

Supplemental Table 1 ICD-10 codes for delirium diagnosis.

Number of delirium patients identified by diagnosis (ICD-10)	Number of patients	
	N	(%)
Total	17 124	(11.8)
Delirium not superimposed on dementia (F05.0)	977	(0.7)
Delirium superimposed on dementia (F05.1)	1447	(1.0)
Other delirium (F05.8)	37	(0.0)
Subacute infection psychosis	0	(0.0)
Subacute organic reaction	0	(0.0)
Subacute organic psychiatric syndrome	0	(0.0)
Subacute cerebral syndrome	5	(0.0)
Acute infectious psychosis	1	(0.0)
Acute organic reaction	3	(0.0)
Acute organic psychiatric syndrome	2	(0.0)
Acute confusional state	14	(0.0)
Acute brain syndrome	11	(0.0)
Non-alcoholic acute confusional state	1	(0.0)
Delirium, unspecified (F05.9)	14 801	(10.2)
Delirium	11 828	(8.1)
Nocturnal delirium	2494	(1.7)
Senile nocturnal delirium	498	(0.3)

ICD-10, International Classification of Diseases, 10th Revision.

Supplemental Table 2 Definition of cognitive impairment.

		Number of patients N (%)	
Number of patients		145 219	
Cognitive impairment	Yes	40 376	(27.8)
	Diagnosis of dementia (ICD-10)	21 498	(14.8)
	Prescription of anti-dementia drugs	12 032	(8.3)
	Low degree of independence in daily life for the elderly with dementia	25 537	(17.6)

ICD-10, International Classification of Diseases, 10th Revision.

Supplemental Table 3 Comorbidities (diseases present in $\geq 3\%$ of patients with delirium in each category).

Category	Disease	ICD-10	Number of patients	
			N	(%)
Number of patients			145	219
Circulatory system diseases		I00-199	81 954	(56.4)
	Essential (primary) hypertension	I10	47 887	(33.0)
	Heart failure	I50	23 214	(16.0)
	Atrial fibrillation and flutter	I48	12 774	(8.8)
	Angina pectoris	I20	11 296	(7.8)
	Sequelae of cerebrovascular disease	I69	8759	(6.0)
	Cerebral infarction	I63	6577	(4.5)
	Aortic aneurysm and dissection	I71	4432	(3.1)
Endocrine, nutritional and metabolic diseases		E00-E90	59 955	(41.3)
	Type 2 diabetes mellitus	E11	23 809	(16.4)
	Disorders of lipoprotein metabolism and other lipidaemia	E78	17 530	(12.1)
	Volume depletion	E86	13 698	(9.4)
	Other disorders of fluid, electrolyte and acid-base balance	E87	4896	(3.4)
	Unspecified diabetes mellitus	E14	4364	(3.0)
Digestive system diseases		K00-K93	59 691	(41.1)
	Gastroesophageal reflux disease	K21	13 242	(9.1)
	Other functional intestinal disorders	K59	10 515	(7.2)
	Gastric ulcer	K25	9864	(6.8)
	Cholelithiasis	K80	8230	(5.7)

Paralytic ileus and intestinal obstruction without hernia	K56	5276	(3.6)
Gastritis and duodenitis	K29	5025	(3.5)
Other diseases of the biliary tract	K83	4850	(3.3)
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Malignant neoplasms	C00- C97	41 710	(28.7)
Malignant neoplasm of stomach	C16	7644	(5.3)
Malignant neoplasm of colon	C18	7163	(4.9)
Secondary malignant neoplasm of respiratory and digestive organs	C78	5631	(3.9)
Malignant neoplasm of bronchus and lung	C34	4433	(3.1)
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Respiratory system diseases	J00- J99	36 958	(25.4)
Respiratory failure, not elsewhere classified	J96	14 385	(9.9)
Pneumonia, organism unspecified	J18	7004	(4.8)
Pneumonitis due to solids and liquids	J69	6991	(4.8)
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Nervous system diseases	G00- G99	28 557	(19.7)
Alzheimer disease	G30	9659	(6.7)
Sleep disorders	G47	9351	(6.4)
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Genitourinary system diseases	N00- N99	25 617	(17.6)
Chronic kidney disease	N18	8208	(5.7)
Benign prostatic hyperplasia	N40	5360	(3.7)
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Mental and behavioural disorders	F00- F99	20 047	(13.8)
Unspecified dementia	F03	8934	(6.2)
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Musculoskeletal system/connective tissue diseases	M00- M99	17 523	(12.1)

