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SUPPLEMENTARY MATERIAL

Anticholinergic and sedative medication burden in older adults: an observational analysis

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Supplementary Table 1. EuroQol 5-Dimension 5-Level questionnaire frequencies and proportions reported by dimensions and level.

	Mobility n (%)	Self-Care n (%)	Usual activities n (%)	Pain/discomfort n (%)	Anxiety/depression n (%)
Level 1	281 (47.07)	310 (51.93)	251 (42.04)	221 (37.02)	284 (47.57)
Level 2	193 (32.33)	168 (28.14)	208 (34.84)	192 (32.16)	146 (24.46)
Level 3	81 (13.57)	62 (10.39)	85 (10.39)	184 (30.82)	120 (20.10)
Level 4	26 (4.36)	38 (6.37)	37 (6.20)	0	47 (7.87)
Level 5	16 (2.68)	19 (3.18)	16 (2.68)	0	0
Total	597 (100)	597 (100)	597 (100)	597 (100)	597 (100)

Level 1, no problem; Level 2, slight problems; Level 3, moderate problems; Level 4, severe problems; Level 5, extreme problems/inability to do.

Supplementary Table 2. Anticholinergic drug use pattern during hospitalization according to the World Health Organization Anatomical Therapeutic Chemical classification system.

ATC Drug Class	Drug	Distribution (%) (n=1229)
A: alimentary tract and metabolism	Metformin (50); Domperidone (23); Dicyclomine (12); Metoclopramide (4); Ranitidine (3); Mebeverine (2); Bisacodyl (1)	95 (7.84)
B: blood and blood forming organs	Warfarin (1)	1 (0.08)
C: cardiovascular system	Atenolol (17); Furosemide (188); Metoprolol (65); Isosorbide Dinitrate (30); Hydralazine (28); Diltiazem (8); Digoxin (6); Isosorbide Mononitrate (6); Prazosin (1)	349 (28.80)
G: genito urinary system and sex hormones	Flavoxate (15); Solifenacin (2); Tolterodine (1)	18 (1.49)
H: systemic hormonal preparations, excl. sex hormones and insulins	Hydrocortisone (54); Methylprednisolone (23); Dexamethasone (12); Prednisolone (9)	98 (8.08)
J: antiinfectives for systemic use	Piperacillin (38); Clindamycin (22)	60 (4.95)
L: antineoplastic and immunomodulating agents	Methotrexate (1)	1 (0.08)
M: musculo-skeletal system	Baclofen (3)	3 (0.25)
N: nervous system	Tramadol (42); Levodopa/ Carbidopa (36); Amitriptyline (34); Clonazepam (20); Cinnarizine (18); Nifedipine (16); Trihexyphenidyl (7); Nortriptyline (6); Olanzapine (6); Sertraline (6); Escitalopram (5); Alprazolam (4); Chlordiazepoxide (3); Lorazepam (3); Quetiapine (3); Risperidone (3); Carbamazepine (2); Fentanyl (2); Hydroxyzine (2); Mirtazapine (2); Paroxetine (2); Prochlorperazine (2); Amantadine (1); Amisulpride (1); Fluoxetine (1); Haloperidol (1); Midazolam (1); Oxazepam (1); Oxcarbazepine (1); Pramipexole (1)	232 (19.14)
R: respiratory system	Ipratropium (274); Levocetirizine (74); Dimenhydrinate (14); Theophylline (6); Cetirizine (3); Promethazine (1)	372 (30.69)

ATC, Anatomical Therapeutic Chemical.

Supplementary Table 3. Anticholinergic potency of prescribed medications.

