

Implied ADR-Admissions: A Cohort Study Introducing a Novel Administrative Data Approach for Identifying Drug-Related Hospitalisations

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Table S1: Mapping of adverse events with ICD-10 codes and/or laboratory values

Adverse event	Used ICD-10 codes	Laboratory value(s) with upper or lower limit
Anaemia	D46.0, D46.1, D46.2, D46.4, D46.5, D50.0, D50.8, D50.9, D51.0, D51.1, D51.2, D51.3, D51.8, D51.9, D52.0, D52.1, D52.8, D52.9, D53.0, D53.1, D53.2, D53.8, D53.9, D55.0, D55.1, D55.2, D55.3, D55.8, D55.9, D57.0, D59.0, D59.1, D59.2, D59.3, D59.4, D59.8, D59.9, D60.0, D60.1, D60.8, D60.9, D61.0, D61.1, D61.2, D61.3, D61.8, D61.9, D62, D63.0, D63.8, D64.0, D64.1, D64.2, D64.3, D64.4, D64.8, D64.9	/
Bleeding outside the GIT	D50.0, D62, D68.3, D69.8, D69.9, G95.1, I23.0, I31.2, I60.0, I60.1, I60.2, I60.3, I60.4, I60.5, I60.6, I60.7, I60.8, I60.9, I61.0, I61.1, I61.2, I61.3, I61.4, I61.5, I61.6, I61.8, I61.9, I62.0, I62.1, I62.9, I69.0, I69.1, I69.2, J94.2, K66.1, M25.0, N02.0, N02.1, N02.2, N02.3, N02.4, N02.5, N02.6, N02.7, N02.8, N02.9, N42.1, N93.8, N93.9, R04.0, R04.1, R04.2, R04.8, R04.9, R31, R58, S06.4	/
Dehydration	E86	/
GI bleeding	I85.0, K22.8, K25.0, K25.2, K25.4, K25.6, K26.0, K26.2, K26.4, K26.6, K27.0, K27.2, K27.4, K27.6, K28.0, K28.2, K28.4, K28.6, K29.0, K62.5, K92.0, K92.1, K92.2	/
Heart failure	I11.0, I13.0, I13.2, I50.0, I50.1, I50.9	/
Hyperkalaemia	E87.5	Potassium Upper limit → CTCAE grade 3 ^a : ≥6.0 mmol/L
Hypoglycaemia	E15, E16.0, E16.1, E16.2	Blood glucose of patients with diabetes Lower limit → CTCAE grade 3 ^a : <40–30 mg/dL OR < 2.2–1.7 mmol/L
Hypokalaemia	E87.6	Potassium Lower limit → CTCAE grade 3 ^a : ≤3.0 mmol/L
Hyponatraemia	E87.1	Sodium Lower limit → CTCAE grade 3 ^a : ≤124 mmol/L
Hypotension	I95.0, I95.1, I95.2, I95.8, I95.9, R03.1	/
Respiratory depression	J96.0, J96.9	/
Syncope	G90.0, I45.9, R55, T67.1	/

GI(T): gastrointestinal (tract);

^a CTCAE grade 3: common terminology criteria for adverse events: severe or medically significant but not immediately life-threatening; hospitalisation or prolongation of hospitalisation indicated.

Table S2: Mapping of more complex adverse events

Adverse Event	Definition							
Acute kidney injury (AKI)	Hospital admission was counted as AKI-related, if: • Main condition was one of the following ICD-10 codes: N17.0, N17.1, N17.2, N17.8, N17.9, N99.0							
	OR							
	- Serum creatinine increase according to the KDIGO criteria:							
	<table><tr><th>Stage</th><th>Serum creatinine</th></tr><tr><td>1</td><td>1.5–1.9 times baseline</td></tr><tr><td>2</td><td>2.0–2.9 times baseline</td></tr><tr><td>3</td><td>>3.0 times baseline</td></tr></table> OR Increase in serum creatinine to ≥ 4.0 mg/dl	Stage	Serum creatinine	1	1.5–1.9 times baseline	2	2.0–2.9 times baseline	3
Stage	Serum creatinine							
1	1.5–1.9 times baseline							
2	2.0–2.9 times baseline							
3	>3.0 times baseline							
	The baseline creatinine value was defined as the median value within the previous year. If available, all serum creatinine values in the previous 7-30 days were used; if not available, then in 31-90 days; if not available, then in 91-180 days; if not available, then in 181-365 days. If a patient is currently or was previously on haemodialysis or peritoneal dialysis (ICD-10 codes: Z49.0, Z49.1, Z49.2), the case was excluded.							
Delirium	Hospital admission was counted as delirium-related, if: - Main condition was one of the ICD-10 codes of category 1 OR - Main condition was one of the ICD-10 codes of category 2 AND antipsychotic medication in the 90 days prior to admission (category 3) OR - Main condition was one of the ICD-10 codes of category 4 AND one of the ICD-10 codes of category 5 was a secondary condition AND the patient was ≥ 80 years old (category 6) OR - Main condition was one of the ICD-10 codes of category 4 AND one of the ICD-10 codes of category 5 was a secondary condition AND sodium levels were <135 mmol/L or >145 mmol/L (category 7) OR - Main condition was one of the ICD-10 codes of category 4 AND the patient was ≥ 80 years old (category 6) AND sodium levels were <135 mmol/L or >145 mmol/L (category 7) Categories: - <u>Category 1 (explicit ICD-10 codes):</u> F05.0, F05.1, F05.8, F05.9, F10.4, F11.4, F12.4, F13.4, F14.4, F15.4, F16.4, F17.4, F18.4, F19.4 - <u>Category 2 (implicit ICD-10 codes – delirium):</u> A81.2, E51.2, G92X, G93.4, I67.3, I67.4, G94.3* - <u>Category 3 (antipsychotic medication):</u> BNF-Codes: 0402010xx, 0402020xx, 0402030R0, 0402030K0, 0402030P0 - <u>Category 4 (implicit ICD-10 codes – cognitive impairment):</u> F00.-*, F01.-, F02.-*, F03, F10.7, F04, G31.0, G31.1, R41.- - <u>Category 5 (ICD-10 codes – infection):</u> G00.0, G00.1, G00.2, G00.3, G00.8, G00.9, G01*, G02.0*, G02.1*, G02.8*, G03.0, G03.1, G03.8, G03.9, A87.0+, A87.1+, A87.2, A87.8, A87.9, G04.0, G04.1, G04.2, G04.8, G04.9, G05.0*, G05.1*, G05.2*, G05.8*, A40.0, A40.1, A40.2, A40.3, A40.8, A40.9, A41.0, A41.1, A41.2, A41.3, A41.4, A41.5, A41.8, A41.9, A26.7, A42.7, B37.7, A02.1, A20.7, A22.7, A32.7, A39.2, A39.3, A39.4, A31.0, A31.8, A31.9, J06.0, J06.8, J06.9, J09, J10.0, J10.1, J10.8, J11.0, J11.1, J11.8, J12.0, J12.1, J12.2, J12.3, J12.8, J12.9, J13, J14, J15.0, J15.1, J15.2, J15.3, J15.4, J15.5, J15.6, J15.7, J15.8, J15.9, J16.0, J16.8, J17.0*, J17.1*, J17.2*, J17.3*, J17.8*, J18.0, J18.1, J18.2, J18.8, J18.9, U04.9, A48.1, B01.2+, B05.2+, B25.0+, J85.1, K35.2, K35.3, K35.8, K36, K37, K57.0, K57.1, K57.2, K57.3, K57.4, K57.5, K57.8, K57.9, K67.0*, K67.1*, K67.2*, K67.3*, K67.8*, K65.0, K65.8, K65.9, M86.0, M86.1, M86.2, M86.3, M86.4, M86.5, M86.6, M86.8, M86.9, M90.0*, M90.2*, B48.1, B42.0, B42.1, B42.7, B42.8, B42.9, B43.0, B43.1, B43.2,							

	B43.8, B43.9, B44.0, B44.1, B44.2, B44.7, B44.8, B44.9, B47.0, B47.1, B47.9, B45.0, B45.1, B45.2, B45.3, B45.7, B45.8, B45.9, B48.2, B46.0, B46.1, B46.2, B46.3, B46.4, B46.5, B46.8, B46.9, B48.8, B49, N39.0, N30.0, N30.9, N33.0*, N33.8*, A54.0, A54.1, A54.2, A56.0, A56.1, A56.2, N34.0, N34.1, N34.2, N37.0*, L03.0, L03.1, L03.2, L03.3, L03.8, L03.9, A46 - <u>Category 6</u>: age ≥ 80 years - <u>Category 7</u>: sodium levels <135 mmol/L or >145 mmol/L on the day of admission or the day after
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Fall or fall injury	Hospital admission was counted as fall-related, if: • Main condition was one of the ICD-10 codes of category 1 OR • Main condition was one of the ICD-10 codes of category 2 AND • one of the ICD-10 codes of category 4 was a secondary condition OR • Main condition was one of the ICD-10 codes of category 2 AND • the patient was ≥ 65 years (category 5) OR • Main condition was one of the ICD-10 codes of category 3 AND • one of the ICD-10 codes of category 4 was a secondary condition AND the patient was ≥ 65 years (category 5)
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If one of the following ICD-10 codes (V01-V99 (transportation accidents)) has also been coded, the case was excluded.

