

Changing Patterns in Medication Use with Increasing Probability of Death for Older Medicare Beneficiaries

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Introduction

- There has been little research on medication use at the end of life.
 - There is little evidence on how to appropriately transition a patient from a curative to a palliative treatment regimen.
 - There is a potential concern for under-prescribing palliative-care drugs vs. continuing chronic use medications that have limited short-term benefits.
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Study Objectives

- To determine whether use of symptom relief drugs increases and use of chronic medications decreases with greater probability of death for older adults
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Study Design/Setting

- Study design: pooled cross-sectional study using 20,233 community-dwelling Medicare beneficiaries enrolled in part A and part B aged 65 and older.
 - Excluded: residents from long-term care facilities and beneficiaries enrolled in Medicare health maintenance organizations
 - Study setting: non-institutionalized older Medicare population in 2000-2005.
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Methods

- The study used 6 years of data (2000-2005) from the Medicare Current Beneficiary Survey (MCBS)
 - Subjects were asked to keep a log of all prescriptions filled and save all empty medicine containers
 - Logs were reviewed 3 times per year in patient interviews
 - Inpatient drugs were not included
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Drug Measures

- Prescription medications
 - Symptomatic relief
 - Antidepressants
 - Anxiolytics
 - Opioids/ Analgesics
 - Sleep aids
 - Essential medicines for palliative care
 - Chronic use
 - Statins
 - Drugs used for osteoporosis (bisphosphonates, calcitonin, estrogens)
 - Drug measures
 - Drug use = if drug was prescribed
 - Intensity of use = total # of fills/months pt alive
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Measure of probability of death

- Used a multivariate logistic regression
 - Age
 - Sex
 - Marital status
 - Self-reported health status
 - Difficulty with ADL
 - BMI
 - Income as a percentage of federal poverty level
 - Comorbidities (CHF, COPD, CKD, malignant cancer)
 - Hospital length of stay
- Two significant sets of interactions
 - Health status and aged 85 and older
 - Health status and hospital length of stay
- Predicted values of death were stratified
 - < 5%, 5-10%, 11-20%, 21-30%, 31-40%, 41-50%, >50%

Table 1: Study population demographics

Characteristic	Predicted Probability of Death						
	0–5%	5–10%	11–20%	21–30%	31–40%	41–50%	> 50%
Sample n	33,224	3,364	2,547	1,067	520	255	230
Weighted n	18,868,008	1,745,722	1,285,722	524,319	248,516	121,913	107,013
Actual death	1.1	7.5	15.3	28.4	35.2	39.8	50.1
Age							
65–69	20.8	12.8	10.2	8.7	7.4	4.9	4.6
70–74	29.3	21.2	17.4	14.3	11.0	7.1	5.8
75–79	24.2	23.5	23.1	19.4	18.1	21.3	14.3
80–84	15.9	21.1	24.3	21.3	20.8	21.6	27.6
85	9.8	21.5	25.0	36.3	42.8	45.2	47.6
Sex							
Female	58.7	56.8	52.3	49.3	43.1	39.3	35.2
Male	41.3	43.2	47.7	50.7	56.9	60.7	64.8
Marital status							
Married	56.1	47.7	45.8	44.9	43.3	49.6	42.3
Widowed	33.3	40.8	42.1	42.8	43.4	37.6	43.5
Single	10.5	11.5	12.1	12.3	13.3	12.8	14.2
Health status							
Excellent, very good	50.0	17.2	16.1	16.1	19.0	18.6	17.5
Good	35.0	24.4	23.1	20.9	22.2	15.9	18.6
Fair	13.9	34.3	30.4	31.0	26.5	30.3	23.3
Poor	1.1	24.1	30.4	31.9	32.3	35.1	40.6
ADL functioning							
No ADL limitations	78.8	45.7	37.6	32.1	28.7	25.7	17.1
Difficulty with 1 ADLs	21.2	54.3	62.4	67.9	71.3	74.3	82.9
Body mass index, kg/m²							
< 18.5 (underweight)	1.6	5.4	7.4	10.8	14.6	27.7	28.1
18.5–24.9 (normal)	36.7	36.7	41.0	44.9	43.5	39.5	41.9
25.0–29.9 (overweight)	39.6	35.1	33.3	30.4	32.2	24.6	25.5
> 30 (obese)	22.0	22.8	18.4	13.9	9.7	8.2	4.4
Supplemental medical insurance							
No	6.7	8.7	9.9	9.9	9.4	13.6	20.4
Yes	93.3	91.3	90.1	90.1	90.6	86.4	79.6
Select comorbidities							
Congestive heart failure	6.8	29.0	51.7	62.4	68.0	68.6	74.7
Chronic obstructive pulmonary disease	6.4	21.9	34.6	43.7	49.4	52.6	51.9
Chronic kidney disease	1.0	4.3	8.1	14.4	18.8	17.6	18.6
Malignant cancer	1.7	9.4	13.2	26.8	43.0	55.4	82.0
Hospital length of stay, days							
0	92.0	34.5	15.3	4.9	2.9	3.8	0.7
1–3	4.9	22.2	17.8	9.0	6.0	3.7	1.9
4–7	2.9	22.3	21.0	14.1	11.5	10.4	7.3
Hospice stay	0.3	3.0	5.7	9.5	14.0	18.3	23.9

