Supplement materials.

Supplementary Table S1. List of the Selected Potentially Inappropriate Medications.

The list is based on the 2015 Beers Criteria Table 1 - Medications to avoid in adults over 65 years of age.

Generic Medication Name	Medication Class
BROMPHENIRAMINE	Anticholinergics
CARBINOXAMINE	Anticholinergics
CHLORPHENIRAMINE	Anticholinergics
CLEMASTINE	Anticholinergics
CYPROHEPTADINE	Anticholinergics
DEXBROMPHENIRAMINE	Anticholinergics
DEXCHLORPHENIRAMINE	Anticholinergics
DIMENHYDRINATE	Anticholinergics
DIPHENHYDRAMINE	Anticholinergics
DOXYLAMINE	Anticholinergics
HYDROXYZINE	Anticholinergics
MECLIZINE	Anticholinergics
PROMETHAZINE	Anticholinergics
TRIPROLIDINE	Anticholinergics
BENZTROPINE	Antiparkinsonian agents
TRIHEXYPHENIDYL	Antiparkinsonian agents
ATROPINE	Antispasmodics
BELLADONNA ALKALOIDS	Antispasmodics
CLIDINIUM-CHLORDIAZEPOXIDE	Antispasmodics
DICYCLOMINE	Antispasmodics
HYOSCYAMINE	Antispasmodics
PROPANTHELINE	Antispasmodics
SCOPOLAMINE	Antispasmodics
DIPYRIDAMOLE	Antithrombotics
TICLOPIDINE	Antithrombotics
GUANABENZ	Cardiovascular
GUANFACINE	Cardiovascular
METHYLDOPA	Cardiovascular
RESERPINE	Cardiovascular
DISOPYRAMIDE	Cardiovascular
NIFEDIPINE	Cardiovascular
AMITRIPTYLINE	Antidepressants

AMOXAPINE	Antidepressants
CHLORDIAZEPOXIDE-AMITRIPTYLINE	Antidepressants
CLOMIPRAMINE	Antidepressants
DESIPRAMINE	Antidepressants
DOXEPIN	Antidepressants
IMIPRAMINE	Antidepressants
NORTRIPTYLINE	Antidepressants
PAROXETINE	Antidepressants
PERPHENAZINE-AMITRIPTYLINE	Antidepressants
PROTRIPTYLINE	Antidepressants
TRIMIPRAMINE	Antidepressants
AMOBARBITAL	Barbiturates
BUTABARBITAL	Barbiturates
BUTALBITAL	Barbiturates
MEPHOBARBITAL	Barbiturates
PENTOBARBITAL	Barbiturates
PHENOBARBITAL	Barbiturates
SECOBARBITAL	Barbiturates
ALPRAZOLAM	Benzodiazepines
ESTAZOLAM	Benzodiazepines
LORAZEPAM	Benzodiazepines
OXAZEPAM	Benzodiazepines
TEMAZEPAM	Benzodiazepines
TRIAZOLAM	Benzodiazepines
CLORAZEPATE	Benzodiazepines
CHLORDIAZEPOXIDE	Benzodiazepines
CLONAZEPAM	Benzodiazepines
DIAZEPAM	Benzodiazepines
FLURAZEPAM	Benzodiazepines
QUAZEPAM	Benzodiazepines
MEPROBAMATE	Benzodiazepines
ESZOPICLONE	Benzodiazepines
ZOLPIDEM	Benzodiazepines
ZALEPLON	Benzodiazepines
ISOXSUPRINE	Ergoloid
DESICCATED THYROID	Endocrine
MEGESTROL	Appetite Stimulant
CHLORPROPAMIDE	Sulfonylureas
GLYBURIDE	Sulfonylureas

MINERAL OIL	Gastrointestinal medications
MEPERIDINE	Pain medications
INDOMETHACIN	Pain medications
KETOROLAC	Pain medications
PENTAZOCINE	Pain medications
CARISOPRODOL	Skeletal muscle relaxants
CHLORZOXAZONE	Skeletal muscle relaxants
CYCLOBENZAPRINE	Skeletal muscle relaxants
METAXALONE	Skeletal muscle relaxants
METHOCARBAMOL	Skeletal muscle relaxants
ORPHENADRINE	Skeletal muscle relaxants

Note: Number of medications from Table 1 2015 Beers Criteria were not included as their appropriateness was dependent on clinical factors that could not be determined from Medicare claims data. *E.g*. Non-cyclooxygenase-selective NSAIDs were excluded because chronic use of these medications should be avoided, unless other alternatives are not effective and patients can take gastroprotective agents (proton-pump inhibitor or misoprostol). Gastroprotective agents are often available over-the counter, thus will not be captured in claims data, or there is no evidence regarding effectiveness of previous treatment in claims data.

