

SUPPLEMENTAL APPENDICES

SUPPLEMENTAL TABLE 1. Zhan Criteria Drugs by Classification of Appropriateness for the Elderly

Some Indications	Amitriptyline	
	Doxepin	
	Indomethacin	
	Dipyridamole	
	Ticlopidine	
	Methyldopa	
	Reserpine	
	Disopyramide	
	Oxybutynin	
	Chlorpheniramine	
	Cyproheptadine	
	Diphenhydramine	
	Hydroxyzine	
	Promethazine	
	Rarely Appropriate	Chlordiazepoxide
Diazepam		
Propoxyphene		
Carisoprodol		
Chlorzoxazone		
Cyclobenzaprine		
Metaxalone		
Methocarbamol		
Always Inappropriate		Butabarbital
		Secobarbital
	Pentobarbital	
	Flurazepam	
	Meprobamate	
	Chlorpropamide	
	Meperidine	
	Pentazocine	
	Trimethobenzamide	
	Belladonna alkaloids	
Dicyclomine		
Hyoscyamine		
Propantheline		

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SUPPLEMENTAL TABLE 2. Most Commonly Prescribed Zhan Criteria Drug Classes, 2006-7

DRUG CLASS	DRUG
Antihistamine	Chlorpheniramine
	Cyproheptadine
	Diphenhydramine
	Hydroxyzine
	Promethazine
Opiates	Meperidine
	Pentazocine
	Propoxyphene
Skeletal Muscle Relaxants	Carisoprodol
	Chlorzoxazone
	Cyclobenzaprine
	Metaxalone
	Methocarbamol

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SUPPLEMENTAL TABLE 3. Patient, Community, and Insurance Plan Characteristics of MA Enrollees by Number of Dispensings for High-Risk Drugs

	1 High-Risk Drug Dispensing	>4 High-Risk Drug Dispensings
N (%)	8,117 (67.4)	800 (6.6)
PATIENT CHARACTERISTICS		
Mean Age, y (SD)*	75.0 (6.6)	76.2 (6.9)
Female, % *	64	72
Race, %		
White	87	87
Black	8	9
Other	5	4
Married, % *	55	47
Annual Household Income <\$10,000, % *	15	18
Any College Education, %	34	31
Self Reported General Health, % *		
Excellent/Very Good	26	19
Good/Fair/Poor	74	81
Limitation in Moderate Activity, % *		
No Limitation	40	28
Any Limitation	60	72
Mean Number of Chronic Conditions (SD)*	3.3 (2.1)	3.8 (2.2)
Mean Number of Unique Prescriptions (SD)*	11.6 (6.0)	12.4 (6.2)
Mean Number of Unique Zhan High-Risk Prescriptions (SD)	1.2 (0.4)	1.2 (0.5)
Mean Physical Component Summary (PCS) Score (SD)*	38.1 (11.9)	34.2 (12.0)
Mean Mental Component Summary (MCS) Score (SD)*	51.3 (11.2)	49.5 (12.3)
COMMUNITY CHARACTERISTICS		
Mean Percentage of White Residents (SD)*	78.4 (19.7)	80.6 (17.2)
Mean Percentage of Elderly Residents (SD)	13.3 (3.4)	13.6 (3.3)
Mean Percentage of Residents under Poverty Line (SD)*	12.0 (4.5)	12.5 (4.3)
Mean Household Income (SD)*	\$49,849 (\$13,989)	\$48,802 (\$11,809)
Mean # MDs Per/1000 Residents (SD)	3.0 (1.8)	2.9 (1.9)
PLAN CHARACTERISTICS		
Model Type, %		
Staff/Group	12	11
Non-Staff/Non-Group	88	89
Profit Status, % *		
Not For Profit	29	33
For Profit	71	67
Years Participating in Medicare*		
<5	27	23
5-10	29	32
≥10	44	45
Population Served*		
<4,845	22	26
4,845 – 16,295	24	28
16,296 – 32,390	27	23
>32,390	27	23

* p-value <0.05

SUPPLEMENTAL TABLE 4. Adjusted Odds of Receiving a High-Risk Prescription by Zhan Classification of Appropriateness among Elderly Medicare Advantage Beneficiaries

