The Effect of Primary Care Visits on Total Patient Care Cost

Evidence from the Veterans Health Administration

Supplemental Materials

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1. Statistical Modeling

1.1. Outcome Transformation and Generalized Linear Models (GLM)

In healthcare cost analyses, model specification plays a vital role. It has been widely, but mistakenly, believed that linear regression is valid only when the outcome (i.e., dependent variable) is normally distributed. As a result, the dependent variable is often log or square-root transformed to achieve a normal distribution.[1]

Fitting linear regression does not require normality of the dependent variable, although estimating the standard errors and testing statistical significance of the coefficients do when the sample size is small. However, when the sample size is large, the latter does not require normality either. This is because the Central Limit Theorem (CLT) guarantees the normal distribution of the coefficient estimators which are the weighted average of the dependent variable.[2] In fact, based on their simulation analyses, Lumley and colleagues concluded that "These results suggest that cost data can be analyzed using least-squares approaches with samples of 500 and more." Most importantly, for large samples, not only is the outcome transformation for normality not needed but can also result in severe bias of the coefficient estimates.[2-6]

Generalized Linear Models (GLM) have also been proposed for analyzing right-skewed data, especially the Gamma model with the log link for cost analyses. However, as Manning and Mullahy noted in describing log transformation in their 2001 landmark paper,[1] "When she was good, she was very, very good. But when she was bad, she was horrid!" We fitted the Gamma model with the log link and compared its model fit statistics to those of the multivariate linear model:

Model	MAPE	MAE
Multivariate Linear Model	1.5	6,723.2
GLM (Gamma with Log Link)	315.5	34,879,057.5

Here, MAPE (mean absolute percentage error) = $\frac{1}{N}\sum_{n=1}^{N}\left|\frac{observed\ value - predicted\ value}{observed\ value}\right|$, and MAE (mean absolute error) = $\frac{1}{N}\sum_{n=1}^{N}|observed\ value - predicted\ value|$.

Further examination of the errors revealed that the Gamma model grossly overpredicted the cost. We contacted the statistical team at SAS and shared our SAS codes and results to rule out any syntax errors. A senior statistician informed us that the gamma model did not fit our data, which confirmed our conclusion.

Taken together, these assessments led us to choose to use multivariate linear regression modeling to adjust for confounding variables. Of special note, the signs of the confounder coefficient estimates may not be intuitive. For instance, the variable "age" has a negative coefficient, but it must be interpreted with the age categories together because of its non-linear effect and multicollinearity. For the aim of this study, what matters is how inclusion/exclusion of age or age groups affects the estimate of the treatment effect. Our sensitivity analyses showed the treatment effects from including age only, age groups only, or both are nearly identical (-721.8, -720.3, and -721.2, respectively). In addition, the large negative intercept (-22,208) reported in Table 3 is not a sign of model misspecification but a result of the CPM risk score scaling which was centered on 100. If the risk score were centered on zero, the intercept would be a large positive number, 17,261; and if the risk scores were scaled to have a minimum value of zero, then the intercept would be 831.

1.2. Endogeneity

Endogeneity arises when a regressor is correlated with the error term in the regression, which results in inconsistent or biased estimates. Endogeneity can result under the following circumstances: (1) Errors-in-variables, (2) simultaneous causality, and (3) omitted variables. In the VHA system, clinical encounters such as outpatient visits and inpatient admissions are recorded into centralized databases with few errors -- each encounter is recorded with service date and provider IDs; and the accuracy of the encounters is routinely audited by local Compliance Offices and external stakeholders such as the Office of the Inspector General (OIG). It is possible but unlikely changes of costs drive changes of PC visits – the number of PC providers in the VHA system is rather fixed and the number of patients a PC provider sees each day does not change much either, which is evidenced by the average number of PC in-person visits per patient as shown in Table 1. Despite our earnest effort, there might be some variables

that should be included in the model but we are not aware of. Thus, we conducted Hausman's endogeneity test, which indicate no sign of endogeneity ($p = 0.2934$).