Supplementary Table S2. Prevalence of Different Classes of Potentially Inappropriate Medications (PIM) by Age Groups.

PIM category	**Prevalence of PIM, %**			
	65-74 y/o	**75-84 y/o**	**85+ y/o**	**p-value**
Any PIM	39.2	35.4	33.8	**0.001**
PIM category				
Anticholinergics	10.3	9.6	11.1	0.392
Antidepressants	7.2	5.0	5.8	**0.004**
Antiparkinsonian agents	0.3	0.2	0.4	0.708
Antispasmodics	4.3	4.1	2.9	0.141
Antithrombotics	1.0	1.3	1.4	0.409
Barbiturates	0.3	0.3	0.1	0.417
Benzodiazepines	11.6	9.8	8.8	**0.015**
Cardiovascular	2.5	2.7	3.7	0.115
Megestrol	1.1	1.8	3.9	**<0.001**
Pain drugs	3.1	3.0	1.4	**0.007**
Skeletal muscle relaxants	8.9	4.6	2.1	**<0.001**
Sulfonylureas	4.1	3.1	2.6	**0.031**

Note: Values in bold are statistically significant at p = 0.05.

Supplementary Table S3. Differences in Prescribing of Potentially Inappropriate Drug Classes by Sex and Multimorbidity patterns. Unadjusted and Adjusted Odds Ratio,[1] 95% Confidence Interval.

Drug class	Prevalence of PIM[4]		Unadjusted OR women vs men (ref.)	Medicare-Adjusted OR women vs men (ref.)[2]	Fully-Adjusted OR women vs men (ref.)[3]
	Women	Men			
Anticholinergics					
CVM[5] only	6.7	3.7	**2.05 (1.28, 3.27)**	**2.06 (1.30, 3.27)**	**2.04 (1.21, 3.43)**
CVM & no MHC & 1+ DD	10.3	6.7	**1.61 (1.32, 1.97)**	**1.67 (1.36, 2.04)**	**1.63 (1.29, 2.04)**
CVM & 1+ MHC	13.8	11.9	**1.26 (1.04, 1.53)**	**1.34 (1.11, 1.63)**	1.24 (0.99, 1.56)
No CVM	9.1	12.5	0.91 (0.22, 3.84)	1.05 (0.24, 4.51)	3.12 (0.36, 27.12)
Antidepressants					
CVM only	3.1	2.2	1.81 (0.69, 4.78)	1.80 (0.68, 4.73)	1.74 (0.59, 5.14)
CVM & no MHC & 1+ DD	4.8	2.6	**2.30 (1.55, 3.40)**	**2.29 (1.55, 3.38)**	**2.07 (1.33, 3.21)**
CVM & 1+ MHC	11.3	7.0	**2.03 (1.53, 2.69)**	**2.00 (1.50, 2.67)**	**1.93 (1.37, 2.73)**
No CVM	7.6	8.3	1.62 (0.24, 11.04)	1.57 (0.23, 10.74)	4.07 (0.40, 41.55)
Antispasmodics					
CVM only	1.5	2.2	2.13 (0.94, 4.80)	2.12 (0.94, 4.79)	2.10 (0.82, 5.35)
CVM & no MHC & 1+ DD	4.2	1.7	**2.05 (1.39, 3.01)**	**2.09 (1.42, 3.07)**	**2.10 (1.34, 3.29)**
CVM & 1+ MHC	5.8	4.2	1.11 (0.82, 1.51)	1.16 (0.85, 1.58)	1.03 (0.69, 1.55)
No CVM	6.1	0	3.11 (0.48, 20.10)	3.34 (0.54, 20.62)	2.58 (0.37, 17.92)
Antithrombotics					
CVM only	1.0	1.0	1.59 (0.35, 7.29)	1.67 (0.36, 7.63)	1.58 (0.31, 8.09)
CVM & no MHC & 1+ DD	0.6	1.0	0.67 (0.32, 1.40)	0.70 (0.33, 1.46)	0.56 (0.25, 1.28)
CVM & 1+ MHC	1.7	1.6	1.02 (0.56, 1.84)	1.04 (0.57, 1.90)	0.77 (0.39, 1.53)
No CVM	0	0	1.59 (0.35, 7.29)	1.67 (0.36, 7.63)	1.58 (0.31, 8.09)
Benzodiazepines					
CVM only	5.7	4.9	0.95 (0.54, 1.65)	0.96 (0.55, 1.69)	1.19 (0.61, 2.30)
CVM & no MHC & 1+ DD	8.3	6.9	1.16 (0.93, 1.45)	1.19 (0.95, 1.49)	1.22 (0.94, 1.57)
CVM & 1+ MHC	14.7	17.2	1.07 (0.90, 1.28)	1.10 (0.92, 1.31)	1.23 (0.99, 1.54)
No CVM	7.6	12.5	0.69 (0.17, 2.77)	0.71 (0.17, 2.91)	0.52 (0.12, 2.26)
Cardiovascular					
CVM only	1.8	1.5	0.60 (0.20, 1.82)	0.60 (0.20, 1.82)	0.48 (0.14, 1.59)
CVM & no MHC & 1+ DD	3.2	2.4	**1.79 (1.10, 2.92)**	**1.81 (1.11, 2.95)**	**1.53 (0.88, 2.66)**
CVM & 1+ MHC	3.0	3.1	1.23 (0.76, 1.98)	1.22 (0.76, 1.96)	1.02 (0.61, 1.72)
No CVM	0	0	0.60 (0.20, 1.82)	0.60 (0.20, 1.82)	0.48 (0.14, 1.59)