	Sometimes Indicated				Rarely Appropriate				Always Inappropriate			
	OR	95% CI			OR	95% CI			OR	95% CI		
N	1,394				7,653				5,895			
PATIENT CHARACTERISTICS												
Age*												
65-69	Ref.	--			Ref.	--			Ref.	--		
70-74	0.96	0.88	to	1.05	0.89	0.82	to	0.97	0.84	0.71	to	0.99
75-79	1.07	0.98	to	1.17	0.89	0.82	to	0.95	0.82	0.69	to	0.97
80-85	0.99	0.90	to	1.10	0.81	0.73	to	0.89	0.73	0.59	to	0.90
>85	0.86	0.75	to	0.98	0.59	0.52	to	0.67	0.61	0.46	to	0.80
Sex												
Male	Ref.	--			Ref.	--			Ref.	--		
Female	1.19	1.11	to	1.28	1.46	1.38	to	1.55	1.80	1.57	to	2.07
Race												
White	Ref.	--			Ref.	--			Ref.	--		
Black	1.04	0.93	to	1.17	0.92	0.83	to	1.03	0.47	0.34	to	0.65
Other	1.08	0.93	to	1.25	0.88	0.75	to	1.03	0.93	0.65	to	1.33
Marital Status												
Single/Widowed/Divorced	Ref.	--			Ref.	--			Ref.	--		
Married	1.04	0.97	to	1.12	1.05	0.99	to	1.13	1.16	1.00	to	1.36
Annual Household Income												
<\$10,000	Ref.	--			Ref.	--			Ref.	--		
\$10,000 - \$19,999	0.89	0.80	to	0.99	1.03	0.94	to	1.12	0.97	0.81	to	1.17
\$20,000 - \$29,999	0.87	0.78	to	0.98	0.93	0.85	to	1.02	1.13	0.91	to	1.39
≥\$30,000	0.86	0.80	to	0.96	0.95	0.86	to	1.05	1.05	0.84	to	1.33
Education												
No College Education	Ref.	--			Ref.	--			Ref.	--		
Any College Education	0.93	0.87	to	0.99	0.99	0.93	to	1.05	1.08	0.95	to	1.17
Physical Component Summary (PCS) Score												
Q1: <30	Ref.	--			Ref.	--			Ref.	--		
Q2: 30 – 40	0.84	0.77	to	0.92	0.82	0.76	to	0.88	1.00	0.86	to	1.17
Q3: 41 – 49	0.72	0.66	to	0.79	0.71	0.65	to	0.78	0.85	0.71	to	1.02
Q4: >49	0.63	0.57	to	0.70	0.56	0.51	to	0.62	0.71	0.58	to	0.88
Mental Component Summary (MCS) Score												
Q1: <45	Ref.	--			Ref.	--			Ref.	--		
Q2: 45 – 55	0.86	0.80	to	0.92	0.95	0.87	to	1.02	0.86	0.73	to	1.01
Q3: 56 – 60	0.83	0.75	to	0.92	0.93	0.85	to	1.02	0.86	0.72	to	1.03
Q4: >60	0.74	0.68	to	0.81	0.89	0.82	to	0.97	0.65	0.54	to	0.79
Number of Chronic Conditions												
<Median (<3)	Ref.	--			Ref.	--			Ref.	--		
≥Median (≥3)	1.26	1.16	to	1.37	1.30	1.22	to	1.39	1.32	1.14	to	1.53
COMMUNITY CHARACTERISTICS												
County % Population White												
Q1: <74.1	Ref.	--			Ref.	--			Ref.	--		
Q2: 74.1 – 83.2	1.07	0.96	to	1.19	1.04	0.94	to	1.16	1.11	0.91	to	1.37
Q3: 83.3 – 91.8	1.09	0.98	to	1.22	1.01	0.89	to	1.13	1.03	0.81	to	1.31
Q4: >91.8	1.15	1.02	to	1.29	0.98	0.85	to	1.13	0.99	0.74	to	1.30
County % Population ≥65												
Q1: <11.1	Ref.	--			Ref.	--			Ref.	--		