2. Sensitivity Analyses

2.1. Inclusion of Medicare Expenditures

Veteran patients also seek care from providers in the community covered by Medicare coverage. Our stratification analysis by Medicare eligible age (s-Tables 4 and 5) indicates Medicare eligibility did not meaningfully affect the association between PC visits and costs to the VHA. To further validated this result, we obtained data on Medicare expenditures (FY 2016-2019) for VHA enrollees. The VHA (through its program office, Medicare & Medicaid Analysis Center) has a contractual agreement with the CMS (Centers for Medicare and Medicaid Services) to receive Veterans' Medicare data. The VHA receives both fee-for-service and Medicare Advantage (MA) data, but MA costs are not available to the VHA. About 28% of VHA patients using Medicare are enrolled in MA.

With Medicare expenditures added into the outcome (VHA costs), we refitted the multivariate linear model (pooled data and by year) and reported the results in s-Tables 6 and 7. As shown, the estimated cost reduction associated with each additional in-person visit was larger ($1,157.1) than the reduction with VHA costs only ($721.2). Refitting the model with in-person visits as a discrete variable yielded similar results and thus not reported here.

2.2. Fixed vs. Random Effect Model

To control for clustering or hospital effects we employed fixed effect models which included all VHA hospitals in the regression as fixed effects. However, fixed effect models do not allow correlations of patient outcomes within hospitals. Hence, such a model may produce inefficient (larger standard errors) albeit unbiased estimates, especially when sample size is small. To ascertain this issue, we refitted the multivariate model with random effects (only FY 2019 data were used due to excessive computing time). As shown in s-Table 8, the random effect model yielded nearly identical estimate of the in-person visit effect ($783.2) compared to the fixed

effect model ($797.4; s-Table 2). We chose to report the results of fixed effect models because estimating random effects requires excessive computational resources and running time for this large-scale study, which makes sensitivity analyses challenging.

2.3. Alternative Risk Adjustments

Adjustment for disease severity or patient risk is critically important in observational studies examining healthcare costs. Studies analyzing program/intervention effects on costs often adjust for patient risk by using a group of conditions (e.g., CHF and COPD). However, the estimate of the treatment effect can vary with what and how many conditions are included, and intractable multicollinearity may result if many conditions are used. In addition, using condition groups precludes risk stratification analysis. The CPM (Case-mix for Performance Management) risk score employed in our main analyses was specifically developed to predict VHA costs and has been shown to outperform alternative risk adjusters. Nevertheless, we examined and compared several alternative risk adjustment schemes with FY2019 data.

Considering a large part of the PCP effort is to coordinate care among specialists and manage medications, we postulate that the number of diagnoses of each patient may play a significant role in the relationship between primary care and total patient care cost. Thus, we counted the number of unique ICD-10 CM codes (mean =15.2; sd = 14.3) as a proxy for the number of diagnoses at the patient level and used it in place of the CPM risk score in our multivariate modeling. With this new risk score, the effect of in-person visits was estimated at $917.2, which was moderately higher than the estimate based on the CPM risk score ($797.4; s-Table 2).

Given the limitation of using ICD-10 counts as the number of diagnoses (e.g., a diabetic patient can have several different ICD-10 codes recorded), we next mapped all the patients into 530 homogenous CCRS clinical groups by using the crosswalk between ICD-10 codes and CCSR (Clinical Classifications Software Refined, https://www.hcup-us.ahrq.gov/). We then counted the number of unique CCSR groups for each patient (mean = 11.6; sd = 9.2) and used it in place of the CPM risk to refit the multivariate cost model; the resultant estimate was $864.1.

Considering the number of diagnoses per se might not be an optimal predictor of total cost. We subsequently developed a risk model predicting VHA costs based on the 530 homogenous

clinical groups classified by CCSR (Clinical Classifications Software Refined; https://www.hcup-us.ahrq.gov/toolssoftware/ccsr/ccs_refined.jsp), as well as patient age and gender. This alternative risk model yielded high predictive power with VHA costs (R^2 = 0.705). Refitting the cost model with this alterative risk score yielded a slightly lower estimate ($732.8) compared to the result based on the CPM risk score.

To further ascertain the reliability of the risk scores, we expanded the 530 CCSR categories into 950 more clinically homogeneous groups based on the specificity of ICD-10 codes and refitted the patient risk model (R^2 = 0.726). Using the resultant risk score in place of the CPM risk score, we refitted the multivariate cost model and reached an estimate of $751 cost reduction associated with each additional PC in-person visit, close to the estimate based on the CPM risk score.