Injury		S00- T35	15 866	(10.9)
	Fracture of femur	S72	6427	(4.4)
Blood diseases		D50- D89	13 458	(9.3)
	Iron deficiency anaemia	D50	6881	(4.7)
Infectious disease (excluding parasitic disease)	-	A00- A49 / B90- 99	12 442	(8.6)
Skin/subcutaneous tissue disease	-	L00- L99	4094	(2.8)
Eye disease	-	H00- H59	1565	(1.1)
Poisoning	-	T36- T65	806	(0.6)
Ear disease	-	H60- H95	624	(0.4)
Others			39 232	(27.0)
	Somnolence, stupor and coma	R40	6943	(4.8)

ICD-10, International Classification of Diseases, 10th Revision.

Supplemental Table 4 Hospitalisation information.

		Number of patients N (%)	
Number of patients		145 219	
Type of hospitalisation	Hospitalisation with elective surgery	52 766	(36.3)
	Emergency hospitalisation without surgery	59 727	(41.1)
	Emergency hospitalisation with surgery	32 726	(22.5)
Number of beds	0–199 beds	6760	(4.7)
	200–499 beds	79 995	(55.1)
	≥500 beds	58 464	(40.3)
Inpatient department	Surgery	28 656	(19.7)
	Internal Medicine	28 232	(19.4)
	Gastroenterology	15 445	(10.6)
	Cardiology	12 337	(8.5)
	Orthopaedics	11 302	(7.8)
	Neurosurgery	8144	(5.6)
	Urology	7031	(4.8)
	Cardiovascular Surgery	6042	(4.2)
	Respiratory Medicine	5506	(3.8)
	Gastrointestinal Surgery	4093	(2.8)
	Emergency Medicine	3414	(2.4)
	Neurology	3008	(2.1)
	Pulmonary Surgery	1734	(1.2)
	Obstetrics & Gynaecology	1528	(1.1)
	Otolaryngology	1416	(1.0)
Nephrology	1252	(0.9)	
Haematology	729	(0.5)	

	Endocrinology, Metabolism & Diabetology	706	(0.5)
	Reconstructive Surgery	625	(0.4)
	Ophthalmology	606	(0.4)
	Others	2977	(2.1)
	Unknown	436	(0.3)
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Surgery	Yes	85 492	(58.9)
	Surgery sites:		
	Abdomen	38 898	(26.8)
	Heart and blood vessels	15 240	(10.5)
	Musculoskeletal system, extremities and trunk	10 424	(7.2)
	Thoracic	6061	(4.2)
	Urinary system and adrenal glands	4893	(3.4)
	Nervous system and cranial	3708	(2.6)
	Skin or subcutaneous tissue	3076	(2.1)
	Genital	2557	(1.8)
	Ear, nose and throat	1113	(0.8)
	Face, mouth and neck	738	(0.5)
	Eyes	606	(0.4)

Supplemental Table 5 Sensitivity analyses: Delirium identification algorithm, patient characteristics, clinical practice, delirium treatment with antipsychotics and patient outcomes.