Q2: 11.1 – 12.8	0.97	0.87	to	1.07	0.96	0.88	to	1.06	1.04	0.85	to	1.28
Q3: 12.9 – 14.8	0.96	0.86	to	1.08	1.00	0.90	to	1.11	1.08	0.88	to	1.33
Q4: >14.8	0.94	0.83	to	1.06	1.09	0.96	to	1.24	0.88	0.70	to	1.11
County % Population below Poverty Line												
Q1: <9.2	Ref.			--	Ref.			--	Ref.			--
Q2: 9.2 – 11.9	1.12	1.01	to	1.24	0.92	0.83	to	1.01	0.99	0.80	to	1.23
Q3: 12.0 – 15.0	1.15	1.03	to	1.29	0.94	0.85	to	1.04	0.92	0.75	to	1.14
Q4: >15.0	1.18	1.07	to	1.31	1.00	0.91	to	1.10	1.15	0.92	to	1.42
County # of MDs /1000 Population												
Q1: <1.8	Ref.			--	Ref.			--	Ref.			--
Q2: 1.8 – 2.7	0.98	0.89	to	1.07	0.98	0.89	to	1.08	1.14	0.94	to	1.39
Q3: 2.8 – 4.0	1.00	0.90	to	1.11	0.93	0.84	to	1.03	1.23	1.00	to	1.52
Q4: >4.0	0.97	0.86	to	1.09	0.86	0.76	to	0.96	0.82	0.63	to	1.05

INSURANCE PLAN CHARACTERISTICS												
Model Type												
Staff/Group	Ref.			--	Ref.			--	Ref.			--
Non-staff/Non-group	1.13	1.01	to	1.27	1.03	0.88	to	1.21	0.97	0.75	to	1.25
Profit Status												
Not For Profit	Ref.			--	Ref.			--	Ref.			--
For Profit	1.02	0.93	to	1.12	1.16	1.04	to	1.29	1.32	1.11	to	1.58
Years Participating in Medicare												
<5	Ref.			--	Ref.			--	Ref.			--
5-10	1.01	0.90	to	1.15	1.10	0.96	to	1.26	0.91	0.74	to	1.12
>10	0.92	0.83	to	1.03	1.02	0.89	to	1.16	1.02	0.84	to	1.25

*Cochran-Armitage trend test for age effect p<0.05 for all three categories. Also controls for census division.