Low potency (score 1)		
Alprazolam	Fluoxetine	Metoclopramide
Amisulpride	Furosemide	Metoprolol
Atenolol	Haloperidol	Midazolam
Bisacodyl	Hydralazine	Mirtazapine
Cetirizine	Hydrocortisone	Nifedipine
Chlordiazepoxide	Ipratropium	Oxazepam
Cinnarizine	Isosorbide Dinitrate	Piperacillin
Clindamycin	Isosorbide Mononitrate	Pramipexole
Clonazepam	Levocetirizine	Prednisolone
Dexamethasone	Levodopa/ Carbidopa	Risperidone
Digoxin	Lorazepam	Sertraline
Diltiazem	Mebeverine	Theophylline
Domperidone	Metformin	Warfarin
Escitalopram	Methotrexate	
Fentanyl	Methylprednisolone	
Medium potency (score 2)		
Amantadine	Oxcarbazepine	Ranitidine
Baclofen	Paroxetine	Tramadol
Carbamazepine	Prochlorperazine	
Olanzapine	Quetiapine	
High potency (score 3)		
Amitriptyline	Hydroxyzine	Tolterodine
Dicyclomine	Nortriptyline	Trihexyphenidyl
Dimenhydrinate	Promethazine	
Flavoxate	Solifenacin	

Supplementary Table 4. Anticholinergic and sedative profiles of selected drugs.

Drug	ATC Code	Anticholinergic effect (AC)	Sedative effects (S)	Sedation %		Minimum daily dose		
				Very common: $\geq 1/10$ ($\geq 10\%$)	Common: $\geq 1/100$ to $< 1/10$ ($\geq 1\%$ and $< 10\%$)	PO	Parenteral	Inhalation
Acceflofenac	M01AB16		S		✓	100		
Agomelatine	N06AX22		S		✓	25		
Alprazolam	N05BA12	AC	S		✓	0.5		
Amantadine	N04BB01	AC	S		✓	100		
Amiodarone	C01BD01		S		✓	200		
Amisulpride	N05AL05	AC	S		✓	50		
Amitriptyline	N06AA09	AC	S	✓		10		
Amlodipine	C08CA01		S		✓	5		
Atenolol	C07AB03	AC	S		✓	100		
Baclofen	M03BX01	AC	S	✓		10		
Bilastine	R06AX29		S		✓	20		
Bisacodyl	A06AB02	AC				5		
Bisoprolol	C07AB07		S		✓	2.5		
Carbamazepine	N03AF01		S	✓		400		
Carvedilol	C07AG02		S		✓	12.5		
Cetirizine	R06AE07	AC	S	✓		10		
Chlordiazepoxide	N05BA02	AC	S		✓	5		
Cilostazol	B01AC23		S		✓	100		
Cinnarizine	N07CA02	AC	S		✓	15		
Clidinium	A03CA02		S		✓	2.5		
Clonazepam	N03AE01	AC	S	✓		0.5		
Clonidine	C02AC01		S		✓	0.1		
Desloratadine	R06AX27		S		✓	5		
Desvenlafaxine	N06AX23		S	✓		50		
Dexamethasone	R01AD03	AC				0.5		
Dicyclomine	A03AA07	AC	S	✓		20		
Digoxin	C01AA05	AC	S		✓	0.25		
Diltiazem	C08DB01	AC	S		✓	120		
Dimenhydrinate	R06AA11	AC				50		
Domperidone	A03FA03	AC	S		✓	10		
Donepezil	N06DA02		S		✓	5		
Duloxetine	N06AX21		S		✓	30		
Enalapril	C09AA02		S	✓		5		
Escitalopram	N06AB10	AC	S		✓	5		