Categories:

- Category 1 (“strong” ICD-10 codes: most important/frequent fractures: hip, femur, wrist, cranium): S00.-, S01.-, S05.-, T00.0, T01.0, S02.-, T02.0, S06.-, S03.4, S03.5, T03.0, S09.0, S04.-, S07.-, S03.0, S12.-, S22.-, S32.-, T08.0, T08.1, T02.1, T02.7, S42.-, S52.-, S62.-, T02.2, T02.4, T02.6, T10.0, T10.1, S40.7, S40.8, S40.9, S50.7, S50.8, S50.9, S60.7, S60.8, S60.9, T00.2, T11.0, S72.-, S82.-, S92.-, T02.3, T02.5, T12.0, T12.1, S70.0, S70.7, S70.8, S70.9, S80.7, S80.8, S80.9, S90.7, S90.8, S90.9, T00.3, T00.6, T13.0, S93.0, T02.8, T02.9, T14.2
- Category 2 (“weaker” ICD-10 codes: superficial injuries, open wounds, other fractures): S10.-, S11.-, S20.-, S21.-, S30.-, S31.-, T00.1, T01.1, T09.0, T09.1, S14.-, S15.-, S17.-, S24.-, S25.-, S28.0, S34.-, S35.-, S38.0, S38.1, T04.0, T04.1, T04.7, T06.0, T06.1, T09.3, T09.4, S41.-, S51.-, S61.-, T01.2, T01.6, T11.1, S40.0, S60.0, S60.1, S60.2, S50.0, S50.1, S43.0, S43.1, S43.2, S43.3, S53.0, S53.1, S63.0, S63.1, S63.2, T03.2, T03.4, S81.-, S91.0, S91.7, S90.0, S90.1, S90.2, S90.3, S70.1, S80.0, S80.1, S73.0, S70.0
- Category 3 (unspecific ICD-10 codes: other injuries, unspecified injury, other accident): S13.1, S13.2, S13.3, S23.1, S23.2, S33.1, S33.2, S33.3, T03.1, T09.2, S13.4, S13.5, S13.6, S16.-, S23.3, S23.4, S23.5, S33.5, S33.6, S33.7, S26.-, S27.-, S36.-, S37.-, T06.5, S43.4, S43.5, S43.6, S43.7, S46.-, S53.4, S56.-, S63.5, S63.6, S63.7, S66.-, T03.4, T11.2, S44.-, S45.-, S47, S54.-, S55.-, S57.-, S64.-, S65.-, S67.-, T04.2, T04.7, T04.4, T11.3, T11.4, S71.-, S91.3, S91.1, S91.2, T01.3, T13.1, S83.0, S83.1, S93.1, S93.3, S73.1, S76.-, S83.4, S83.5, S83.6, S86.-, S93.4, S93.5, S93.6, S96.-, T03.3, T13.2, T13.5, S74.-, S75.-, S77.-, S84.-, S85.-, S87.-, S94.-, S95.-, S97.-, T04.3, T13.3, T13.4
- Category 4 (underlying diseases/risk factors): R26.0, R26.2, R26.8, R29.6, R54
- Category 5: age ≥ 65 years

The W codes for fall have been deliberately omitted because they are not always documented, and when they are, they are rarely documented as the main condition, but usually as other condition. It is therefore not clear whether the hospitalisation was due to the fall or for another reason.

Table S3: Adverse events and linked drugs

Linked drug / Adverse event	Acute kidney injury	Anaemia	Bleeding outside the GIT	Dehydration	Delirium	Fall or fall injury	GI bleeding	Heart failure	Hyper-kalaemia	Hypo-glycaemia	Hypo-kalaemia	Hypo-natraemia	Hypo-tension	Respiratory depression	Syncope
ACE inhibitors									X				X		
Alpha blockers													X		
Aminoglycosides	X														
Antiepileptics affecting sodium levels (carbamazepine, oxcarbazepine, eslicarbazepine, valproic acid)												X			
Antiplatelet drugs			X				X								
Antipsychotics (2 nd generation) (excl. clozapine, quetiapine)													X		
AT ₁ receptor antagonists									X				X		
Baclofen					X									X	
Barbiturates					X									X	
Benzodiazepines					X	X								X	
Beta blockers													X		
Calcium-channel blockers (dihydropyridines)													X		
Calcium-channel blockers (non-dihydropyridines)								X					X		
Centrally-acting antihypertensive drugs (excl. methyldopa)													X		
Certain antiarrhythmics (dronedarone, sotalol)								X							

[illegible]

Table S4: Used BNF codes of selected linked drugs

Linked drug (group)	Drugs included	BNF codes
ACE inhibitors	Captopril, Cilazapril, Enalapril, Fosinopril, Imidapril, Lisinopril, Moexipril, Perindopril, Quinapril, Ramipril, Trandolapril	0205051xx ^a
Alpha blockers	Doxazosin, Indoramin, Phenoxybenzamine, Phentolamine, Prazosin, Terazosin, Tamsulosin, Yohimbine, Alfuzosin	0205040xx ^a 0704010M0 0704050AD 0704010T0 0704010U0 0704010V0 0704010W0 0704020AF 0704050Y0 0704010A0
Aminoglycosides	Amikacin, Gentamicin, Neomycin, Tobramycin	0501040xx ^a
Antiepileptics affecting sodium levels (carbamazepine, oxcarbazepine, eslicarbazepine, valproic acid)	Carbamazepine, Oxcarbazepine, Eslicarbazepine, Valproic acid	0408010C0 0408010D0 0408010AI 0402030Q0 040801020 0408010AC 0408010W0
Antiplatelet drugs	Aspirin, Clopidogrel, Dipyridamole, Eptifibatide, Prasugrel, Ticagrelor, Ticlopidine, Cilostazol, Iloprost, Epoprostenol	0204000AC 0205010V0 0206040X0 0208010E0 0209000xx ^a
Antipsychotics (2nd generation) (excl. clozapine, quetiapine)	Amisulpride, Aripiprazole, Cariprazine, Lurasidone, Olanzapine, Paliperidone, Risperidone, Sulpiride, Ziprasidone, Zotepine	0402010A0 0402010AD 0402020AD 0402010AJ 0402010AI 040201060 0402020AC 0402010AE 0402020AB 040201030 0402020AA 0402010U0 0402010AG 0402010AC
AT₁ receptor antagonists	Azilsartan, Candesartan, Eprosartan, Irbesartan, Losartan, Olmesartan, Telmisartan, Valsartan	0205052xx ^a 0206020Z0
Baclofen	Baclofen	1002020C0
Barbiturates	Amobarbital, Butobarbital, Phenobarbital, Secobarbital	0401030C0 0401030E0 0401030H0 0408010N0 0408010P0 0401030T0
Benzodiazepines	Flurazepam, Loprazolam, Lormetazepam, Nitrazepam, Temazepam, Alprazolam, Bromazepam, Chlordiazepoxide, Diazepam, Lorazepam, Oxazepam, Clobazam, Clonazepam, Midazolam	0401010L0 0401010N0 0401010P0 0401010Q0 0401010R0 0401010T0 0401020A0 0401020G0 0401020E0 0401020K0

		0401020P0 0401020T0 040801060 0408010F0 0408020D0 0408020W0 0408020V0 1501041T0
Beta blockers	Acebutolol, Atenolol, Bisoprolol, Carvedilol, Celiprolol, Labetalol, Metoprolol, Nadolol, Nebivolol, Oxprenolol, Pindolol, Propranolol, Sotalol, Timolol	02040xxxx ^a
Calcium-channel blockers (dihydropyridines)	Amlodipine, Felodipine, Isradipine, Lacidipine, Lercanidipine, Nicardipine, Nifedipine, Nimodipine, Nisoldipine	0205052AB 0205052AC 0206020A0 0206020F0 0206020I0 0206020K0 0206020L0 0206020Q0 0206020R0 0206020M0 0206020W0 0206020Z0
Calcium-channel blockers (non-dihydropyridines)	Diltiazem, Verapamil	0206020C0 0206020T0
Centrally-acting antihypertensive drugs (excl. methyl dopa)	Clonidine, Guanfacine, Moxonidine	0205020E0 0205020G0 0205020M0 0404000V0 0407042F0
Certain antiarrhythmics (dronedarone, sotalol)	Dronedarone, Sotalol	0203020X0 0204000T0
Clozapine	Clozapine	0402010C0
Coxibs	Celecoxib, Etoricoxib, Lumiracoxib, Parecoxib, Rofecoxib	0801050AY 1001010AH 1001010AJ 1001010AN 1001010AF 1501042H0
Diuretics (excl. potassium sparing diuretics)	Bendroflumethiazide, Chlorothiazide, Chlortalidone, Cyclopenthiazide, Hydrochlorothiazide, Indapamide, Metolazone, Polythiazide, Xipamide, Bumetanide, Torasemide, Furosemide, Mannitol	0202010xx ^a 0202020xx ^a 0202050xx ^a 0204000Y0 020400040 0205052AC 0205052Y0 0205051G0 0205051AB
DOACs	Apixaban, Dabigatran, Edoxaban, Rivaroxaban	0208020Z0 0208020X0 0208020AA 0208020Y0
Drugs with ACB Score sum ≥ 3	See Table S5	
Glitazones	Pioglitazone, Rosiglitazone	0601023B0 0601023S0 0601023V0 0601023W0