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SUPPLEMENTAL TABLE 5. Adjusted Odds of Receiving a High-Risk Prescription by Census Division among Elderly Medicare Advantage Beneficiaries																												
		New England			Middle Atlantic			East North Central			West North Central			South Atlantic			East South Central			West South Central			Mountain			Pacific		
		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI				
Age*																												
65-69		Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.		
70-74		1.05	0.76	1.46	0.87	0.75	1.01	0.99	0.87	1.13	1.06	0.86	1.29	0.91	0.77	1.09	1.04	0.79	1.38	0.75	0.57	0.98	0.78	0.65	0.93	0.93	0.79	1.10
75-79		0.84	0.74	0.96	0.86	0.75	1.00	1.08	0.93	1.25	1.10	0.93	1.30	0.98	0.82	1.17	1.06	0.78	1.44	0.96	0.71	1.32	0.94	0.75	1.18	0.91	0.76	1.09
80-85		0.65	0.45	0.94	0.77	0.65	0.92	0.95	0.78	1.15	0.93	0.73	1.19	1.03	0.87	1.21	1.36	0.90	2.06	0.69	0.55	0.88	0.94	0.78	1.14	0.80	0.67	0.96
>85		0.53	0.32	0.88	0.60	0.44	0.81	0.77	0.61	0.96	0.73	0.59	0.90	0.85	0.70	1.04	0.66	0.34	1.30	0.63	0.46	0.88	0.71	0.51	1.00	0.60	0.48	0.75
Sex																												
Male		Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.		
Female		0.93	0.68	1.28	1.32	1.18	1.47	1.51	1.32	1.72	1.33	1.15	1.54	1.31	1.14	1.50	1.17	1.00	1.35	1.41	1.15	1.75	1.45	1.25	1.68	1.40	1.18	1.66
Race																												
White		Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.		
Black		0.82	0.47	1.40	0.79	0.65	0.97	1.05	0.88	1.24	0.89	0.69	1.16	0.92	0.76	1.11	0.97	0.71	1.32	1.01	0.71	1.43	1.14	0.70	1.84	0.84	0.55	1.30
Other		1.55	0.85	2.83	0.81	0.63	1.04	0.99	0.56	1.77	1.66	1.08	2.56	0.87	0.61	1.22	1.03	0.49	2.17	0.97	0.74	1.28	1.13	0.88	1.46	0.82	0.65	1.05
Marital Status																												
Single/Widowed/ Divorced		Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.		
Married		1.02	0.88	1.18	1.13	0.97	1.31	1.10	0.93	1.29	1.10	0.95	1.26	1.02	0.88	1.17	0.89	0.72	1.10	1.30	1.12	1.50	1.04	0.87	1.23	1.02	0.89	1.17
Annual Household Income																												
<\$10,000		Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.		
\$10,000 - \$19,999		0.92	0.67	1.27	0.80	0.64	1.00	0.97	0.81	1.15	1.06	0.83	1.36	1.05	0.83	1.31	0.90	0.65	1.24	1.11	0.92	1.33	0.92	0.73	1.15	1.14	0.92	1.42
\$20,000 - \$29,999		0.71	0.50	1.02	0.81	0.67	0.98	0.90	0.73	1.10	0.91	0.69	1.20	1.05	0.83	1.33	0.70	0.53	0.92	0.95	0.65	1.37	0.95	0.76	1.19	0.98	0.76	1.26
≥\$30,000		0.74	0.55	0.98	0.83	0.66	1.05	0.78	0.64	0.96	1.01	0.82	1.23	0.84	0.66	1.07	1.06	0.70	1.61	1.01	0.69	1.47	0.89	0.70	1.11	1.14	0.93	1.41
Education																												
No College Education		Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.		
Any College Education		1.03	0.83	1.28	0.98	0.85	1.13	0.91	0.82	1.00	1.02	0.88	1.20	1.01	0.89	1.15	0.98	0.79	1.21	0.84	0.76	0.93	0.94	0.85	1.03	0.94	0.83	1.07
Physical Component Summary (PCS) Score																												
<30		Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.		
30 - 40		0.64	0.45	0.93	0.83	0.72	0.96	0.77	0.66	0.90	0.94	0.79	1.12	0.74	0.64	0.85	0.78	0.58	1.04	0.94	0.68	1.29	1.01	0.83	1.23	0.89	0.77	1.03
41 - 49		0.86	0.60	1.24	0.61	0.51	0.73	0.67	0.56	0.79	0.78	0.68	0.91	0.70	0.58	0.83	0.83	0.55	1.25	0.65	0.50	0.83	0.75	0.62	0.90	0.97	0.79	1.19
>49		0.55	0.43	0.70	0.55	0.44	0.69	0.57	0.51	0.64	0.54	0.45	0.64	0.62	0.51	0.76	0.58	0.40	0.84	0.63	0.50	0.79	0.64	0.50	0.82	0.71	0.56	0.89
Mental Component Summary (MCS) Score																												
<45		Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.		