2.4. Additional Sensitivity Analyses

In multivariate linear regression, multicollinearity could bias the coefficient estimates. Thus, we assessed whether inclusion/exclusion of telehealth or phone visits in the regression analysis affected the estimated effect of in-person visits on total cost. We re-estimated the effect of in-person visits by excluding telehealth visits from the regression, which yielded an estimate of $722.3. Likewise, when phone visits were excluded from the regression, the estimated effect was $736.0, and when both telehealth and phone visits were excluded, the estimate was $737.3. All these results were close to $721.2 as reported in Table 3 (pooled data: FY 2016-2019). We also examined multicollinearities between in-person visits and other independent variables and found no appreciable bias.

We further conducted other sensitivity analyses. We refitted the model by excluding HBPC (home-based primary care) patients and/or deceased patients, which resulted in little change of our findings. We also examined different combinations of age and age categories (age only, age categories only, and both), tested interactions and nonlinearity of the independent variables, and ascertained multicollinearity and heteroscedasticity. All these analyses yielded little changes of our findings and are not reported further.

References

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s-Table 1. Annual Average Patient Care Costs by CPM Risk Decile and Number of PC Visits (Pooled Data: FY2016-2019)

CPM Risk Decile	Number of PC Visits (Annual)	Number of Patients	VA Outpatient Cost	VA Inpatient Cost	Community Care Cost	Prescription Drug Cost	Total Cost
1	0	564,336	$1,052	$205	$120	$112	$1,377
1	1	1,271,184	$886	$2	$29	$95	$917
1	2	238,206	$1,372	$0	$35	$133	$1,407
1	3	38,712	$1,777	$0	$44	$143	$1,821
1	4	7,441	$2,237	$0	$59	$154	$2,296
1	5	1,939	$2,589	$0	$71	$159	$2,660
1	6	619	$3,024	$0	$81	$174	$3,105
1	7	227	$3,090	$0	$103	$140	$3,193
1	8	127	$3,746	$0	$21	$170	$3,767
1	9	75	$3,936	$0	$35	$208	$3,971
1	10	67	$3,583	$0	$15	$138	$3,598
1	11	70	$3,768	$0	$3	$189	$3,771
1	12	95	$3,858	$0	$12	$189	$3,870
1	>12	200	$4,637	$0	$29	$214	$4,667
2	0	321,185	$1,668	$304	$307	$196	$2,279
2	1	1,214,295	$1,298	$5	$64	$161	$1,366
2	2	445,130	$1,758	$2	$63	$198	$1,823
2	3	106,214	$2,144	$0	$72	$205	$2,216
2	4	24,733	$2,551	$0	$83	$217	$2,633
2	5	6,664	$2,993	$0	$105	$262	$3,098
2	6	2,058	$3,269	$0	$138	$228	$3,407
2	7	869	$3,618	$0	$105	$314	$3,723
2	8	400	$3,957	$0	$248	$280	$4,205
2	9	247	$4,191	$0	$118	$417	$4,309
2	10	159	$3,965	$0	$31	$227	$3,996
2	11	164	$4,383	$0	$39	$512	$4,422
2	12	249	$4,544	$0	$22	$518	$4,566
2	>12	588	$5,763	$0	$43	$391	$5,805
3	0	204,226	$2,578	$331	$505	$302	$3,414
3	1	1,075,058	$1,829	$9	$120	$234	$1,958
3	2	580,282	$2,262	$4	$108	$265	$2,374
3	3	183,371	$2,662	$3	$118	$275	$2,783
3	4	52,786	$3,050	$2	$129	$300	$3,181
3	5	15,768	$3,405	$5	$151	$306	$3,561
3	6	5,341	$3,871	$7	$194	$385	$4,072
3	7	2,026	$4,258	$7	$225	$475	$4,490
3	8	965	$4,585	$0	$231	$433	$4,816
3	9	532	$4,917	$0	$140	$571	$5,056
3	10	354	$5,038	$0	$298	$457	$5,336
3	11	299	$5,290	$0	$118	$619	$5,408
3	12	415	$6,123	$0	$118	$796	$6,241
3	>12	1,183	$6,795	$2	$161	$706	$6,958