Glucocorticoids	Beclometasone, Budesonide, Hydrocortisone, Prednisolone, Betamethasone, Cortisone, Deflazacort, Dexamethasone, Methylprednisolone, Prednisone, Triamcinolone	0105020xx ^a 0603020xx ^a
Heparins	Bemiparin, Dalteparin, Danaparoid, Enoxaparin, Heparin, Tinzaparin	0208010AC 0208010L0 0208010C0 0208010D0 0208010N0 0208010P0 0208010K0 0208010W0
Insulinotropic antidiabetics	Albiglutide, Alogliptin, Chlorpropamide, Dulaglutide, Exenatide, Glibenclamide, Gliclazide, Glimepiride, Glipizide, Linagliptin, Liraglutide, Lixisenatide, Nateglinide, Repaglinide, Saxagliptin, Semaglutide, Sitagliptin, Tirzepatide, Tolbutamide, Vildagliptin	0601023AS 0601023AK 0601023AJ 0601021E0 0601023AQ 0601023AY 0601023Y0 0601021H0 0601021M0 0601021A0 0601021P0 0601023AU 0601023AE 0601023AF 0601023AB 0601023AI 0601023AD 0601023Z0 0601023U0 0601023R0 0601023AC 0601023AV 0601023AH 0601023AW 0601023X0 0601023AZ 0601021X0 0601023AA
Insulins	Insulin aspart, Insulin degludec, Insulin detemir, Insulin glargine, Insulin glulisine, Insulin human, Insulin lispro, Insulin zinc suspension, Isophane insulin, Protamine zinc insulin, Neutral insulin	060101xxx ^a 0601023AU
Laxatives	Ispaghula husk, Methylcellulose, Sterculia, Bisacodyl, Castor oil, Co-danthramer (Dantron/poloxamer 188), Co-danthrusate (Dantron/docusate sodium), Docusate sodium, Glycerol, Phenolphthalein and rhubarb, Senna, Sennosides, Sodium picosulfate, Arachis oil, Liquid paraffin, Lactitol, Lactulose, Macrogol, Magnesium, Phosphates, Sodium citrate, Sodium picosulfate, Methylnaltrexone, Naldemedine, Naloxegol, Linaclotide, Lubiprostone, Prucalopride	010200AF 01060xxxx ^a
Metformin	Metformin	0601022B0 0601023AD 0601023AF 0601023AH 0601023AJ 0601023AL 0601023AP 0601023AR 0601023V0

		0601023W0 0601023Z0
Methotrexate	Methotrexate	0801030P0 1001030U0
Methyldopa	Methyldopa	0205020H0
NSAIDs (excl. coxibs)	Aceclofenac, Acemetacin, Azapropazone, Benorilate, Dexibuprofen, Dexketoprofen, Diclofenac, Diflunisal, Etodolac, Fenbufen, Fenoprofen, Flurbiprofen, Ibuprofen, Indometacin, Ketoprofen, Lornoxicam, Mefenamic acid, Meloxicam, Nabumetone, Naproxen, Phenylbutazone, Piroxicam, Sulindac, Tenoxicam, Tiaprofenic acid	0309020AA 0407010AA 0407010AD 0407010A0 0407010B0 0407010M0 0407010W0 0701011F0 100101080 100101050 1001010B0 1001010H0 1001010AM 1001010AE 1001010AG 1001010C0 1001010D0 1001010E0 1001010F0 1001010G0 1001010I0 1001010J0 1001010AD 1001010AP 1001010K0 1001010L0 1001010AI 1001010N0 1001010AA 1001010X0 1001010P0 100101070 1001010Q0 1001010R0 1001010S0 100101040 1001010T0
Opioids	Alfentanil, Buprenorphine, Codeine, Dextromoramide, Dextropropoxyphene, Diamorphine, Dihydrocodeine, Dipipanone, Fentanyl, Hydromorphone, Meptazinol, Methadone, Morphine, Nalbuphine, Opium, Oxycodone, Papaveretum, Pentazocine, Pethidine, Remifentanyl, Tapentadol, Tramadol	0104020N0 0309010C0 0309010N0 0309010S0 0407010A0 0407010F0 0407010M0 0407010N0 0407010Q0 0407020xx ^a 0410030A0 0410030B0 0410030C0 1501010Q0 1501043A0 1501043F0 1502010Z0
Potassium containing agents	Tripotassium dicitratobismuthate, Bendroflumethiazide/potassium, Bumetanide/potassium,	0103030W0 0202080B0

	Furosemide/potassium, Potassium iodide, Potassium iodate, Potassium citrate, Potassium bicarbonate, Potassium chloride, Potassium phosphate	0202080C0 0202080K0 030902020 0602020H0 0602020I0 0704030G0 0902011U0 0902013P0 0902021N0 0905021F0 0905021I0
Potassium sparing diuretics	Amiloride, Eplerenone, Finerenone, Spironolactone, Triamterene	0202030xx ^a 0202040xx ^a 0202080D0
Quetiapine	Quetiapine	0402010AB
Renin inhibitors	Aliskiren	0205053A0
SGLT-2 inhibitors	Dapagliflozin, Canagliflozin, Empagliflozin, Ertugliflozin	0601023AG 0601023AL 0601023AM 0601023AN 0601023AP 0601023AR 0601023AV 0601023AX 0601023AY
SNRIs	Duloxetine, Venlafaxine	0403030Z0 0403040Y0 0704020AA 0403040W0
SSRIs	Citalopram, Escitalopram, Fluoxetine, Fluvoxamine, Paroxetine, Sertraline	0403030D0 0403030Z0 0403030X0 0403030E0 0403030L0 0403030P0 0403030Q0
Tricyclic antidepressants	Amitriptyline, Amoxapine, Clomipramine, Dosulepin, Doxepin, Imipramine, Lofepramine, Nortriptyline, Trimipramine	0403010B0 0403010C0 0403010F0 0403010J0 0403010L0 0403010N0 0403010R0 0403010V0 0403010Y0
Vasopressin analogues	Desmopressin, Terlipressin	0605020E0 0605020T0
Vitamin K antagonists	Acenocoumarol, Phenindion, Phenprocoumon, Warfarin	0208020H0 0208020N0 0208020S0 0208020V0
Z-drugs	Zaleplon, Zolpidem, Zopiclone	0401010W0 0401010Y0 0401010Z0

^a x[...]x at the end of a BNF code means that all codes with the preceding characters are included.

Table S5: Adapted Anticholinergic Burden (ACB) Score of anticholinergic drugs used as linked drugs^a

ACB Score	Drug	BNF code
3	Amitriptyline	0403010B0
	Amoxapine	0403010C0
	Atropine	0102000AC 0104020H0 1501030D0
	Belladonna total alkaloids	0102000H0
	Benzatropine	0409020E0
	Biperiden	0409020G0
	Brompheniramine	0304010F0
	Carisoprodol	1002020G0
	Chlorpheniramine	0304010G0
	Chlorpromazine	0402010D0
	Clemastine	0304010H0
	Dicyclomine/Dicycloverine	0102000J0 0102000K0
	Dimenhydrinate	0406000AC
	Diphenhydramine	0304010N0 030902040 0309020AB 0309020AH
	Hydroxyzine	0304010J0
	Hyoscin Butylbromide	0102000N0
	Imipramine	0403010N0
	Meclozine/Meclizine	0406000N0
	Orphenadrine	0409020N0
	Oxybutynin	0704020J0 0704040G0
	Procyclidine	0409020S0
	Propantheline	0102000Y0
	Scopolamine (Hyoscine)	0406000A0 0406000L0 1501030H0
	Thioridazine	0402010W0
	Trifluorperazine	0402010X0
	Trihexyphenidyl	0409020C0
2	Amantadine	0409010B0 0503040C0
	Chlorprothixen	0402010F0
	Cimetidine	0103010D0
	Clomipramine	0403010F0
	Clozapine	0402010C0
	Cyproheptadine	0304010K0
	Darifenacin	0704020AC
	Dosulepine	0403010J0
	Doxepin	0403010L0
	Fesoterodine	0704020AD
	Flavoxate	0704020G0
	Fluphenazine	0402010I0 0402020L0
	Levomepromazine	0402010K0 0402010L0
	Loxapine	0402010M0
	Maprotiline	0403010S0
	Nefopam	0407010P0
	Nortriptyline	0403010V0
	Olanzapine	040201060 0402020AC

	Oxcarbazepine	0408010D0
	Paroxetine	0403030P0
	Pericyazine	0402010P0
	Perphenazine	0402010Q0
	Pethidine (Meperidine)	0407020V0
	Pimozide	0402010R0
	Pregabalin	0408010AE
	Pridinol	1002020Z0
	Promazine	0402010S0
	Promethazine	0304010W0 0406000V0
	Propiverine	0704020P0
	Propoxyphene (Dextropropoxyphene)	0407020E0
	Secobarbital	0401030T0
	Solifenacine	0704010W0 0704020AF 0704020AB
	Tizanidine	1002020T0
	Tolterodine	0704020N0
	Trimipramine	0403010Y0
	Trospium	0704020Z0
	Zotepine	0402010AC
	Pseudoephedrine+Dextromethorphan	0309020AF
	Naltrexon+Bupropion	0405010T0 0405020U0
1	Acclidinium	0301020R0 0301020U0 0301040V0
	Alimemazine	0304010Y0
	Almotriptan	0407041B0
	Alprazolam	0401020A0
	Amisulpride	0402010A0
	Aripiprazole	0402010AD 0402020AD
	Asenapine	0402030R0
	Baclofen	1002020C0
	Bupropion	0410020A0
	Capecitabin	0801030V0
	Carbamazepine	0408010C0
	Cetirizine	0304010I0
	Chlordiazepoxide	0401020E0
	Chloroquine	0504010F0 0504010G0 0504010Z0
	Cinnarizine	0206040AA 0406000D0
	Citalopram	0403030D0 0403030Z0
	Clonazepam	0408010F0 0408020D0
	Codeine	0309010C0 0407010F0 0407010M0 0407020C0
	Cortisone	0603020F0
	Desloratadine	0304010AB
	Dextromethorphan	0309010L0 0309020R0
	Diazepam	0401020K0
	Digitoxin	0201010D0