Megestrol					
CVM only	0.3	0	3.05 (0.36, 25.71)	3.18 (0.38, 26.73)	1.40 (0.19, 10.44)
CVM & no MHC & 1+ DD	0.5	1.6	0.71 (0.44, 1.14)	0.79 (0.49, 1.28)	0.68 (0.39, 1.18)
CVM & 1+ MHC	3.2	3.6	0.86 (0.65, 1.14)	1.02 (0.77, 1.36)	1.00 (0.64, 1.57)
No CVM	1.5	4.2	0.05 (0.00, 0.51)	0.06 (0.01, 0.67)	0.10 (0.01, 1.30)
Pain drugs					
CVM only	1.8	2.7	0.70 (0.34, 1.42)	0.69 (0.34, 1.41)	0.64 (0.29, 1.42)
CVM & no MHC & 1+ DD	2.9	4.0	**0.53 (0.41, 0.69)**	**0.53 (0.41, 0.68)**	**0.53 (0.39, 0.72)**
CVM & 1+ MHC	2.3	2.9	0.81 (0.58, 1.14)	0.83 (0.59, 1.17)	0.88 (0.59, 1.32)
No CVM	0	0	0.70 (0.34, 1.42)	0.69 (0.34, 1.41)	0.64 (0.29, 1.42)
Skeletal muscle relaxants					
CVM only	5.4	5.6	1.17 (0.69, 2.00)	1.18 (0.69, 2.01)	1.37 (0.75, 2.51)
CVM & no MHC & 1+ DD	7.3	4.0	**1.40 (1.11, 1.76)**	**1.41 (1.12, 1.77)**	**1.38 (1.06, 1.80)**
CVM & 1+ MHC	8.1	5.1	**1.70 (1.35, 2.15)**	**1.76 (1.38, 2.23)**	**1.70 (1.28, 2.25)**
No CVM	1.5	4.2	2.64 (0.32, 21.68)	2.66 (0.32, 21.87)	2.65 (0.32, 21.89)
Sulfonylureas					
CVM only	4.6	7.1	0.68 (0.34, 1.35)	0.70 (0.35, 1.40)	0.61 (0.27, 1.36)
CVM & no MHC & 1+ DD	2.9	3.5	0.80 (0.53, 1.21)	0.82 (0.54, 1.23)	0.64 (0.41, 1.01)
CVM & 1+ MHC	3.2	4.0	0.74 (0.50, 1.10)	0.71 (0.47, 1.06)	0.50 (0.30, 0.84)
No CVM	0	0	0.68 (0.34, 1.35)	0.70 (0.35, 1.40)	0.61 (0.27, 1.36)

Note: Drug types with >1% prevalence of use were considered for these analyses.

[1] The logistic regression models with interaction term were conducted for each potentially inappropriate medication class separately.

Models were adjusted for:

[2] Adjusted for number of medications used ≥90 days, number of all-cause ED visits, number of all-cause hospitalizations, number of physician visits and count of chronic disease.

[3] Further adjusted for age group, years of education, race/ethnicity, marital status, region, BMI, current smoking status, and current alcohol use

Values in bold are statistically significant at p = 0.05

[4] PIM-potentially inappropriate medication.

[5] CVM only – concordant cardiovascular-metabolic only pattern; CVM & no MHC & 1+ DD – cardiovascular-metabolic plus discordant physical conditions pattern; CVM & 1+ MHC- DD – cardiovascular-metabolic plus mental health conditions pattern; No CVM – no cardiovascular-metabolic patterns.