Characteristics		Sensitivity analysis 1		Sensitivity analysis 2	
		N (%)		N (%)	
Number of subjects		184 817		213 844	
Delirium identification algorithm					
Patients meeting criteria	Diagnosis (ICD-10) only	8401	(4.5)	9874	(4.6)
	Antipsychotic prescription only	167 756	(90.8)	193 507	(90.5)
	Both	8660	(4.7)	10 463	(4.9)
Patient demographic and baseline characteristics					
Age (years)	Mean (SD)	76.1 (13.8)		76.3 (14.1)	
	≤64	29 659	(16.0)	34 204	(16.0)
	65–74	37 770	(20.4)	41 091	(19.2)
	75–84	62 820	(34.0)	71 825	(33.6)
	≥85	54 568	(29.5)	66 724	(31.2)
Sex	Male	105 167	(56.9)	120 696	(56.4)
	Female	79 650	(43.1)	93 148	(43.6)
ADL score (point)	Dependent group (0–59)	96 591	(52.3)	113 005	(52.8)
	Independent group (60–100)	85 101	(46.0)	97 296	(45.5)
	Unknown	3125	(1.7)	3543	(1.7)
Cognitive impairment	Yes	49 445	(26.8)	60 930	(28.5)
	Diagnosis of dementia (ICD-10)	26 470	(14.3)	33 014	(15.4)
	Prescription of anti-dementia drugs	15 214	(8.2)	18 685	(8.7)
	Low degree of independence*	30 820	(16.7)	38 575	(18.0)
Inpatient department	Surgery	36 983	(20.0)	38 799	(18.1)
	Internal Medicine	33 955	(18.4)	40 868	(19.1)
	Gastroenterology	20 135	(10.9)	26 557	(12.4)
	Cardiology	14 845	(8.0)	19 516	(9.1)
	Orthopaedics	14 769	(8.0)	15 886	(7.4)
	Neurosurgery	10 039	(5.4)	12 943	(6.1)
	Urology	8619	(4.7)	10 501	(4.9)
	Cardiovascular Surgery	7953	(4.3)	7405	(3.5)
	Respiratory Medicine	7056	(3.8)	7484	(3.5)
	Gastrointestinal Surgery	5427	(2.9)	4905	(2.3)
	Emergency Medicine	4047	(2.2)	5245	(2.5)
	Neurology	3598	(1.9)	4648	(2.2)
	Pulmonary Surgery	2134	(1.2)	2297	(1.1)
	Obstetrics & Gynaecology	2034	(1.1)	2274	(1.1)
	Otolaryngology	2033	(1.1)	2047	(1.0)

Characteristics		Sensitivity analysis 1		Sensitivity analysis 2	
		N (%)		N (%)	
	Nephrology	1728	(0.9)	1755	(0.8)
	General Medicine	1272	(0.7)	1574	(0.7)
	Haematology	1024	(0.6)	974	(0.5)
	Endocrinology, Metabolism & Diabetology	859	(0.5)	1037	(0.5)
	Reconstructive Surgery	905	(0.5)	958	(0.4)
	Ophthalmology	720	(0.4)	1040	(0.5)
	Others	4093	(2.2)	4550	(2.1)
	Unknown	589	(0.3)	581	(0.3)
Comorbidities	Circulatory system diseases	103 602	(56.1)	119 306	(55.8)
	Endocrine, nutritional and metabolic diseases	77 200	(41.8)	86 310	(40.4)
	Digestive system diseases	76 319	(41.3)	88 300	(41.3)
	Malignant neoplasms	56 282	(30.5)	58 680	(27.4)
	Others	51 859	(28.1)	57 420	(26.9)
	Respiratory system diseases	47 586	(25.7)	52 118	(24.4)
	Nervous system diseases	36 193	(19.6)	42 476	(19.9)
	Genitourinary system diseases	32 942	(17.8)	36 993	(17.3)
	Mental and behavioural disorders	24 824	(13.4)	30 773	(14.4)
	Musculoskeletal system/connective tissue diseases	22 601	(12.2)	24 732	(11.6)
	Injury	20 340	(11.0)	23 901	(11.2)
	Blood diseases	18 251	(9.9)	19 041	(8.9)
	Infectious disease (excluding parasitic disease)	16 392	(8.9)	17 308	(8.1)
	Skin/subcutaneous tissue disease	5688	(3.1)	5836	(2.7)
	Eye disease	1960	(1.1)	2445	(1.1)
	Poisoning	876	(0.5)	1399	(0.7)
	Ear disease	793	(0.4)	927	(0.4)
Hospitalisation information					
Type of hospitalisation	Hospitalisation for elective surgery	52 647	(28.5)	64 141	(30.0)
	Emergency hospitalisation without surgery	71 805	(38.9)	88 286	(41.3)
	Emergency hospitalisation with surgery	44 391	(24.0)	48 568	(22.7)
	Unknown	15 974	(8.6)	12 849	(6.0)
Number of beds	0–199	8992	(4.9)	9895	(4.6)
	200–499	101 596	(55.0)	117 555	(55.0)
	≥500	74 229	(40.2)	86 394	(40.4)