Digoxin	0201010F0
Disopyramide	0203020F0
	0203020G0
Doxylamine	0406000AA
Escitalopram	0403030X0
Eslicarbazepine	0408010AI
Etoricoxib	1001010AJ
Fentanyl	0407020A0
	1501043F0
	1502010Z0
Fexofenadine	0304010E0
Fluoxetine	0403030E0
Flupentixol	0402010H0
	0402020G0
	0403040F0
Flurazepam	0401010L0
Fluvoxamine	0403030L0
Furosemide	0202020L0
	0202080K0
	0202040B0
Glycopyrronium	0102000L0
	1501030G0
	0301011AB
	0301020S0
	0301040AA
	0301040Y0
	0302000Y0
Guaifenesin	0309020G0
	1002020L0
Haloperidol	0402010J0
	0402020T0
Hydralazine	0205010J0
Hydrocortisone	0105020B0
	0105020C0
	0603020J0
	0603020L0
	0603020M0
	1001022G0
Ipratropium	0301020I0
Ketotifen	0304010AG
Levocetirizine	0304010AC
Lofepramine	0403010R0
Loperamide	0104020L0
	0104020P0
Loratadine	0304010D0
Lorazepam	0401020P0
Lumiracoxib	1001010AN
Mefloquine	0504010L0
Methadone	0309010S0
	0407020M0
	0410030C0
Methocarbamol	1002020S0
Midazolam	0401010Q0
	0408020V0
	0408020W0
	1501041T0
Mirtazapine	0403040X0
Morphine	0104020N0
	040702020
	0407020P0

	0407020Q0
	0407020W0
Naltrexone	0410030E0
Nefazodone	0403040T0
Oxazepam	0401020T0
Oxycodone	0407020AD
	0407020AF
	0407020Z0
Paliperidone	0402010AE
	0402020AB
Pancuronium	1501050L0
Phenelzine	0403020M0
Prednisolone	0105020D0
	0105020E0
	0105020F0
	0603020T0
	1001022N0
Prednisone	0603020X0
Primaquine	0504010K0
Prochlorperazine	0406000T0
	0406000U0
Pseudoephedrine	0309020AA
	0309020Q0
	0310000N0
	0310000M0
Quetiapine	0402010AB
Quinidine	0203020U0
Ranitidine	0103010S0
	0103010T0
Risperidone	040201030
	0402020AA
Rotigotine patch	0409010Z0
Temazepam	0401010T0
Theophylline	0301030S0
Tiotropium	0301020Q0
	0301040X0
Tramadol	040702040
Trandolapril	0205051U0
	0205051V0
Trazodone	0403010X0
Umeclidinium	0301020T0
	0301040U0
	0301040W0
Venlafaxine	0403040W0
Ziprasidone	0402010AG
Zonisamide	0408010AD
Zuclopenthixol	040201010
	0402010T0
	0402020Z0

^a As the modified Anticholinergic Risk Scale (mARS) was published ten years ago, we conducted a structured literature search to identify other international scores that assess the anticholinergic burden (ACB) of drugs on a scale of 0 to 3. Here, we found six additional scores from Brazil, Germany, Korea, USA, Spain and Sweden. The mean was then calculated for each of the drugs listed, always rounding down regardless of the number of decimals. Thus, we identified a total of 146 drugs registered in Scotland (26 with ACB 3, 37 with ACB 2, and 83 with ACB 1).

Table 6: Mapping of explicit ADR-admissions

Category	Used ICD-10 codes^a
A.1: A drug-related causation was noted in the ICD-10	D52.1, D59.0, D59.2, D61.1, E06.4, E16.0, E23.1, E24.2, E27.3, E66.1, G21.0, G21.1, G24.0, G25.1, G25.4, G25.6, G44.4, G62.0, G72.0, H26.3, H40.6, I95.2, J70.2, J70.3, J70.4, K85.3, L10.5, L43.2, L56.0, L56.1, L64.0, M10.2, M32.0, M80.4, M81.4, M83.5, M87.1, N14.0, O74.4, P04.0, P04.1, P96.2, Q86.1, Q86.2, R50.2, T88.3
A.2: A drug- or other substance-related causation was noted in the ICD-10	D64.2, E03.2, F11.0, F11.1, F11.2, F11.3, F11.4, F11.5, F11.6, F11.7, F11.8, F11.9, F13.0, F13.1, F13.2, F13.3, F13.4, F13.5, F13.6, F13.7, F13.8, F13.9, F15.0, F15.1, F15.2, F15.3, F15.4, F15.5, F15.6, F15.7, F15.8, F15.9, F19.0, F19.1, F19.2, F19.3, F19.4, F19.5, F19.6, F19.7, F19.8, F19.9, G21.2, I42.7, L23.3, L24.4, L25.1, L27.0, L27.1, L27.8, L27.9, M34.2, N14.1, N14.2, N14.3, N14.4, O35.5, P04.4, P58.4, P93, P96.1, T78.2, T78.3, T78.4, T78.8, T78.9, T80.1, T80.2, T80.3, T80.4, T80.5, T80.6, T80.8, T80.9, T88.6, T88.7, Y40.-, Y41.-, Y42.-, Y43.-, Y44.-, Y45.-, Y46.-, Y47.-, Y48.-, Y49.-, Y50.-, Y51.-, Y52.-, Y53.-, Y54.-, Y55.-, Y56.-, Y57.-, Y58.-, Y59.-
B.1: The event was denoted as a drug poisoning	T36.0, T36.1, T36.2, T36.3, T36.4, T36.5, T36.6, T36.7, T36.8, T36.9, T37.0, T37.1, T37.2, T37.3, T37.4, T37.5, T37.8, T37.9, T38.0, T38.1, T38.2, T38.3, T38.4, T38.5, T38.6, T38.7, T38.8, T38.9, T39.0, T39.1, T39.2, T39.3, T39.4, T39.8, T39.9, T40.0, T40.1, T40.2, T40.3, T40.4, T40.5, T40.6, T40.7, T40.8, T40.9, T41.0, T41.1, T41.2, T41.3, T41.4, T41.5, T42.0, T42.1, T42.2, T42.3, T42.4, T42.5, T42.6, T42.7, T42.8, T43.0, T43.1, T43.2, T43.3, T43.4, T43.5, T43.6, T43.8, T43.9, T44.0, T44.1, T44.2, T44.3, T44.4, T44.5, T44.6, T44.7, T44.8, T44.9, T45.0, T45.1, T45.2, T45.3, T45.4, T45.5, T45.6, T45.7, T45.8, T45.9, T46.0, T46.1, T46.2, T46.3, T46.4, T46.5, T46.6, T46.7, T46.8, T46.9, T47.0, T47.1, T47.2, T47.3, T47.4, T47.5, T47.6, T47.7, T47.8, T47.9, T48.0, T48.1, T48.2, T48.3, T48.4, T48.5, T48.6, T48.7, T49.0, T49.1, T49.2, T49.3, T49.4, T49.5, T49.6, T49.7, T49.8, T49.9, T50.0, T50.1, T50.2, T50.4, T50.6, T50.7
B.2: The event was denoted as poisoning by or harmful use of drugs or other substances	F55, T50.3, T50.5, T50.8, T50.9, T96, X40, X41, X42, X43, X44

^a adapted from the German modification of ICD-10 to the WHO version

Table 7: Indicators for detecting preventable ADR-admissions (exemplary for GI bleeding)

Emergency hospital admission due to GI bleeding preceded by:	
1.	NSAID or aspirin without gastroprotection in patient with prior peptic ulcer
2.	NSAID without gastroprotection in patient aged ≥ 75 years
3.	NSAID without gastroprotection in patient aged ≥ 65 years taking aspirin
4.	Clopidogrel without gastroprotection in patient aged ≥ 65 years taking aspirin
5.	NSAID without gastroprotection in patient taking an oral anticoagulant
6.	Aspirin or clopidogrel without gastroprotection in patient taking an oral anticoagulant

Table 8: Mapping of preventable ADR-admissions

a)

Drug (group)	Drug(s) included	BNF codes
NSAID	Aceclofenac, Acemetacin, Azapropazone, Benorilate, Dexibuprofen, Dexketoprofen, Diclofenac, Diflunisal, Etodolac, Fenbufen, Fenoprofen, Flurbiprofen, Ibuprofen, Indometacin, Ketoprofen, Lornoxicam, Mefenamic acid, Meloxicam, Nabumetone, Naproxen, Phenylbutazone, Piroxicam, Sulindac, Tenoxicam, Tiaprofenic acid	0309020AA 0407010AA 0407010AD 0407010A0 0407010B0 0407010M0 0407010W0 0701011F0 100101080 100101050 1001010B0 1001010H0 1001010AM 1001010AE 1001010AG 1001010C0 1001010D0 1001010E0 1001010F0 1001010G0 1001010I0 1001010J0 1001010AD 1001010AP 1001010K0 1001010L0 1001010AI 1001010N0 1001010AA 1001010X0 1001010P0 100101070 1001010Q0 1001010R0 1001010S0 100101040 1001010T0
Aspirin	Aspirin	0204000AC 0209000A0 0209000V0
Gastroprotection (proton pump inhibitor or H2-receptor antagonist)	Proton pump inhibitors: Esomeprazole, Lansoprazole, Omeprazole, Pantoprazole, Rabeprazole H2-receptor antagonists: Cimetidine, Famotidine, Nizatidine, Ranitidine	0103050E0 0103050L0 0103050P0 0103050R0 0103050T0 0103010D0 0103010H0 0103010N0 0103010S0 0103010T0
Clopidogrel	Clopidogrel	0209000C0
Oral anticoagulant	Acenocoumarol, Apixaban, Dabigatran, Edoxaban, Phenindion, Phenprocoumon, Rivaroxaban, Warfarin	0208020Z0 0208020X0 0208020AA 0208020Y0

b)