Etizolam	N05BA19		S		✓	0.5		
Febuxostat	M04AA03		S		✓	40		
Fentanyl	N02AB03	AC	S		✓		0.3	
Flavoxate	G04BD02	AC				100		
Fluoxetine	N06AB03	AC	S		✓	20		
Furosemide	C03CA01	AC				20		
Gabapentin	N02BF01		S	✓		900		
Gliclazide	A10BB09		S		✓	40		
Glimepiride	A10BB12		S		✓	1		
Glipizide	A10BB07		S		✓	2.5		
Glyceryl Trinitrate	C01DA02		S		✓	0.3		
Glycopyrrolate	A03AB02		S		✓			0.25
Haloperidol	N05AD01	AC	S		✓	0.5		
Hydralazine	C02DB01	AC				10		
Hydrocortisone	H02AB09	AC				10	100	
Hydroxyzine	N05BB01	AC				25		
Hyoscine Butylbromide	A03BB01		S	✓		10	10	
Indomethacin	M01AB01		S		✓	25		
Ipratropium	R03AL02	AC	S		✓			0.5
Isosorbide Dinitrate	C01DA58	AC	S	✓		5		
Isosorbide Mononitrate	C01DA14	AC	S		✓	20		
Labetalol	C07AG01		S	✓		100		
Lacosamide	N03AX18		S		✓	50		
Levetiracetam	N03AX14		S	✓		500		
Levocetirizine	R06AE09	AC	S		✓	5		
Levodopa/ Carbidopa	N04BA02	AC	S	✓		125		
Levosalbutamol	R03CC02		S		✓			0.1
Lorazepam	N05BA06	AC	S	✓		0.5		
Losartan	C09CA01		S		✓	25		
Mebeverine	A03AA04	AC				135		
Memantine	N06DX01		S	✓		5		
Mesalazine	A07EC02		S		✓	1200		
Metformin	A10BA02	AC	S		✓	500		
Methotrexate	L04AX03	AC	S	✓		7.5		
Methylprednisolone	H02AB04	AC				4	20	
Metoclopramide	A03FA01	AC	S	✓		10		
Metolazone	C03BA08		S		✓	2.5		
Metoprolol	C07AB02	AC	S		✓	25		

Midazolam	N05CD08	AC	S		✓	1		
Minocycline	J01AA08		S		✓	100		
Mirabegron	G04BD12		S		✓	50		
Mirtazapine	N06AX11	AC	S	✓		15		
Montelukast	R03DC53		S		✓	10		
Naproxen	M01AE02		S		✓	250		
Nebivolol	C07AB12		S		✓	5		
Nifedipine	C08CA05	AC	S	✓		30		
Nintedanib	L01EX09		S	✓		100		
Nortriptyline	N06AA10	AC				30		
Olanzapine	N05AH03	AC	S	✓		5		
Olmesartan	C09CA08		S		✓	10		
Omeprazole	A02BC01		S		✓	20		
Ondansetron	A04AA01		S	✓		8		
Oxazepam	N05BA04	AC				10		
Oxcarbazepine	N03AF02	AC	S	✓		600		
Pantoprazole	A02BC02		S		✓	40		
Paracetamol	N02BE01		S		✓	650	1000	
Paroxetine	N06AB05	AC	S	✓		20		
Pramipexole	N04BC05	AC	S	✓		0.088		
Prazosin	C02CA01		S		✓	2		
Prednisolone	H02AB06	AC				5		
Pregabalin	N02BF02		S	✓		150		
Prochlorperazine	N05AB04	AC				10	1.25	
Promethazine	R06AD02	AC				25		
Propranolol	C07AA05		S		✓	40		
Prucalopride	A06AX05		S		✓	1		
Quetiapine	N05AH04	AC	S	✓		50		
Rabeprazole	A02BC04		S		✓	20		
Ramipril	C09AA05		S		✓	2.5		
Ranitidine	A02BA02	AC				150		
Ranolazine	C01EB18		S		✓	500		
Risperidone	N05AX08	AC	S	✓		1		
Rivaroxaban	B01AF01		S		✓	10		
Rosuvastatin	C10AA07		S		✓	5		
Sacubitril	C09DX04		S		✓	49		
Sertraline	N06AB06	AC	S	✓		50		
Sildenafil	G04BE03		S		✓	20		

Silodosin	G04CA04		S		✓	4		
Solifenacin	G04BD08	AC	S		✓	5		
Spirolactone	C03DA01		S		✓	25		
Tamsulosin	G04CA02		S	✓		0.4		
Theophylline	R03DA04	AC				200		
Ticagrelor	B01AC24		S		✓	90		
Tolterodine	G04BD07	AC	S		✓	2		
Tramadol	N02AX02	AC	S	✓		200	200	
Trihexyphenidyl	N04AA01	AC	S	✓		5		
Valsartan	C09CA03		S	✓		80		
Zolpidem	N05CF02		S	✓		5		

PO, per so (oral).

