Supplemental Appendix:

Effects of Physician Payment Reform on Provision of Home Dialysis

Calculating the policy effect on probability of home dialysis (in the case of Traditional Medicare vs. Medicare Advantage):

$$policy\ effect_i = \left(pHome_{post-policy,TM,i} - pHome_{pre-policy,TM,i}\right) - \left(pHome_{post-policy,MA,i} - pHome_{pre-policy,MA,i}\right)$$

$$average\ policy\ effect = \sum_i policy\ effect_i$$

Where,

- "$pHome_i$" is probability of home dialysis for the i^{th} patient
- "TM" is Traditional Medicare
- "MA" is Medicare Advantage

When computing the marginal effect of reimbursement reform, predicted values were obtained for the following four hypothetical scenarios for all patients in the population:

1) Medicare Advantage, pre-policy
2) Medicare Advantage, post-policy
3) Traditional Medicare, pre-policy
4) Traditional Medicare, post-policy

Consequently, the average predicted policy effect represents the effect of the policy averaged across all individuals in the population. An identical approach was used to calculate the effect of the policy on patients residing in areas with smaller versus larger dialysis facilities.

Method of Multiple Imputation:

Overall 71,714 (29.7%) and 115,474 (29.6%) of patients had at least one variable missing in the "Insurance Coverage" and Traditional Medicare" cohort, respectively. For each cohort, we used multiple imputation methods to impute missing values for Quételet's (body mass), index (BMI), hemoglobin, albumin, age, drug or alcohol abuse, or population density. We imputed one record with missing sex in the "Insurance Coverage" cohort. Data was assumed to be missing at random and we used a fully conditional specification approach to impute 5 datasets[1]. Each

imputation model included all covariates as well as the outcomes used to analyze the specific cohort (i.e. the "insurance coverage" and "Non-HMO Medicare" cohorts). Model estimates from each imputed dataset were combined using the rules described by Little and Rubin.[2]

To test the sensitivity of our results to multiple imputation, we conducted “complete case” regression models. In these “complete case” models, the difference-in-difference estimated policy effects were similar. Specifically, the estimated absolute probability of home dialysis among patients with Traditional Medicare Coverage at the start of dialysis was 0.6% greater following reimbursement reform (95% CI 0.02% to 1.1%) compared to patients with enrolled in Medicare Advantage programs (Insurance Coverage Cohort). The estimated absolute probability of home dialysis among patients residing in areas with larger facilities was 1.0% greater following reimbursement reform (95% CI 0.4% to 1.5%) compared to patients living in areas with smaller dialysis facilities.

Table A1: Physician Payment Schedule Before and After Payment Reform

	2001	2002	2003	2004	2005	2006
1 visit per month	$275	$273	$262	$205	$208	$207
2-3 visits per month	$275	$273	$262	$256	$260	$259
4 or more visits per month	$275	$273	$262	$308	$313	$312
home dialysis	$275	$273	$262	$256	$260	$259

Note: Payment is averaged across all carrier localities in the United States.
Source: US Department of Health and Human Services, Centers for Medicare and Medicaid Services. Physician Fee Schedule Search. Baltimore, MD 2015. url: https://www.cms.gov/apps/physician-fee-schedule/search/search-results.aspx?Y=16&T=4&HT=0&CT=3&H1=90921&M=5. Accessed on 8/8/2015.

Table A2: Visit Frequency and Change in In-Center Hemodialysis Revenues Stratified by Facility Size and Population Density.

	Size Quintile				
	1st	2nd	3rd	4th	5th
Proportion with four or more visits:	0.50	0.63	0.65	0.67	0.65
Change in revenue per patient-month:	$14	$20	$22	$25	$25

	Population Density	
	rural and small town	urban and large town
Proportion with four or more visits:	0.61	0.64
Change in revenue per patient-month:	$19	$23

Note: Visit frequency includes visits for all prevalent hemodialysis patients in the United States in the 3 years following reimbursement reform (2004-2006). Changes in revenue describe the change in revenue per patient month in the three years prior to reimbursement reform (2001-2003) to the three years following reimbursement reform. Revenue is measured in US dollars, and is not adjusted for inflation.

Table A3: Regression Results for Traditional Medicare versus Medicare Advantage.

