%	25	7.4%
Antitumor Antibiotic	20	1.0%	8	0.4%	20	4.3%	43	12.7%	12	2.9%	0	0.0%	54	16.1%
Enzyme Inhibitor	3	0.2%	0	0.0%	5	1.1%	1	0.3%	0	0.0%	0	0.0%	1	0.3%
Plant Alkaloid	114	5.8%	3	0.2%	7	1.5%	9	2.7%	8	2.0%	1	2.9%	9	2.7%
Proteasome Inhibitor	0	0.0%	0	0.0%	1	0.2%	0	0.0%	0	0.0%	0	0.0%	1	0.3%
Topoisomerase I Inhibitor	15	0.8%	1	0.1%	2	0.4%	1	0.3%	1	0.2%	0	0.0%	14	4.2%
Chemotherapy - non specific	6	0.3%	12	0.6%	1	0.2%	2	0.6%	0	0.0%	0	0.0%	1	0.3%
First ICI treatment														
Atezolizumab	101	5.1%	5	0.3%	21	4.5%	65	19.2%	10	2.4%	0	0.0%	11	3.3%
Avelumab	10	0.5%	8	0.4%	1	0.2%	0	0.0%	6	1.5%	11	31.4%	1	0.3%
Cemiplimab	0	0.0%	6	0.3%	0	0.0%	0	0.0%	5	1.2%	0	0.0%	0	0.0%
Durvalumab	53	2.7%	1	0.1%	0	0.0%	2	0.6%	1	0.2%	0	0.0%	0	0.0%
Ipilimumab	21	1.1%	462	24.8%	2	0.4%	1	0.3%	9	2.2%	1	2.9%	6	1.8%
Nivolumab	736	37.4%	445	23.9%	248	53.1%	74	21.8%	146	35.6%	7	20.0%	152	45.2%
Combo (niv+ipi)	84	4.3%	282	15.2%	106	22.7%	8	2.4%	14	3.4%	1	2.9%	16	4.8%
Pembrolizumab	963	48.9%	650	34.9%	89	19.1%	189	55.8%	219	53.4%	15	42.9%	150	44.6%
Other irAEs developed within 1 year of ICI initiation⁴														
										0.0%				0.0%
Hematologic	886	45.0%	569	30.6%	220	47.1%	198	58.4%	180	43.9%	18	51.4%	191	56.8%
Pulmonary (pneumonitis)	741	37.7%	294	15.8%	110	23.6%	62	18.3%	118	28.8%	5	14.3%	62	18.5%
Endocrine	899	45.7%	835	44.9%	263	56.3%	133	39.2%	204	49.8%	19	54.3%	130	38.7%
Renal (acute kidney injury)	381	19.4%	316	17.0%	198	42.4%	162	47.8%	80	19.5%	5	14.3%	90	26.8%
Neurological	552	28.0%	339	18.2%	107	22.9%	109	32.2%	125	30.5%	10	28.6%	77	22.9%
Hepatic	295	15.0%	424	22.8%	105	22.5%	66	19.5%	60	14.6%	7	20.0%	121	36.0%
Gastrointestinal	395	20.1%	421	22.6%	134	28.7%	72	21.2%	150	36.6%	9	25.7%	78	23.2%

Skin(vitiligo)	65	3.3%	295	15.9%	21	4.5%	8	2.4%	25	6.1%	2	5.7%	13	3.9%
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1. Primary can sites are based on diagnoses of primary cancers (excluding secondary diagnoses) before ICI initiation or 30 days after. Site variables are not mutually exclusive and patients may have multiple cancer sites and could not be compared.
2. Comorbidities and Charlson Cormobidity Index (CCI) were calculated based on diagnoses before or on the day of ICI initiation. ICD 9 and 10 codes used to calculate the CCI were from Quan et al. (2005). Primary cancer diagnoses were not included in the calculation of the index but metastatic/secondary cancers were included. Hierarchy coding was applied to prevent duplicated accounting. For instance, if a person had diagnoses of both a mild and a severe form of the disease (e.g. mild and moderate/severe liver disease, diabetes with and without chronic complications), the patient was only scored on the more severe disease in the CCI.
3. Any diabetes included patients who had any of the following diagnoses, diabetes without chronic complicaiton, diabetes with chronic complication, or diabetes secondary to drug use, prior to or on the day of ICI initiation.
4. Other irAEs included hematologic [anemia, thrombocytopenia, leukopenia], pneumonitis, endocrine [hypothyroidism, hyperthyroidism, hypophysitis/PGA, Hyper/hypo-parathyroidism, diabetes type I, dysfunctional uterine bleeding/infertility], renal [acute kidney injury/AKI], neurological [encephalitis/myelitis/encephalomyelitis, neuritis, meningitis], hepatic [hepatitis], gastrointestinal (GI) [colitis, pancreatitis, mucositis] and skin [vitiligo]).

Table S4. Estimated Rate per Person-Year

	<i>n</i>	CAEs within One Year		Follow-up time (in years)		Total Person-Year	Rate per Person-Year	95% CI	
		Yes	%	Median	IQR				
Any CAE	5518	691	12.5%	0.647	(0.252-1)	3394.4	0.203	0.19	0.22
Arrhythmia	5518	511	9.3%	0.647	(0.252-1)	3394.4	0.150	0.14	0.16
Acute MI	5518	94	1.7%	0.647	(0.252-1)	3394.4	0.028	0.02	0.03
Myocarditis	5518	116	2.1%	0.647	(0.252-1)	3394.4	0.034	0.03	0.04
Pericarditis	5518	68	1.2%	0.647	(0.252-1)	3394.4	0.020	0.02	0.03
Cardiomyopathy	5518	47	0.9%	0.647	(0.252-1)	3394.4	0.014	0.01	0.02
	N	Overall Death		Follow-up time (in years)		Total Person-Year	Rate Per Person-Year	95% CI	
		Yes	%	Median	IQR				
All	5518	2070	37.5%	0.647	(0.252-1.441)	5786.2	0.358	0.343	0.373
CAE within 1 Year (Yes)	691	380	55.0%	0.682	(0.301-1.230)	679.6	0.331	0.316	0.347
CAE within 1 Year (No)	4827	1690	35.0%	0.636	(0.249-1.477)	5106.7	0.559	0.506	0.618