History of...	Definition
Peptic ulcer (with or without bleeding)	Prior hospital admission with one of the following ICD-10 codes within the past 10 years: I85.0, K22.8, K25.0, K25.2, K25.4, K25.6, K26.0, K26.2, K26.4, K26.6, K27.0, K27.2, K27.4, K27.6, K28.0, K28.2, K28.4, K28.6, K29.0, K62.5, K92.0, K92.1, K92.2

Table S9: Mapping of Potentially Inappropriate Medication (PIM) using the EU(7)-PIM list^a

Drug	BNF codes
Ranitidine	0103010S0 0103010T0
Metoclopramide	0406000P0
Senna Glycosides	0106020M0 0106020V0
Sodium picosulfate	0106020P0 0106050S0
Insulin, sliding scale	0601011A0 0601011P0 0601011R0 0601011L0 0601011N0
Glibenclamide	0601021H0
Glimepiride	0601021A0
Sitagliptine	0601023AD 0601023X0
Acenocoumarol	0208020H0
Dipyridamole	0209000L0 0209000V0
Digitoxin	0201010D0
Digoxin	0201010F0
Amiodarone	0203020D0
Trimetazidine	0206020B0
Rilmenidine	Not approved
Doxazosin	0205040D0
Pentoxifylline	0206040AG
Propranolol	0204000Q0 0204000R0
Sotalol	0204000T0
Nifedipine	0206020R0
Verapamil	0206020T0
Diltiazem	0206020C0
Oestrogen	0604011AD 0604011P0 0604011Q0
Oxybutynine	0704020J0 0704040G0
Tolterodine	0704020N0
Solifenacin	0704010W0 0704020AB 0704020AF
Diclofenac	1001010AG 1001010C0
Dexketoprofen	1001010AE
Etoricoxib	1001010AJ
Meloxicam	1001010AA
Strontium ranelate	0606020X0
Tramadol	040702040
Clonazepam	0408010F0 0408020D0
Carbamazepine	0408010C0
Ropinirole	0409010H0
Pramipexole	0409010W0
Chlorpromazine	0402010D0
Levomepromazine	0402010K0 0402010L0

Zuclopenthixol	040201010 0402010T0 0402020Z0
Clozapine	0402010C0
Diazepam	0401020K0
Bromazepam	0401020G0
Alprazolam	0401020A0
Flunitrazepam	Not approved
Temazepam	0401010T0
Clomethiazole	0401010D0 0401010F0
Amitriptyline	0403010B0
Nortriptyline	0403010V0
Fluoxetine	0403030E0
Paroxetine	0403030P0
Venlafaxine	0403040W0
Piracetam	0409030P0
Ginkgo biloba	Not approved
Theophylline	0301030S0
Promethazine	0304010W0 0406000V0
Hydroxyzine	0304010J0

^a A drug is counted as a PIM if it is part of this list and the patient is ≥ 65 years.

Table S10: Mapping of medication-based chronic disease score (medCDS)

Drug (group)	Drugs included	BNF codes
Chronic gastritis, gastroesophageal reflux disease		
H2-receptor antagonists	Cimetidine, Famotidine, Nizatidine, Ranitidine without concurrent prescription of NSAIDs	0103010D0 0103010H0 0103010N0 0103010S0 0103010T0 without concurrent prescription of 1001010xx^a
Proton pump inhibitors	Esomeprazole, Lansoprazole, Omeprazole, Pantoprazole, Rabeprazole	0103050E0 0103050L0 0103050P0 0103050R0 0103050T0
Combinations for eradication of <i>Helicobacter pylori</i>	<i>Helicobacter pylori</i> eradication therapy	0103050A0
Cardiac arrhythmias		
Vitamin K antagonists	Acenocoumarol, Phenindione, Phenprocoumon, Warfarin	0208020H0 0208020N0 0208020S0 0208020V0
Dabigatran	Dabigatran	0208020X0
Direct factor Xa inhibitors	Apixaban, Edoxaban, Rivaroxaban	0208020Z0 0208020AA 0208020Y0
Digitalis glycosides	Digitoxin, Digoxin	0201010D0 0201010F0
Propafenone	Propafenone	0203020R0
Flecainide	Flecainide	0203020I0
Amiodarone	Amiodarone	0203020D0
Dronedarone	Dronedarone	0203020X0
Sotalol	Sotalol	0204000T0
Asthma, chronic obstructive pulmonary disease (COPD)		
Selective beta-2-adrenoreceptor agonists, inhalants	Bambuterol, Fenoterol, Formoterol, Indacaterol, Olodaterol, Salbutamol, Salmeterol, Terbutaline	0301011AB 0301011B0 0301011F0 0301011E0 0301011X0 0301011Z0 0301011R0 0301011U0 0301011V0
Adrenergics in combination with corticosteroids or other drugs, excl. anticholinergics, inhalants	Fluticasone /vilanterol, Indacaterol/mometasone	0302000V0 0302000X0
Glucocorticoids, inhalants	Beclometasone, Budesonide, Ciclesonide, Fluticasone, Mometasone	0302000C0 0302000K0 0302000U0 0302000N0 0302000R0 0302000Z0 0302000Y0
Anticholinergics, inhalants	Acclidinium, Glycopyrronium, Ipratropium, Oxitropium, Tiotropium, Umeclidinium	0301020U0 0301020R0 0301020S0 0301020I0 0301020P0 0301020Q0 0301020T0

Antiallergic agents, corticosteroids, inhalants	Nedocromil, Sodium cromoglicate	0303010J0 0303010Q0
Selective beta-2-adrenoreceptor agonists	Not approved for this indication	Not approved for this indication
Xanthines	Aminophylline, Theophylline	0301030B0 0301030C0 0301030S0
Leukotriene receptor antagonists	Montelukast, Zafirlukast	0303020G0 0303020Z0
Omalizumab	Omalizumab	0304020X0
Roflumilast	Roflumilast	0303030B0
Cancer (colorectal, mamma, and prostate carcinoma) including antiemetic therapy		
Capecitabine	Capecitabine	0801030V0
Tegafur, combinations	Tegafur	0801030S0
Mistletoe	Not approved for this indication	Not approved for this indication
Lapatinib	Lapatinib	0801050AT
Everolimus	Everolimus	0801050AX
Progestogens	Medroxyprogesterone, Megestrol	0803020H0 0803020L0
Gonadotropin-releasing hormone analogues	Buserelin, Goserelin, Histrelin, Leuporelin, Triptorelin	0803042B0 0803042K0 0803042Q0 0803042N0 0803042W0 0803042P0 0803042S0
Antiestrogens	Fulvestrant, Tamoxifen, Toremifene	0803041AA 0803041S0 0803041U0
Antiandrogens	Apalutamide, Bicalutamide, Enzalutamide, Flutamide	0803042V0 0803042A0 0803042U0 0803042H0
Aromatase inhibitors	Anastrozole, Exemestane, Letrozole	0803041B0 0803041C0 0803041L0
Abiraterone	Abiraterone	0803042T0
Alizapride	Not approved for this indication	Not approved for this indication
Serotonin (5-HT ₃) antagonists	Granisetron, Ondansetron, Palonosetron	0406000AF 0406000M0 0406000S0 0406000AB 0406000AG
Aprepitant, Fosaprepitant	Aprepitant, Fosaprepitant	0406000AD 0406000AE
Cardiovascular disease category 2 (“heart failure”) CVD2		
Ivabradine	Ivabradine	0206030Y0
Sulfonamides, plain	Bumetanide, Furosemide, Torasemide	0202020D0 0202020L0 0202020U0
Aldosterone antagonists	Eplerenone, Finerenone, Spironolactone	0202030X0 0202030Y0 0202030S0
Furosemide and triamterene	Triamterene with loop diuretics	0202040U0
Aldosterone antagonists and low-ceiling diuretics	Hydroflumethiazide/spironolactone, Spironolactone with thiazides	0202040G0 0202040S0
Aldosterone antagonists and high-ceiling diuretics	Spironolactone with loop diuretics	0202040T0