	OR	p-value	LCI	UCI
Policy Variables				
Post-policy	0.94	0.21	0.85	1.04
Traditional Medicare	1.34	<0.001	1.24	1.44
Medicare*Policy Interaction	0.88	0.02	0.79	0.98
Demographic				
Male sex	1.07	0.001	1.03	1.11
Age - 10 years	0.58	<0.001	0.57	0.60
Race (white as referent)				
American Indian	0.84	0.11	0.68	1.04
Black	0.46	<0.001	0.43	0.48
Other race including asian	1.03	0.52	0.94	1.14
Ethnicity (non-hispanic as referent)				
Hispanic ethnicity	0.62	<0.001	0.57	0.66
Comorbidities				
Diabetes	0.93	0.001	0.90	0.97
Coronary disease	0.92	<0.001	0.88	0.95
Cancer	0.89	<0.001	0.83	0.95
Heart failure	0.74	<0.001	0.71	0.78
Pulmonary disease	0.67	<0.001	0.63	0.72
Cerebrovascular disease	0.90	0.001	0.85	0.96
Peripheral vascular disease	0.91	0.00	0.86	0.96
Smoking history	1.07	0.23	0.96	1.18
Immobility	0.51	<0.001	0.45	0.58
Drug or alcohol use	0.42	<0.001	0.29	0.59
Hbg - 1g/dL	1.23	<0.001	1.21	1.24
Seri, albumin - 0.5g/dL	1.54	<0.001	1.51	1.57
Body mass index - 5kg/m^2	0.98	<0.001	0.97	0.99
Geographic				
Larger facilities	1.12	<0.001	1.06	1.19
Rural or small town	1.57	<0.001	1.48	1.65

Note: The difference-in-difference estimate is the interaction between the “post-policy” period and having Traditional Medicare coverage at dialysis initiation.

Table A4: Regression Results for Dialysis Facility Size.

	OR	p-value	LCI	UCI
Policy Variables				
Post-policy	0.99	0.73	0.91	1.07
Large Facility	1.15	<0.001	1.08	1.23
Large Facility*Policy Interaction	0.84	<0.001	0.78	0.92
Demographic				
Male sex	0.86	<0.001	0.84	0.89
Age - 10 years	0.79	<0.001	0.78	0.79
Race (white as referent)				
American Indian	0.83	0.003	0.74	0.94
Black	0.52	<0.001	0.50	0.54
Other race including asian	0.89	0.001	0.83	0.95
Ethnicity (non-hispanic as referent)				
Hispanic ethnicity	0.70	<0.001	0.67	0.74
Comorbidities				
Diabetes	1.07	<0.001	1.04	1.10
Coronary disease	1.00	0.97	0.97	1.04
Cancer	0.87	<0.001	0.82	0.93
Heart failure	0.74	<0.001	0.71	0.76
Pulmonary disease	0.75	<0.001	0.71	0.80
Cerebrovascular disease	0.89	<0.001	0.85	0.94
PVD	0.96	0.04	0.91	1.00
Smoking history	1.02	0.54	0.96	1.08
Immobility	0.53	<0.001	0.48	0.59
Drug or alcohol use	0.45	<0.001	0.39	0.52
Hbg - 1g/dL	1.20	<0.001	1.19	1.21
Serum albumin - 0.5g/dL	1.43	<0.001	1.41	1.44
Body mass index - 5kg/m^2	0.93	<0.001	0.92	0.94
Geographic				
Rural or small town	1.48	<0.001	1.42	1.54

Note: The difference-in-difference estimate is the interaction between the “post-policy” period and residing in areas with larger dialysis facilities.

Table A5. Estimated Change in Absolute Probability of Home Dialysis Use Among Patients Differentially Affected by Reimbursement Reform, After Accounting for Geographic Correlation of Observations.

	Policy Effect Estimate	LCI	UCI
Traditional Medicare vs. Medicare Advantage	0.60%	0.06%	1.14%
Areas with Larger vs. Smaller Facility Sizes	0.98%	0.35%	1.62%

Note: LCI is lower 95% confidence interval. UCI is upper 95% confidence interval. Results come from a generalized estimating equations model with a logit link function, assuming an exchangeable correlation structure among patients residing in a given hospital referral region. The models were otherwise identical to our primary analytic models. Standard errors are robust to misspecification of the likelihood function. Similar to the primary analysis, multiple imputation was used.

1. Buuren SV, Brands JPL, Groothuis-Oudshoorn CGM, Rubin DB. Fully Conditional Specification in Multivariate Imputation. Journal of Statistical Computation and Simulation 2006;76:1049-64.
2. Little R, Rubin D. Statistical Analysis with Missing Data. Hoboken, New Jersey: John Wiley & Sons, Inc.; 2002.