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CPM Risk Decile	Number of PC Visits (Annual)	Number of Patients	VA Outpatient Cost	VA Inpatient Cost	Community Care Cost	Prescription Drug Cost	Total Cost
4	0	150,549	$3,698	$457	$736	$451	$4,891
4	1	911,362	$2,532	$17	$197	$327	$2,746
4	2	655,760	$2,948	$8	$167	$361	$3,122
4	3	262,334	$3,322	$7	$189	$355	$3,517
4	4	90,600	$3,702	$6	$207	$369	$3,915
4	5	30,569	$4,078	$12	$214	$409	$4,304
4	6	11,117	$4,496	$3	$288	$432	$4,787
4	7	4,442	$4,716	$8	$337	$412	$5,061
4	8	1,990	$5,168	$3	$284	$489	$5,455
4	9	1,152	$5,450	$36	$243	$563	$5,729
4	10	720	$5,464	$0	$266	$498	$5,730
4	11	553	$5,582	$0	$141	$522	$5,722
4	12	652	$6,708	$0	$259	$1,152	$6,967
4	>12	2,138	$7,353	$0	$179	$747	$7,531
5	0	119,814	$5,031	$700	$1,055	$662	$6,785
5	1	752,669	$3,505	$35	$324	$460	$3,864
5	2	685,134	$3,856	$24	$260	$475	$4,140
5	3	336,305	$4,217	$13	$272	$466	$4,501
5	4	135,586	$4,595	$19	$287	$511	$4,900
5	5	51,599	$4,946	$11	$353	$468	$5,310
5	6	20,407	$5,342	$13	$336	$715	$5,691
5	7	8,551	$5,670	$14	$436	$532	$6,119
5	8	3,901	$6,111	$81	$489	$602	$6,681
5	9	2,110	$6,392	$1	$361	$580	$6,754
5	10	1,245	$6,713	$15	$360	$763	$7,088
5	11	936	$7,032	$33	$376	$722	$7,441
5	12	977	$6,625	$16	$301	$804	$6,943
5	>12	3,352	$8,782	$1	$340	$1,105	$9,123
6	0	96,574	$6,802	$1,361	$1,496	$906	$9,659
6	1	607,674	$4,885	$114	$514	$663	$5,514
6	2	680,777	$5,132	$58	$403	$651	$5,592
6	3	398,788	$5,456	$44	$397	$627	$5,897
6	4	186,537	$5,807	$40	$432	$617	$6,279
6	5	80,684	$6,131	$27	$466	$611	$6,625
6	6	34,731	$6,474	$33	$501	$640	$7,008
6	7	15,358	$6,813	$70	$545	$674	$7,428
6	8	7,504	$7,155	$25	$557	$653	$7,737
6	9	3,867	$7,645	$8	$601	$811	$8,254
6	10	2,293	$7,780	$9	$602	$820	$8,391
6	11	1,566	$7,995	$35	$533	$928	$8,564
6	12	1,449	$8,512	$43	$532	$1,199	$9,087
6	>12	5,358	$10,135	$9	$373	$1,436	$10,516

s-Table 1. Annual Average Patient Care Costs by CPM Risk Decile and Number of PC Visits (Pooled Data: FY2016-2019)