ADL = activity of daily living.

Table 1

- Individuals with a higher probability of death were more likely to be male, older, report poorer health status, and have difficulties with one or more ADLs
 - Hospital stays was a strong predictor of death
 - Patients having comorbidities were found in higher proportions in the higher strata of probability of death
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Table 2: Symptom-relief meds

Table 2. Monthly Fills of Palliative Medication Group According to Predicted Probability of Death

Predicted Probability of Death Stratum, %	Antidepressants		Anxiolytics		Opioids		Sleep Aids		Recommended List of Palliative Medications ¹	
	% Use (RSE)	Mean Number of Fills per Month per User (RSE)	% Use (RSE)	Mean Number of Fills per Month per User (RSE)	% Use (RSE)	Mean Number of Fills per Month per User (RSE)	% Use (RSE)	Mean Number of Fills per Month per User (RSE)	% Use (RSE)	Mean Number of Fills per Month per User (RSE)
All	13.5 (0.02)	0.54 (0.02)	20.9 (0.02)	0.59 (0.02)	18.9 (0.02)	0.34 (0.02)	6.7 (0.03)	0.43 (0.02)	25.1 (0.01)	0.54 (0.02)
< 5 (reference)	11.7 (0.02)	0.53 (0.01)	18.6 (0.01)	0.57 (0.01)	16.0 (0.01)	0.30 (0.02)	5.5 (0.02)	0.41 (0.02)	22.2 (0.01)	0.51 (0.01)
5-10	20.6*** (0.04)	0.56 (0.03)	30.9*** (0.03)	0.65*** (0.03)	33.0*** (0.03)	0.42*** (0.04)	10.7*** (0.04)	0.45 (0.03)	38.1*** (0.02)	0.61*** (0.03)
10-20	22.8*** (0.04)	0.60** (0.04)	34.0*** (0.03)	0.68*** (0.03)	32.8*** (0.03)	0.44*** (0.04)	12.4*** (0.04)	0.49** (0.03)	39.4*** (0.03)	0.66*** (0.03)
20-30	22.8*** (0.05)	0.54 (0.05)	33.5*** (0.05)	0.65* (0.06)	33.6*** (0.05)	0.46*** (0.06)	14.6*** (0.06)	0.44 (0.03)	40.2*** (0.04)	0.64*** (0.06)
30-40	22.0*** (0.09)	0.63 (0.15)	32.0*** (0.07)	0.67 (0.12)	32.2*** (0.07)	0.48*** (0.08)	12.8*** (0.08)	0.52 (0.12)	42.5*** (0.05)	0.64** (0.09)
40-50	23.6*** (0.12)	0.59 (0.09)	30.5*** (0.10)	0.67 (0.08)	29.0*** (0.10)	0.60** (0.14)	16.0*** (0.14)	0.47 (0.13)	39.4*** (0.08)	0.71** (0.12)
> 50%	17.3* (0.16)	0.56 (0.14)	25.3* (0.12)	0.59 (0.13)	27.8*** (0.11)	0.40* (0.13)	12.7** (0.13)	0.46 (0.13)	32.8** (0.10)	0.61 (0.10)

¹ International Association of Hospice and Palliative Care List of Essential Medications, 2008.

P ≤ * .05, ** .01, *** .001.

