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Variation in Medication Adherence in Heart Failure

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Although recent studies have demonstrated geographic variation in pharmaceutical use and spending,[1–4] regional variation in medication adherence in Medicare has not been explored.[5] Medication adherence is a critical quality measure, and is especially important for Medicare beneficiaries with heart failure (HF), a common condition where medications can save lives and reduce downstream costs.[6] We used 2007–2009 national Part D data for a 5% random sample of Medicare beneficiaries to study regional variation in HF medication adherence.

Methods

Our selection criteria included (1) being aged ≥18; (2) having at least one inpatient or two (non-laboratory) outpatient claims between 1/1/2007–12/31/2009 with selected ICD9 codes indicating HF on primary, secondary or third diagnosis; (3) being on at least one drug from one of three therapeutic classes: beta-blockers, angiotensin converting enzymes inhibitors (ACE) or angiotensin receptor antagonists (ARB), and diuretics;[7] and (4) being continuously enrolled in Medicare Parts A, B and D during the follow-up period. The follow-up period was one year after the first prescription drug of interest was filled censored at the end of the study period (12/31/2009) or death. The resulting 178,102 beneficiaries were assigned to 306 Dartmouth Hospital-referral Regions (HRR) based on their ZIP-Code of residence.

The main outcome was adherence, measured by medication possession ratio (MPR). MPR is defined as the ratio of total number of pills the patient had (numerator) over the total number of pills the patient should have had (denominator) during the follow-up period.[8] We then defined an indicator for good adherence (1=MPR≥0.80; 0=otherwise). The denominator for MPR can vary for a patient over time, because patients may initiate different drugs at different times. For example, consider a patient who filled her first beta-blocker prescription on 1/1/08 and her first ACE prescription on 3/1/08. Her MPR in each of the first two months

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Access to data:
Dr. Zhang and Mr. Wu had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Meeting presentation:
Some preliminary results from this paper were presented at the closed session meetings to the Institute of Medicine committee in Geographic Variation in Health Care Spending and Promotion of High-Value Care, in Washington DC on June 4, 2012.

would be the number of beta-blocker pills dispensed by the pharmacy that month divided by 30, while her MPR for the third month would be the total number of beta-blocker and ACE pills divided by 60 (30 days * 2 drugs). We considered drugs in the same therapeutic class substitutable, so we did not double-count the overlapped pills for multiple drugs in the same class.

We defined three additional prescribing measures: (1) gross spending on pharmaceuticals including Part D plan payment before rebates, beneficiary out-of-pocket spending, and subsidies; (2) the number of monthly prescriptions filled (=days supply/30); and (3) intensity of medication treatment, defined as the proportion of patients on all 3 drug classes among those on at least one.

We conducted individual-level linear regressions that included HRR indicators and a set of adjustment variables including patient demographics, insurance status, and clinical characteristics. We then calculated the adjusted outcomes for each HRR (thereby netting out differences between HRRs in those patient characteristics) and reported variation statistics and correlation between adjusted outcomes analysis (see method details in our previous work).[9]

Results

On average 52% of patients were good adherent (MPR≥0.8) for HF medications, but the proportion of being good adherent varied by area, from the lowest 36% to the highest 71%. There was similar variation in the intensity of medication treatment and adherence among HRRs. Drug spending varies more across HRRs than the number of prescriptions (Table), partially due to the mix of drugs used. For example, the area at the 90th percentile of drug spending had per person drug spending that was 31% higher than the area at the 10th percentile of drug spending, but had only 15% higher number of prescriptions. Drug spending was moderately positively correlation with intensity of treatment and the number of prescriptions (r=0.19, P=0.001), but had little correlation with adherence measures (r=.04, P=0.44).

Discussion

We found that areas with higher drug spending did not have systematically better adherence. This suggests that areas with higher drug spending are not necessarily managing heart failure patients more efficiently. There are several limitations to our study, however. First, our adherence measure is imperfect; as with most medication-possession-ratio-based metrics, we did not capture emerging contraindications, unfilled prescriptions, untaken pills after filling prescriptions, or changes in doctors' orders. Second, we could not completely adjust for differences in patient severity or patient preferences that differ across areas.

Nonetheless, our study provides new information on the variation in medication adherence in heart failure patients using national Medicare Part D data. We find that although only 52% of patients are adherent in the average area, some areas have substantially more success in producing patient adherence than others. Areas with better adherence can provide a useful benchmark for what is achievable, and system-level quality metrics that incorporate adherence, rather than focusing solely on drug spending, could promote more efficient use of resources.

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Table

Variation in Adjusted Drug Use and Adherence in Different Hospital-Referral Regions [a]

	Min	25th	Median	75th	Max	Mean	S.D.	90th/10th	75th/25th	COV
Drug spending	336	445	479	508	681	480	52.84	1.31	1.14	0.11
No. of prescriptions	15.98	18.80	19.47	20.25	23.81	19.58	1.15	1.15	1.08	0.06
Intensity of treatment	0.29	0.41	0.43	0.46	0.62	0.44	0.04	1.26	1.13	0.10
MPR≥0.8	0.36	0.48	0.52	0.56	0.71	0.52	0.05	1.31	1.15	0.10

[a] All drug measures are only for three therapeutic drug classes of study interest: beta-blockers, Angiotensin Converting Enzymes/Angiotensin Receptor Antagonists, and diuretics. Intensity of drug treatment is defined as the proportion of patients on these three therapeutic classes.

Abbreviations: MPR = Medication Possession Ratio; 10^{th} = 10^{th} percentiles, etc; S.D. = standard deviation; and COV = coefficient of variation (=S.D./Mean).