Supplementary Table 5. Drug Burden Index medication use pattern during hospitalization according to the World Health Organization Anatomical Therapeutic Chemical classification system.

ATC drug class	Drug	Distribution (%) (n=2925)
A: alimentary tract and metabolism	Pantoprazole (481); Ondansetron (163); Metformin (51); Glimepiride (29); Domperidone (23); Rabeprazole (23); Gliclazide (8); Dicyclomine (6); Omeprazole (6); Glipizide (3); Prucalopride	810 (27.69)

	(3); Ranitidine (3); Glycopyrrolate (2); Hyoscine Butylbromide (2); Mebeverine (2); Metoclopramide (2); Bisacodyl (1); Clidinium (1); Mesalazine (1)	
B: blood and blood forming organs	Ticagrelor (17); Cilostazol (5); Rivaroxaban (5)	27 (0.92)
C: cardiovascular system	Furosemide (188); Metoprolol (65); Amlodipine (64); Spironolactone (57); Bisoprolol (49); Isosorbide Dinitrate (30); Rosuvastatin (30); Hydralazine (28); Carvedilol (27); Ramipril (27); Atenolol (17); Nifedipine (16); Valsartan (16); Losartan (11); Propranolol (10); Clonidine (9); Nitroglycerin (9); Diltiazem (8); Metolazone (7); Amiodarone (6); Digoxin (6); Isosorbide Mononitrate (6); Olmesartan (6); Ranolazine (5); Sacubitril (5); Prazosin (4); Enalapril (3); Nebivolol (3); Labetalol (1)	713 (24.38)
G: genito urinary system and sex hormones	Flavoxate (15); Sildenafil (15); Tamsulosin (15); Silodosin (10); Mirabegron (5); Solifenacin (2); Tolterodine (1)	63 (2.15)
H: systemic hormonal preparations, excl. sex hormones and insulins	Hydrocortisone (50); Methylprednisolone (23); Dexamethasone (12); Prednisolone (9)	94 (3.21)
L: antineoplastic and immunomodulating agents	Methotrexate (1); Nintedanib (1)	2 (0.07)
M: musculo-skeletal system	Febuxostat (5); Baclofen (3); Aceclofenac (1); Indomethacin (1); Naproxen (1)	11 (0.38)
N: nervous system	Paracetamol (155); Levetiracetam (46); Levodopa/ Carbidopa (39); Pregabalin (38); Amitriptyline (34); Tramadol (30); Clonazepam (20); Cinnarizine (18); Zolpidem (10); Gabapentin (9); Donepezil (7); Trihexyphenidyl (7); Nortriptyline (6); Olanzapine (6); Sertraline (6); Escitalopram (5); Alprazolam (4); Agomelatine (3); Chlordiazepoxide (3); Quetiapine (3); Risperidone (3); Carbamazepine (2); Fentanyl (2); Haloperidol (2); Hydroxyzine (2); Memantine (2); Mirtazapine (2); Paroxetine (2); Prochlorperazine (2); Amantadine (1); Amisulpride (1); Desvenlafaxine (1); Duloxetine (1); Etizolam (1); Fluoxetine (1); Lacosamide (1); Lorazepam (1); Midazolam (1); Oxazepam (1); Oxcarbazepine (1); Pramipexole (1)	480 (16.41)
R: respiratory system	Levosalmbutamol (279); Ipratropium (274); Levocetirizine (74); Montelukast (71); Dimenhydrinate (14); Theophylline (6); Cetirizine (3); Bilastine (2); Desloratadine (1); Promethazine (1)	725 (24.79)

ATC, Anatomical Therapeutic Chemical.