Psychiatric diseases including depression, schizophrenia, and anxiety disorders		
Non-selective monoamine reuptake inhibitors	Amitriptyline, Amoxapine, Clomipramine, Dosulepin, Doxepin, Imipramine, Lofepramine, Maprotiline, Nortriptyline, Trimipramine without concurrent prescription of opioids; Only concerns prescriptions of <u>amitriptyline</u>: without concurrent prescription of triptans or ergot alkaloids	0403010B0
		0403010C0
		0403010F0
		0403010J0
		0403010L0
		0403010N0
		0403010R0
		0403010S0
		0403010V0
		0403010Y0
		without concurrent prescription of
		0407020xx^a;
		Only concerns prescriptions of
		<u>amitriptyline</u>: without concurrent
		prescription of
		0407041B0
Selective serotonin reuptake inhibitors (SSRI)	Citalopram, Escitalopram, Fluoxetine, Fluvoxamine, Paroxetine, Sertraline without concurrent prescription of Memantine, Rivastigmine, Donepezil, Galantamine	0403030D0
		0403030Z0
		0403030X0
		0403030E0
		0403030L0
		0403030P0
		0403030Q0
		without concurrent prescription of
		0411000G0
		0411000E0
Monoamine oxidase A inhibitor: moclobemide	Moclobemide	0403020K0
Monoamine oxidase inhibitor, non-selective: tranylcypromine	Tranylcypromine	0403020Q0
Serotonin-norepinephrine reuptake inhibitor: venlafaxine	Venlafaxine without concurrent prescription of opioids, triptans or ergot alkaloids	0403040W0
		without concurrent prescription of
		0407020xx^a
		0407041B0
		0407041AA
		0407041AB
		0407041M0
		0407041R0
		0407041T0
		0407041Z0
Serotonin-norepinephrine reuptake inhibitor: duloxetine	Duloxetine without concurrent prescription of opioids	0403030Y0
		0403040Y0

		without concurrent prescription of 0407020xx^a
Norepinephrine reuptake inhibitor: reboxetine	Reboxetine	0403040U0
Noradrenergic and specific serotonergic antidepressant: mianserin	Mianserin	0403010T0
Noradrenergic and specific serotonergic antidepressant: mirtazapine	Mirtazapine	0403040X0
Selective noradrenaline and dopamine reuptake inhibitor: bupropion	Not approved as antidepressant	Not approved as antidepressant
Melatonin receptor agonist: Agomelatine, Trazodone	Agomelatine, Trazodone	0403040Z0 0403010X0
Hypericum perforatum	Not approved for this indication	Not approved for this indication
Benzodiazepine derivatives (anxiolytics)	Alprazolam, Bromazepam, Chlordiazepoxide, Diazepam, Lorazepam, Oxazepam	0401020A0 0401020G0 0401020E0 0401020K0 0401020P0 0401020T0
Antipsychotics	Amisulpride, Aripiprazole, Benperidol, Cariprazine, Chlorpromazine, Chlorprothixene, Clozapine, Flupentixol, Fluphenazine, Haloperidol, Levomepromazine, Loxapine, Lurasidone, Melperone, Olanzapine, Paliperidone, Pericyazine, Perphenazine, Pimozide, Pipotiazine, Promazine, Quetiapine, Risperidone, Sulpiride, Thioridazine, Trifluoperazine, Ziprasidone, Zotepine, Zuclopenthixol, Asenapine, Lithium without concurrent prescription of Memantine, Rivastigmine, Donepezil, Galantamine	0402010A0 0402010AD 0402020AD 0402010B0 0402010AJ 0402010D0 0402010F0 0402010C0 0402010H0 0402020G0 0402010I0 0402020L0 0402010J0 0402020T0 0402010L0 0402010K0 0402010M0 0402010AI 0402010AF 0402010G0 0402020AC 0402010AE 0402020AB 0402010P0 0402010Q0 0402010R0 0402020V0 0402010S0 0402010AB 040201030 0402020AA 0402010U0 0402010W0 0402010X0 0402010AG 0402010AC 040201010 0402010T0 0402020Z0 0402030R0

	0402030K0
	0402030P0
	without concurrent
	prescription of
	0411000G0
	0411000E0
	0411000D0
	0411000F0

^a x[...]x at the end of a BNF code means that all codes with the preceding characters are included.

Table S11: Calculation of medication-based chronic disease score (medCDS)

Parameter	Points
Sex	
Female	0
Male	1
Age	
<75	0
75-84	2
>84	5
Cancer (colorectal, breast, and prostate carcinoma) including antiemetic therapy	
No	0
Yes	3
Cardiac Arrhythmias	
No	0
Yes	1
Asthma/COPD	
No	0
Yes	1
Chronic gastritis, gastroesophageal reflux disease	
No	0
Yes	1
Cardiovascular disease category 2 (CVD2) (“heart failure”)	
No	
Yes	0
	3
Psychiatric diseases including depression, schizophrenia, and anxiety disorders	
No	0
Yes	1
Total score	Risk for all-cause mortality
≤5 points	Low risk
6 points	Medium risk
≥7 points	High risk

Table S12: Mapping of Chronic Kidney Disease as predictor

Calculation of renal function	preferred consideration of outpatient creatinine and eGFR values → calculation of median in 2018
	if only inpatient creatinine and eGFR values available → latest value in 2018
	if only creatinine values available → calculation of eGFR by:
	a) female and creatinine ≤0.7: $144 * \left(\frac{\text{Creatinine}}{0.7} \right)^{-0.329} * 0.993^{\text{Age}} * 1.018$
	b) female and creatinine >0.7: $144 * \left(\frac{\text{Creatinine}}{0.7} \right)^{-1.209} * 0.993^{\text{Age}} * 1.018$

Stages of Chronic Kidney Disease	
eGFR in mL/min/1.73 m²	Stage
>89	Normal
60–89	Mild
30–59	Moderate
15–29	Severe
<15	End-stage

Table S13: Mapping of elevated liver enzymes

Liver enzyme	Upper limit of normal (ULN)	CTCAE grade 1	Considered upper limit ^a
ALT	≤34 U/L	>3.0 * ULN	>102 U/L
AST	≤34 U/L	>3.0 * ULN	>102 U/L
GGT	≤39 U/L	>2.5 * ULN	>97.5 U/L

^a The latest value in 2018 was considered, respectively; CTCAE: Common Terminology Criteria of Adverse Events

Table S14: Univariate odds ratios of all tested variables in binomial logistic regression

Variable	Univariate odds ratio (95% CI)		
	All-cause admission	AE-admission	Implied ADR-admission
Sex			
Female	Reference	Reference	Reference
Male	1.10 (1.06–1.13)	1.00 (0.95–1.04)	0.91 (0.85–0.98)
Age			
40-64 years	Reference	Reference	Reference
65-79 years	1.33 (1.28–1.38)	2.00 (1.86–2.15)	1.96 (1.77–2.18)
≥80 years	2.78 (2.68–2.88)	5.32 (4.97–5.70)	4.51 (4.08–4.98)
Deprivation quintile			
1 (most deprived)	Reference	Reference	Reference
2	0.95 (0.91–0.99)	0.95 (0.87–1.02)	0.97 (0.86–1.08)
3	0.94 (0.90–0.98)	1.00 (0.93–1.08)	0.98 (0.88–1.09)
4	0.90 (0.86–0.94)	0.97 (0.90–1.04)	0.99 (0.88–1.10)
5 (least deprived)	0.84 (0.80–0.88)	0.94 (0.86–1.02)	0.90 (0.80–1.02)
Residence			
Large urban area	Reference	Reference	Reference
Urban area	1.04 (1.01–1.08)	1.07 (1.01–1.14)	0.87 (0.80–0.95)
Accessible rural area	0.97 (0.93–1.01)	0.95 (0.88–1.02)	0.82 (0.74–0.91)
Remote rural area	1.11 (1.03–1.20)	1.18 (1.03–1.33)	1.10 (0.92–1.31)
Hospital days in year before cohort entry			
0 days	Reference	Reference	Reference
1-7 days	2.86 (2.75–2.98)	2.36 (2.20–2.52)	2.36 (2.14–2.59)
8-30 days	5.46 (5.18–5.75)	4.77 (4.43–5.12)	4.20 (3.78–4.66)
>30 days	7.02 (6.46–7.64)	6.79 (6.12–7.51)	5.57 (4.81–6.42)
medCDS			
low risk (≤5 points)	Reference	Reference	Reference
medium risk (6 points)	2.31 (2.19–2.43)	2.98 (2.76–3.22)	2.72 (2.42–3.04)
high risk (≥7 points)	3.37 (3.25–3.51)	4.50 (4.26–4.76)	4.29 (3.96–4.64)
Diseases included in medCDS			
Cancer	1.77 (1.62–1.92)	1.53 (1.32–1.76)	1.49 (1.21–1.82)
Cardiac arrhythmias	2.22 (2.14–2.31)	2.74 (2.59–2.91)	2.94 (2.70–3.18)
Asthma, COPD	1.23 (1.19–1.27)	0.94 (0.89–1.00)	1.08 (1.00–1.17)
Chronic gastritis, gastroesophageal reflux disease	1.33 (1.30–1.37)	1.22 (1.16–1.28)	1.35 (1.26–1.45)
Heart failure	2.34 (2.25–2.42)	2.93 (2.77–3.09)	3.15 (2.92–3.40)
Psychiatric diseases	1.12 (1.09–1.15)	0.98 (0.94–1.03)	1.31 (1.22–1.41)
Stages of Chronic Kidney Disease			
Normal	Reference	Reference	Reference
Mild	1.36 (1.31–1.41)	1.65 (1.55–1.76)	1.93 (1.76–2.11)
Moderate	2.13 (2.06–2.21)	2.90 (2.74–3.07)	2.74 (2.51–2.98)
Severe	4.13 (3.72–4.58)	6.37 (5.57–7.26)	4.52 (3.66–5.52)
End-stage	6.94 (5.66–8.52)	10.37 (8.24–12.96)	6.28 (4.36–8.78)
Liver enzymes^a			
Normal AST	Reference	Reference	Reference