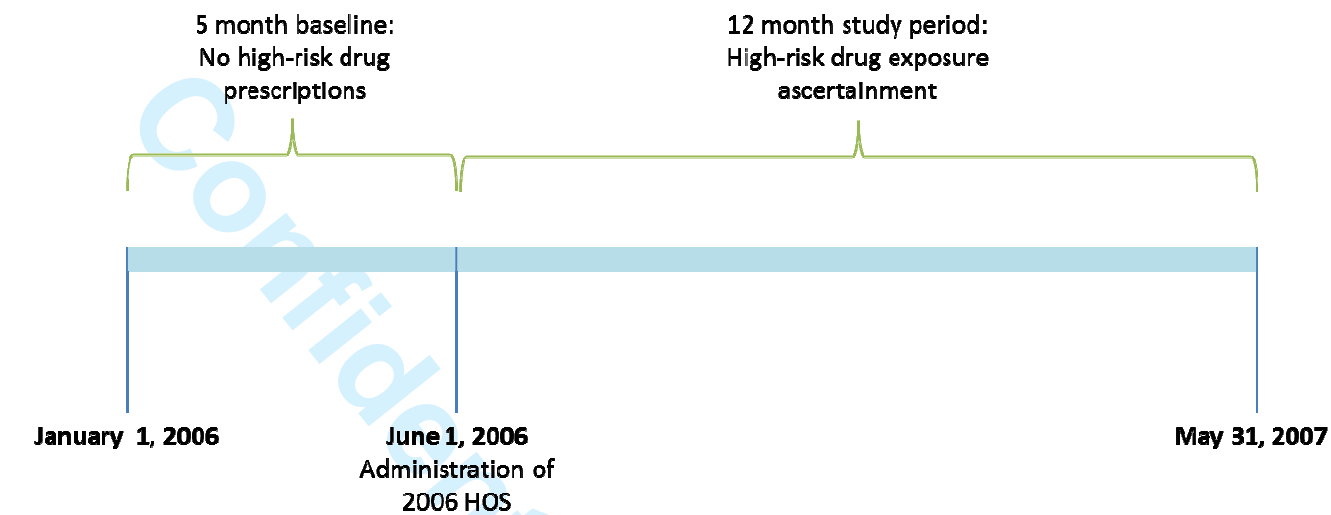
1	45-55	1.05	0.81	1.37	0.88	0.77	1.00	0.86	0.74	1.01	0.95	0.81	1.11	0.86	0.72	1.03	0.94	0.77	1.13	0.97	0.70	1.35	1.08	0.88	1.33	0.86	0.73	1.01
2	56-60	0.71	0.47	1.10	1.03	0.86	1.24	0.85	0.71	1.02	1.01	0.83	1.23	0.85	0.72	1.01	0.84	0.68	1.03	0.77	0.55	1.09	1.04	0.78	1.38	0.77	0.62	0.97
3	>60	0.85	0.62	1.16	0.90	0.75	1.08	0.77	0.65	0.92	0.85	0.71	1.02	0.73	0.62	0.85	0.85	0.68	1.06	0.68	0.47	0.92	0.92	0.79	1.08	0.79	0.66	0.93
4	Number of Chronic Conditions																											
5	<Median (<3)	Ref.			Ref.			Ref.			Ref.			Ref.		Ref.			Ref.			Ref.			Ref.			
6	≥Median (≥3)	1.29	1.09	1.53	1.43	1.24	1.64	1.25	1.13	1.38	1.23	1.08	1.40	1.32	1.10	1.58	1.19	0.92	1.56	1.19	1.00	1.41	1.40	1.12	1.76	1.33	1.11	1.60
7	Model Type																											
8	Staff/Group	Ref.			Ref.			Ref.			Ref.			Ref.		Ref.			Ref.			Ref.			Ref.			
9	Non-staff/Non-group	1.52	1.23	1.89	1.05	0.87	1.28	1.09	0.86	1.37	1.08	0.84	1.23	0.73	0.57	0.94	1.18	1.01	1.38	1.12	0.90	1.38	1.08	0.84	1.38	1.11	0.97	1.27
10	Profit Status																											
11	Not For Profit	Ref.			Ref.			Ref.			Ref.			Ref.		Ref.			Ref.			Ref.			Ref.			
12	For Profit	0.94	0.78	1.13	0.79	0.67	0.93	1.13	0.94	1.36	1.44	1.17	1.77	1.02	0.86	1.22	NA		1.50	1.18	1.90	1.18	1.00	1.38	1.10	0.97	1.26	
13	Years Participating in Medicare																											
14	<5	Ref.			Ref.			Ref.			Ref.			Ref.		Ref.			Ref.			Ref.			Ref.			
15	5-10	1.46	1.22	1.74	1.43	1.15	1.78	1.05	0.85	1.30	1.00	0.81	1.24	1.02	0.79	1.33	1.00	0.73	1.39	1.14	0.81	1.59	1.07	0.91	1.26	0.96	0.73	1.28
16	>10	0.98	0.89	1.08	1.23	1.02	1.50	0.90	0.72	1.12	0.90	0.75	1.07	0.98	0.80	1.21	1.28	0.95	1.73	1.19	0.98	1.43	0.93	0.79	1.10	0.93	0.71	1.22

*Cochran-Armitage trend test for age effect p<0.05 for all census divisions except East South Central, West South Central and Mountain. Also controls for community characteristics.

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Drug Class	New Users	%
Opiates	3,521	29.2
Skeletal Muscle Relaxants	2,727	22.6
Antihistamines	2,272	18.9
Gastrointestinal Drugs (incl. Belladonna Alkaloids)	783	6.6
Anticholinergics	764	6.3
Tricyclic Antidepressants	710	5.9
NSAIDs	675	5.6
Anticoagulants	286	2.4
Benzodiazepines	206	1.7
Antiemetics	56	0.5
Antihypertensives	28	0.2
Antiarrhythmics	10	0.1
Hypoglycemics	2	0.0
TOTAL	12,040	100.0

1 SUPPLEMENTAL FIGURE 1. Study timeline.
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