RSE = relative standard error.

Table 2

- Symptom relief medication use was lowest in the $< 5\%$ predicted death stratum and then rose significantly in the next death stratum (5-10%)
 - No variation in the middle four strata
 - Intensity of use (monthly fills per user) generally rose and then fell in the $> 50\%$ stratum
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Table 3: Chronic use meds

Table 3. Monthly Prescription Fills of Statins and Drugs Used to Treat Osteoporosis According to Predicted Probability of Death

Predicted Probability of Death Stratum, %	Statins		Drugs Used to Treat Osteoporosis	
	% Use (RSE)	Mean Number of Fills per Month per User (RSE)	% Use (RSE)	Mean Number of Fills per Month per User (RSE)
All	34.4 (0.01)	0.53 (0.01)	10.4 (0.02)	0.49 (0.02)
<5 (reference)	35.0 (0.01)	0.53 (0.01)	10.7 (0.02)	0.50 (0.01)
5–10	34.6 (0.03)	0.53 (0.02)	10.9 (0.05)	0.45* (0.04)
10–20	32.3*** (0.03)	0.56* (0.02)	8.3*** (0.07)	0.46 (0.05)
20–30	29.6*** (0.05)	0.53 (0.04)	8.8 (0.10)	0.57 (0.19)
30–40	21.7*** (0.09)	0.56 (0.06)	6.7*** (0.16)	0.44 (0.12)
40–50	20.5*** (0.13)	0.50 (0.12)	6.4** (0.26)	0.54 (0.13)
over 50	17.6*** (0.15)	0.53 (0.17)	6.6* (0.25)	0.54 (0.17)

$P \leq .05$, ** .01, *** .001.

RSE = relative standard error.

Table 3

- 34% of the study sample used statins and 10.4% used osteoporosis drugs
 - Statin use monotonically declined from 35% in the < 5% stratum to 17.6% in the > 50% stratum
 - Osteoporosis drug use declined from 10.7% in the < 5% stratum to 6.6% in the > 50% stratum
 - Intensity of use remained the same across all strata for statins and fluctuated for osteoporosis
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Discussion

- Hypothesis: “...annual utilization rates of symptom relief therapies would rise and that use of chronic medications would decline as the likelihood of ding increased.”
 - First hypothesis – no evidence
 - Second hypothesis – some evidence
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Discussion, cont

- Symptom relief medications:
 - USE OF MEDS: did not increase across the spectrum of predicted death but there was a significant difference between the first stratum and the second strata
 - INTENSITY OF USE: those who were previous users of these meds used more and this generally increased along the death strata except for the highest predicted level of death
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Discussion, cont

- Chronic medications
 - USE OF MEDS: continual decrease across all death strata
 - INTENSITY OF USE: no change in statins and modest changes for osteoporosis drugs
 - These findings are consistent with current recommendations of chronic meds with long term benefit to be discontinued at the end of life
 - NOTE: evidence is not strong enough to make this a general recommendation
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Conclusion

- In order to discuss appropriateness of medications at the end of life, there must first be an active incorporation of a medication review
 - At the end of life, the pharmacokinetics and pharmacodynamics of medications change due to the physiologic changes that occur in various disease processes
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Conclusion, cont

- 2 previous studies attempt to create a framework for decision making in prescribing medications at the end of life
 - 1st study: framework that includes 3 levels of prevention strategy that form a gradient for considering treatment changes
 - 2nd study: 4 aspects of medication use that should be considered in assessing their appropriateness for individuals later in life – (1) remaining life expectancy (2) goals of care (3) treatment target (4) time until benefit
 - Overall, must consider appropriateness of medications when a patient's treatment plan changes from curative to palliative
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Limitations of Study

- Cross-sectional design provided association between drug use and intensity but failed to confirm causality; nor did it show direction of change over time.
 - Stratifying the probability of death, resulted in the inability to appropriately classify higher probability of death.
 - Model of probability of death that was used lacked important clinically-based variables.
 - Their method of capturing prescriptions failed to take temporal aspects into consideration.
 - The model used did not take into consideration the physician-patient discussions involving end-of-life care, as well as the legal and ethical aspects of the patient's care.
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Future Research

- Study that involves meaningful measure of physical impairment.
 - Study that involves the finer measures of drug use to accurately capture all prescriptions.
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