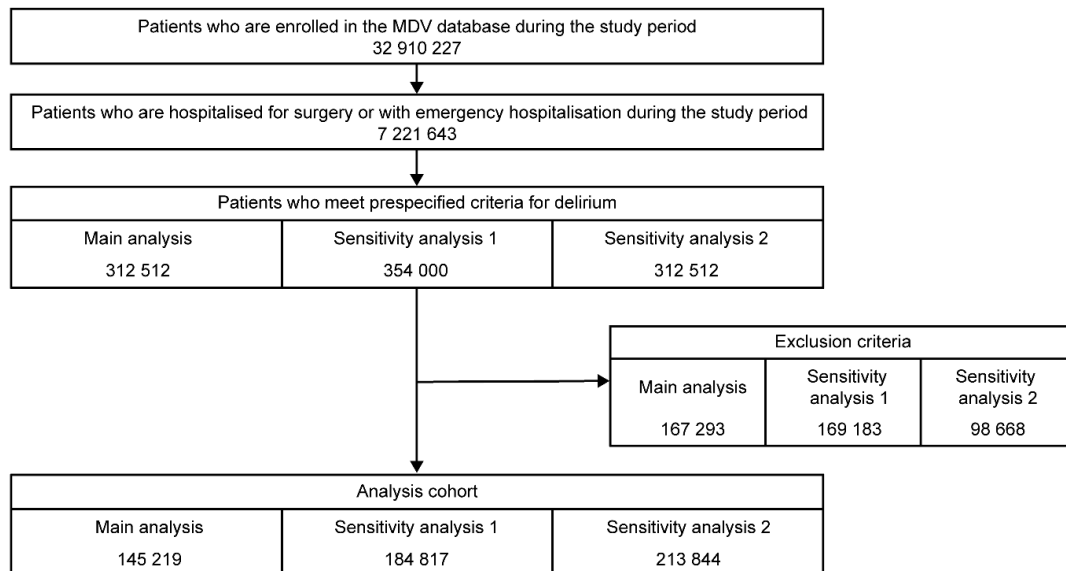
Characteristics		Sensitivity analysis 1		Sensitivity analysis 2	
		N (%)		N (%)	
Clinical practice					
Prescription of PIM	Yes	94 998	(51.4)	69 827	(32.7)
	Antidepressants	371	(0.2)	254	(0.1)
	Anticholinergic drugs	194	(0.1)	137	(0.1)
	Benzodiazepines	38 988	(21.1)	28 269	(13.2)
	Non-benzodiazepines	12 954	(7.0)	8780	(4.1)
	Corticosteroids	21 746	(11.8)	13 734	(6.4)
	H1-receptor antagonists	12 388	(6.7)	6959	(3.3)
	H2-receptor antagonists	21 028	(11.4)	15 246	(7.1)
	Opioids	35 588	(19.3)	19 253	(9.0)
Prescription of PIM	1	5640	(3.1)	4728	(2.2)
(number of PIM	2	7794	(4.2)	6064	(2.8)
drugs)	3	7985	(4.3)	6451	(3.0)
	≥4	73 579	(39.8)	52 584	(24.6)
Prescription of PIM	1	58 500	(31.7)	51 123	(23.9)
(number of PIM	2	26 719	(14.5)	15 136	(7.1)
classes)	3	8011	(4.3)	3089	(1.4)
	≥4	1768	(1.0)	479	(0.2)
Surgery	Yes	113 012	(61.1)	125 558	(58.7)
	Surgery sites:				
	Skin or subcutaneous tissue	4477	(2.4)	4672	(2.2)
	Musculoskeletal system, extremities and trunk	13 859	(7.5)	14 564	(6.8)
	Nervous system and cranial	4825	(2.6)	5695	(2.7)
	Eyes	704	(0.4)	1060	(0.5)
	Ear, nose and throat	1895	(1.0)	1570	(0.7)
	Face, mouth and neck	874	(0.5)	1192	(0.6)
	Thoracic	7613	(4.1)	9017	(4.2)
	Heart and blood vessels	21 172	(11.5)	21 846	(10.2)
	Abdomen	51 061	(27.6)	57 020	(26.7)
	Urinary system and adrenal gland	6173	(3.3)	7365	(3.4)
	Genital	2964	(1.6)	3933	(1.8)
	Anaesthesia type/duration:				
	Surgery + no/local/light general anaesthesia	49 357	(26.7)	58 743	(27.5)
	Surgery + general anaesthesia (<2 hours)	27 276	(14.8)	32 179	(15.0)