Elevated AST	2.06 (1.44–2.91)	1.67 (0.90–2.83)	2.55 (1.21–4.74)
Normal ALT	Reference	Reference	Reference
Elevated ALT	1.64 (1.35–1.98)	1.36 (0.97–1.86)	0.96 (0.52–1.59)
Normal GGT	Reference	Reference	Reference
Elevated GGT	2.46 (2.25–2.69)	2.44 (2.14–2.78)	2.58 (2.15–3.08)
Number of drugs in 90 days before cohort entry			
5-9 drugs	Reference	Reference	Reference
10-14 drugs	2.04 (1.97–2.11)	2.04 (1.93–2.15)	2.55 (2.36–2.76)
≥15 drugs	3.57 (3.38–3.76)	2.80 (2.58–3.04)	4.19 (3.76–4.67)
Number of PIMs in 90 days before cohort entry			
0 PIM	Reference	Reference	Reference
1 PIM	1.51 (1.46–1.56)	1.84 (1.75–1.95)	2.15 (1.99–2.34)
≥ 2 PIMs	1.86 (1.78–1.95)	2.16 (2.01–2.32)	3.27 (2.98–3.59)
Any of the 15 AE-admission in year before cohort entry			
Acute kidney injury	4.17 (3.24–5.35)	4.61 (3.38–6.20)	3.13 (1.89–4.86)
Anaemia	3.89 (2.99–5.07)	5.10 (3.70–6.92)	3.76 (2.30–5.80)
Bleeding outside the GIT	3.70 (3.06–4.48)	4.97 (3.95–6.21)	4.21 (3.02–5.71)
Dehydration	3.43 (2.01–5.80)	3.57 (1.70–6.77)	2.12 (0.52–5.75)
Delirium	4.58 (3.80–5.52)	5.76 (4.63–7.10)	4.23 (3.06–5.70)
Fall or fall injury	2.83 (2.59–3.08)	3.88 (3.48–4.32)	3.35 (2.86–3.91)
GI bleeding	3.63 (2.94–4.47)	3.81 (2.90–4.95)	3.58 (2.43–5.10)
Heart failure	5.02 (4.20–6.01)	8.03 (6.61–9.71)	4.96 (3.71–6.51)
Hyperkalaemia	3.62 (2.37–5.52)	4.91 (2.90–7.93)	4.33 (2.02–8.17)
Hypoglycaemia	4.89 (2.92–8.24)	6.81 (3.77–11.78)	4.32 (1.66–9.29)
Hypokalaemia	4.96 (2.29–10.92)	16.42 (7.54–35.78)	16.66 (6.83–37.12)
Hyponatraemia	2.22 (1.35–3.56)	3.56 (1.87–6.27)	4.61 (2.04–9.05)
Hypotension	5.06 (3.92–6.55)	5.25 (3.86–7.04)	5.07 (3.34–7.40)
Respiratory depression	4.25 (2.24–8.08)	3.08 (1.16–6.85)	3.21 (0.77–8.91)
Syncope	3.44 (2.87–4.10)	4.05 (3.22–5.04)	4.07 (2.98–5.43)
Non-AE-admission in previous year	3.28 (3.16–3.40)	2.31 (2.18–2.44)	2.31 (2.13–2.50)
Any linked drugs in 90 days before cohort entry			
Aminoglycosides	2.14 (1.22–1.75)	–	0.00 (0.00–50.14)
Antiadrenergic drugs (α-Blockers, β-Blockers)	1.27 (1.23–1.30)	1.46 (1.39–1.53)	1.42 (1.32–1.52)
Antidiabetic drugs affecting insulin levels (insulinotropic antidiabetics, insulins)	1.26 (1.20–1.32)	1.34 (1.25–1.44)	1.35 (1.22–1.50)
Antiepileptics affecting sodium levels (carbamazepine, oxcarbazepine, valproic acid, eslicarbazepine)	1.43 (1.30–1.57)	1.40 (1.20–1.62)	1.87 (1.54–2.26)
Antiplatelet drugs	1.42 (1.38–1.47)	1.47 (1.39–1.54)	1.48 (1.38–1.59)
Antipsychotics (2 nd generation) (excl. clozapine and quetiapine)	1.29 (1.17–1.43)	1.36 (1.16–1.59)	1.86 (1.51–2.27)
Baclofen	1.40 (1.23–1.59)	1.09 (0.86–1.37)	1.54 (1.14–2.02)

Barbiturates	2.07 (1.39–3.03)	1.89 (0.99–3.30)	2.04 (0.80–4.26)
Benzodiazepines	1.46 (1.39–1.54)	1.23 (1.13–1.33)	1.93 (1.73–2.14)
Calcium-channel blockers (Dihydropyridines)	0.84 (0.81–0.87)	0.93 (0.87–0.98)	0.87 (0.80–0.95)
Calcium-channel blockers (Non-Dihydropyridines)	1.36 (1.25–1.47)	1.33 (1.16–1.52)	1.89 (1.59–2.23)
Centrally-acting antihypertensive drugs (excl. methyldopa)	0.71 (0.60–0.83)	0.49 (0.34–0.67)	0.58 (0.35–0.88)
Certain antiarrhythmics (dronedarone, sotalol)	1.70 (0.70–3.72)	1.97 (0.47–5.61)	1.39 (0.08–6.50)
Clozapine	0.92 (0.40–1.87)	0.37 (0.02–1.70)	0.85 (0.05–3.89)
Coxibs	0.57 (0.47–0.69)	0.49 (0.33–0.70)	0.67 (0.40–1.05)
Diuretics (excl. potassium sparing diuretics)	1.38 (1.33–1.42)	1.85 (1.76–1.95)	2.19 (2.04–2.36)
Drugs with ACB Score $\geq 3^b$	1.40 (1.36–1.45)	1.17 (1.11–1.23)	2.12 (1.97–2.27)
Glitazones	0.70 (0.61–0.81)	0.78 (0.61–0.98)	0.69 (0.46–0.97)
Glucocorticoids	1.78 (1.70–1.86)	1.25 (1.15–1.35)	1.74 (1.57–1.93)
Heparins	3.71 (2.92–4.71)	2.68 (1.87–3.73)	2.67 (1.60–4.18)
Laxatives	1.91 (1.85–1.98)	1.98 (1.87–2.09)	2.07 (1.91–2.24)
Metformin	0.91 (0.87–0.95)	0.91 (0.85–0.98)	0.95 (0.86–1.06)
Methotrexate	0.91 (0.82–1.01)	0.83 (0.69–1.00)	0.99 (0.76–1.27)
Methyldopa	1.74 (0.76–3.66)	1.76 (0.42–4.96)	4.01 (0.96–11.32)
NSAIDs (excl. coxibs)	0.58 (0.55–0.61)	0.40 (0.35–0.45)	0.54 (0.46–0.63)
Opioids	1.18 (1.14–1.21)	1.02 (0.97–1.07)	1.29 (1.20–1.39)
Oral anticoagulants (DOACs, vitamin K antagonists)	2.26 (2.14–2.39)	2.65 (2.45–2.87)	2.91 (2.61–3.24)
Potassium containing agents	1.42 (1.05–1.88)	1.39 (0.84–2.15)	1.77 (0.91–3.08)
Potassium sparing diuretics	1.81 (1.70–1.93)	2.39 (2.19–2.61)	2.57 (2.27–2.90)
Quetiapine	1.16 (1.04–1.29)	0.89 (0.73–1.07)	1.17 (0.90–1.49)
Renin-angiotensin system drugs (ACE-inhibitors, AT ₁ receptor antagonists, renin inhibitors)	0.83 (0.80–0.85)	0.90 (0.86–0.95)	0.86 (0.81–0.93)
Serotonin re-uptake inhibitors (SSRIs, SNRIs)	1.03 (0.99–1.06)	0.91 (0.85–0.96)	1.11 (1.02–1.21)
SGLT-2 inhibitors	0.63 (0.57–0.71)	0.34 (0.26–0.44)	0.45 (0.31–0.62)
Tricyclic antidepressants	0.95 (0.91–0.99)	0.81 (0.75–0.87)	1.26 (1.14–1.38)
Vasopressin analogues	1.02 (0.62–1.59)	0.60 (0.18–1.42)	0.67 (0.11–2.10)
Z-drugs	1.38 (1.30–1.47)	1.21 (1.09–1.33)	1.44 (1.25–1.65)

CI: confidence interval; AE-admission: adverse event-related hospital admission; implied ADR-admission: hospitalisation implied to be due to an adverse drug reaction; medCDS: medication-based chronic disease score; COPD: chronic obstructive pulmonary disease; AST: aspartate transferase; ALT: alanine transaminase; GGT: gamma-glutamyl transferase; PIMs: potentially inappropriate medications; GIT: gastrointestinal tract; GI: gastrointestinal; Non-AE-admission: hospitalisation due to other cause than due to an adverse event; ACB: anticholinergic burden; NSAIDs: nonsteroidal anti-inflammatory drugs; DOACs: direct oral anticoagulants; ACE: angiotensin converting enzyme; AT: angiotensin; SSRIs: selective serotonin re-uptake inhibitors; SNRIs: serotonin noradrenaline re-uptake inhibitors; SGLT-2: sodium-dependent glucose cotransporter 2;

^a Common Terminology Criteria for Adverse Events (CTCAE) grade 1;

^b ACB score calculation is shown in Table S5

Table S15: Absolute and relative event rate of adverse event- and implied adverse drug reaction-related hospitalisations per 10,000 admissions in 2019

Emergency hospital admission due to (linked drugs considered in implied ADR-admission detection)	Absolute event rate (95% CI) of^a		Relative event rate (implied ADR-/AE-admission ratio)
	AE-admission	Implied ADR-admission	
Any of the below^b	2259.8 (2212.3-2307.2)	949.3 (918.6-980.1)	0.42
Fall or fall injury (≥1 of: benzodiazepines, drug(s) with ACB ≥3, glucocorticoids)	702.5 (676.0-728.9)	315.2 (297.5-332.9)	0.45
Acute kidney injury (≥1 of: aminoglycosides, methotrexate, NSAIDs)	329.0 (310.9-347.9)	28.5 (23.2-33.9)	0.09
Heart failure (≥1 of: diltiazem, dronedarone, glitazones, NSAIDs, sotalol, verapamil)	224.8 (209.9-239.8)	14.8 (10.9-18.6)	0.07
Delirium (≥1 of: baclofen, barbiturates, benzodiazepines, drugs with ACB ≥3, Z-drugs)	181.8 (168.4-195.3)	78.5 (69.6-87.3)	0.43
Syncope (≥1 of: clozapine, diuretics, opioids, quetiapine)	160.3 (147.7-173.0)	87.3 (78.0-96.6)	0.54
Bleeding outside the GIT (≥1 of: antiplatelet drugs, DOACs, heparins, vitamin K antagonists)	143.5 (131.6-155.5)	99.5 (89.5-109.4)	0.69
Hyponatremia (≥1 of: certain antiepileptics, desmopressin, diuretics, SNRIs, SSRIs)	122.5 (111.5-133.6)	71.0 (62.6-79.4)	0.58
Hypokalaemia (≥1 of: diuretics (excl. potassium sparing diuretics), laxatives)	104.1 (93.9-114.3)	71.5 (63.1-79.9)	0.69
GI bleeding (≥1 of: antiplatelets, DOACs, NSAIDs (excl. coxibs), Vit K antagonists)	95.8 (86.1-105.6)	61.6 (53.8-69.5)	0.64
Hypotension (≥1 of: antihypertensive drugs, antipsychotics (2 nd generation), TCAs)	80.3 (71.4-89.2)	69.2 (60.9-77.5)	0.86
Anaemia (≥1 of: metformin, methotrexate, methyl dopa)	78.7 (69.9-87.6)	11.9 (8.5-15.4)	0.15
Hyperkalaemia (≥1 of: potassium containing agents, potassium sparing diuretics, RAS-drugs)	64.5 (56.5-72.5)	30.8 (25.3-36.4)	0.48
Hypoglycaemia (≥1 of: insulinotropic antidiabetics, insulins)	24.1 (19.2-29.0)	0.8 (0.0-1.7)	0.03
Respiratory depression (≥1 of: baclofen, barbiturates, benzodiazepines, opioids)	21.8 (17.1-26.4)	12.7 (9.1-16.2)	0.58
Dehydration (≥1 of: diuretics, laxatives, SGLT-2 inhibitors)	20.2 (15.7-24.7)	13.7 (10.0-17.4)	0.68

ACB: anticholinergic burden; implied ADR-admission: hospitalisation implied to be due to an adverse drug reaction; AE-admission: adverse event-related hospital admission; CI: confidence interval; DOACs: direct oral anticoagulants; GI(T): gastrointestinal (tract); NSAIDs: nonsteroidal anti-inflammatory drugs; RAS: renin-angiotensin system; SGLT-2: Sodium-dependent glucose cotransporter 2; SNRIs: serotonin noradrenaline re-uptake inhibitors; SSRIs: selective serotonin re-uptake inhibitors; TCAs: tricyclic antidepressants;

^a absolute event rate of: explicit ADR-admissions: 172.3 (159.2-185.3); preventable ADR-admissions: 351.4 (160.4-542.3); ^b Event definitions are shown in Tables S1 and S2

Table S16: Results of group lasso regression

Variable selection on the basis of a lasso regression model:

a) All-cause admission:

Group LASSO Selection Summary		
Step	Effect entered	SBC
0	Intercept	-59761.77
1	Non-AE-admission in year before cohort entry	-60621.39
2		-61341.71
3	Hospital days in year before cohort entry; medCDS	-62556.24
4		-64135.55
5		-65437.42
6	Number of drugs in 90 days before cohort entry	-66651.30
7		-67730.44
8		-68613.03
9		-69335.26
10	Age; Cardiac arrhythmias as part of the medCDS	-69896.63
11		-70504.79
12		-71001.82
13	Laxatives	-71393.04
14	Glucocorticoids; Heart failure as part of the medCDS	-71695.05
15		-72006.49
16		-72259.91
17	Oral anticoagulants; Renin-angiotensin system drugs; Stages of Chronic Kidney Disease; elevated GGT	-72361.72
18	Antiplatelet drugs	-72607.06
19		-72848.03
20	Drug(s) with ACB Score ≥ 3	-73029.18
21	Benzodiazepines	-73176.34
22	NSAIDs (excl. coxibs)	-73299.95
23	Sex; Heparins; Antiepileptics affecting sodium levels	-73361.36
24	Calcium-channel blockers (Dihydropyridines); Antidiabetic drugs affecting insulin levels	-73440.50
25	Hypotension-related hospitalisation in year before cohort entry	-73527.65
26	Z-drugs; Cancer disease as part of the medCDS	-73580.33
27	Opioids; Deprivation quintile	-73590.71
28	Chronic gastritis/gastroesophageal reflux disease as part of the medCDS; Syncope-related hospitalisation in year before cohort entry; SGLT-2 inhibitors; Diuretics (excl. potassium sparing diuretics)	-73590.04
29	Tricyclic antidepressants; Psychiatric diseases as part of the medCDS	-73631.10

SBC: Schwarz Bayesian Information Criterion; Non-AE-admission: hospitalisation due to other cause than due to an adverse event; medCDS: medication-based chronic disease score; GGT: gamma-glutamyl transferase; ACB: anticholinergic burden; NSAIDs: nonsteroidal anti-inflammatory drugs; SGLT-2: sodium-dependent glucose cotransporter 2

b) Adverse event-admission:

Group LASSO Selection Summary		
Step	Effect entered	SBC
0	Intercept	-189080.09
1	medCDS; Any of the 15 AE-admission in year before cohort entry	-189936.64
2		-190715.80
3		-191351.19
4	Hospital days in year before cohort entry	-191913.55
5		-192539.90
6	Age; Cardiac arrhythmias as part of the medCDS; Heart failure as part of the medCDS	-193091.11
7		-193650.31
8		-194107.04
9		-194479.97
10	Number of drugs in 90 days before cohort entry	-194775.58
11		-195064.49
12	Stages of Chronic Kidney Disease	-195269.35
13		-195522.40
14	Heart failure-related hospitalisation in year before cohort entry	-195714.29
15	Laxatives	-195878.29
16	elevated GGT	-196014.88
17		-196154.71
18	Hypokalaemia-related hospitalisation in year before cohort entry	-196249.05
19		-196353.08
20	Oral anticoagulants	-196416.17
21	Antidiabetic drugs affecting insulin levels	-196466.37
22	Antiepileptics affecting sodium levels; Renin-angiotensin system drugs; Antiplatelet drugs	-196468.02
23	SGLT-2 inhibitors; Bleeding outside the GIT-related hospitalisation in year before cohort entry	-196489.17
24	NSAIDs (excl. coxibs)	-196526.34

SBC: Schwarz Bayesian Information Criterion; AE-admission: adverse event-related hospital admission; medCDS: medication-based chronic disease score; GGT: gamma-glutamyl transferase; SGLT-2: sodium-dependent glucose cotransporter 2; GIT: gastrointestinal tract; NSAIDs: nonsteroidal anti-inflammatory drugs

c) Implied adverse drug reaction-admission:

Group LASSO Selection Summary		
Step	Effect entered	SBC
0	Intercept	-282959.09
1	medCDS; Heart failure as part of the medCDS	-283222.82
2	Any of the 15 AE-admission in year before cohort entry	-283529.79
3	Cardiac arrhythmias as part of the medCDS	-283809.36
4	Number of drugs in 90 days before cohort entry; Hospital days in year before cohort entry	-284092.19
5	Drug(s) with ACB Score ≥ 3	-284446.23
6	Number of PIMs in 90 days before cohort entry	-284735.64
7		-285024.45
8	Age	-285256.02
9		-285474.30
10		-285652.39
11		-285797.73
12		-285916.36
13	Benzodiazepines; Diuretics (excl. potassium sparing diuretics)	-285972.57
14	Oral anticoagulants; Hypokalaemia-related hospitalisation in year before cohort entry; elevated GGT	-286003.64
15	Laxatives	-286071.29
16	Antiplatelet drugs	-286125.45
17	Antiepileptics affecting sodium levels; Stages of Chronic Kidney Disease; Glucocorticoids	-286093.65
18		-286162.52
19	Potassium sparing diuretics	-286195.75
20	Renin-angiotensin system drugs; Syncope-related hospitalisation in year before cohort entry; Antipsychotics (2 nd generation)	-286178.09
21	Antidiabetic drugs affecting insulin levels; Hypotension-related hospitalisation in year before cohort entry	-286180.33
22		-286223.59
23	Bleeding outside the GIT-related hospitalisation in year before cohort entry; Calcium-channel blockers (Non-Dihydropyridines)	-286213.42
24	Serotonin re-uptake inhibitors (SSRIs, SNRIs)	-286221.83
25		-286248.67

SBC: Schwarz Bayesian Information Criterion; medCDS: medication-based chronic disease score; AE-admission: adverse event-related hospital admission; ACB: anticholinergic burden; PIMs: potentially inappropriate medications; GGT: gamma-glutamyl transferase; GIT: gastrointestinal tract; SSRIs: selective serotonin re-uptake inhibitors; SNRIs: serotonin noradrenaline re-uptake inhibitors