Characteristics		Sensitivity analysis 1		Sensitivity analysis 2		
		N (%)		N (%)		
	Surgery + general anaesthesia (≥ 2 hours)	36 379	(19.7)	34 636	(16.2)	
Duration of hospitalisation	Mean (SD), days	19.5 (18.9)		14.9 (11.7)		
	≤ 1 week	22 368	(12.1)	44 771	(20.9)	
	> 1 week to ≤ 2 weeks	60 821	(32.9)	81 671	(38.2)	
	> 2 weeks to ≤ 3 weeks	48 981	(26.5)	50 271	(23.5)	
	> 3 weeks to ≤ 4 weeks	26 094	(14.1)	22 322	(10.4)	
	> 4 weeks to ≤ 12 weeks	24 247	(13.1)	14 092	(6.6)	
	> 12 weeks	2306	(1.2)	717	(0.3)	
Use of ICU	Yes	42 565	(23.0)	47 127	(22.0)	
Duration, days	Mean (SD)	3.8 (3.7)		3.3 (3.0)		
	1 day	14 765	(8.0)	17 264	(8.1)	
	2 days	7146	(3.9)	8810	(4.1)	
	3 days	5101	(2.8)	6174	(2.9)	
	4 days	3723	(2.0)	4281	(2.0)	
	5 days	2665	(1.4)	2913	(1.4)	
	6 days	1970	(1.1)	2119	(1.0)	
	≥ 7 days	7195	(3.9)	5566	(2.6)	
Antipsychotics used for delirium						
Antipsychotic use for delirium	Yes	176 416	(95.5)	203 970	(95.4)	
Type of drug formulation	Haloperidol	INJ	107 433	(58.1)	128 456	(60.1)
		TAB	3030	(1.6)	2861	(1.3)
		FGR	311	(0.2)	308	(0.1)
	Risperidone	SOL	26	(0.0)	22	(0.0)
		SOL	45 913	(24.8)	50 360	(23.5)
		ODT	10 987	(5.9)	11 442	(5.4)
		TAB	7314	(4.0)	7493	(3.5)
	Quetiapine	FGR	445	(0.2)	415	(0.2)
		INJ	9	(0.0)	7	(0.0)
		TAB	28 040	(15.2)	30 390	(14.2)
	Olanzapine	FGR	1126	(0.6)	1006	(0.5)
		SRT	26	(0.0)	34	(0.0)
		TAB	4055	(2.2)	3569	(1.7)
		ODT	1678	(0.9)	1569	(0.7)
	Perospirone	FGR	270	(0.1)	248	(0.1)
		INJ	27	(0.0)	16	(0.0)
TAB		3280	(1.8)	3334	(1.6)	

Characteristics		Sensitivity analysis 1		Sensitivity analysis 2	
		N (%)		N (%)	
Duration of prescription, days	Mean (SD)	5.7 (10.1)		5.3 (7.9)	
Patient outcomes					
Transfer to other hospitals/nursing homes	Yes	43 028	(23.3)	47 980	(22.4)
	Transfer to other hospitals or clinics	29 407	(15.9)	32 083	(15.0)
	Admission to long-term care health facilities	3 146	(1.7)	3 614	(1.7)
	Admission to facilities covered by public aid providing long-term care to the elderly	3 909	(2.1)	4 485	(2.1)
	Admission to social welfare facilities or fee-based homes for the elderly, etc.	6 555	(3.5)	7 783	(3.6)
	Nursing home	11	(0.0)	15	(0.0)
Death	Yes	25 377	(13.7)	21 567	(10.1)
	No	159 397	(86.2)	192 239	(89.9)

*Low degree of independence in daily life for the elderly with dementia

ADL, activities of daily living; FGR, fine granule; ICD-10, International Classification of Diseases, 10th revision; ICU, intensive care unit; INJ, injectable; ODT, orally disintegrating tablet; PIM, potentially inappropriate medication; SD, standard deviation; SOL, solution; SRT, sustained-release tablet; TAB, tablet.

Supplemental Figure 1 Patient selection flowchart for the sensitivity analysis.

MDV, Medical Data Vision.