CPM Risk Decile	Number of PC Visits (Annual)	Number of Patients	VA Outpatient Cost	VA Inpatient Cost	Community Care Cost	Prescription Drug Cost	Total Cost
7	0	84,705	$9,259	$2,714	$2,498	$1,286	$14,470
7	1	478,314	$6,961	$346	$835	$1,024	$8,141
7	2	637,905	$7,057	$179	$634	$922	$7,870
7	3	445,402	$7,289	$140	$622	$866	$8,051
7	4	240,452	$7,583	$122	$651	$834	$8,356
7	5	116,916	$7,920	$109	$689	$839	$8,717
7	6	55,578	$8,189	$95	$740	$832	$9,025
7	7	26,792	$8,544	$69	$758	$839	$9,371
7	8	13,225	$8,794	$102	$822	$979	$9,718
7	9	7,092	$9,175	$65	$823	$877	$10,063
7	10	4,171	$9,722	$72	$903	$1,151	$10,697
7	11	2,648	$10,212	$57	$740	$1,159	$11,009
7	12	2,249	$10,348	$82	$604	$1,310	$11,034
7	>12	8,210	$12,215	$47	$670	$1,499	$12,931
8	0	84,275	$13,345	$4,802	$3,659	$2,570	$21,806
8	1	365,400	$10,046	$1,131	$1,506	$1,589	$12,683
8	2	563,602	$10,026	$635	$1,072	$1,385	$11,733
8	3	464,059	$10,192	$490	$1,006	$1,269	$11,688
8	4	290,751	$10,412	$405	$1,010	$1,215	$11,828
8	5	160,570	$10,670	$356	$1,098	$1,177	$12,124
8	6	84,915	$10,949	$300	$1,102	$1,172	$12,352
8	7	43,857	$11,327	$311	$1,214	$1,196	$12,852
8	8	23,551	$11,733	$245	$1,223	$1,217	$13,202
8	9	12,981	$12,088	$289	$1,323	$1,278	$13,701
8	10	7,673	$12,294	$245	$1,298	$1,240	$13,837
8	11	5,003	$12,442	$370	$1,230	$1,290	$14,042
8	12	3,794	$13,205	$254	$1,219	$1,489	$14,678
8	>12	13,267	$15,226	$181	$1,013	$1,962	$16,419
9	0	101,385	$18,969	$9,852	$5,444	$3,835	$34,265
9	1	267,256	$15,213	$4,351	$3,063	$2,699	$22,626
9	2	456,359	$15,216	$2,683	$2,171	$2,346	$20,070
9	3	443,207	$15,316	$2,120	$1,954	$2,091	$19,389
9	4	328,771	$15,537	$1,809	$1,916	$1,950	$19,262
9	5	208,103	$15,788	$1,561	$1,923	$1,858	$19,273
9	6	124,425	$16,104	$1,375	$2,004	$1,799	$19,483
9	7	72,358	$16,363	$1,256	$2,064	$1,771	$19,683
9	8	41,674	$16,855	$1,216	$2,048	$1,783	$20,118
9	9	24,787	$17,119	$1,093	$2,150	$1,814	$20,362
9	10	15,152	$17,299	$1,004	$2,123	$1,723	$20,426
9	11	9,699	$17,743	$1,053	$2,316	$1,821	$21,112
9	12	6,804	$18,240	$1,231	$2,184	$1,940	$21,656
9	>12	22,706	$20,485	$936	$1,926	$2,349	$23,347

s-Table 1. Annual Average Patient Care Costs by CPM Risk Decile and Number of PC Visits (Pooled Data: FY2016-2019)

CPM Risk Decile	Number of PC Visits (Annual)	Number of Patients	VA Outpatient Cost	VA Inpatient Cost	Community Care Cost	Prescription Drug Cost	Total Cost
10	0	153,207	$31,576	$41,220	$12,898	$6,281	$85,694
10	1	203,374	$26,594	$32,946	$9,748	$5,529	$69,288
10	2	315,723	$27,253	$24,156	$7,603	$5,136	$59,012
10	3	350,971	$28,136	$20,582	$6,888	$4,879	$55,606
10	4	309,975	$28,938	$18,994	$6,620	$4,587	$54,552
10	5	238,998	$29,970	$18,341	$6,696	$4,487	$55,007
10	6	170,330	$30,996	$18,148	$6,877	$4,400	$56,021
10	7	116,035	$32,129	$18,254	$7,019	$4,404	$57,402
10	8	78,356	$33,278	$18,404	$7,202	$4,462	$58,883
10	9	52,399	$34,300	$18,239	$7,468	$4,411	$60,007
10	10	35,646	$35,356	$18,447	$7,613	$4,504	$61,416
10	11	24,297	$36,524	$19,096	$7,817	$4,550	$63,438
10	12	17,467	$37,383	$19,385	$7,854	$4,603	$64,623
10	>12	55,900	$41,252	$18,658	$7,619	$5,147	$67,529

s-Table 2. Multivariate Linear Model Estimate of PC Visit Effect on Total Patient Care Cost by Fiscal Year (FY2016-2019)

	FY2016 (N=5,186,112)		FY2017 (N=5,261,550)		FY2018 (N=5,373,568)		FY2019 (N=5,410,034)	
Variable	Parameter Estimate	Pr > |t|	Parameter Estimate	Pr > |t|	Parameter Estimate	Pr > |t|	Parameter Estimate	Pr > |t|
Intercept	-20,849.00	<.0001	-20,767.00	<.0001	-21,756.00	<.0001	-23,625.00	<.0001
Number of PC Visits (in person)	-664.17	<.0001	-658.89	<.0001	-748.39	<.0001	-797.42	<.0001
Number of PC Visits (telehealth)	-438.49	<.0001	-265.04	<.0001	-271.94	<.0001	-328.08	<.0001
Number of PC Visits (phone)	-93.92	<.0001	-58.29	<.0001	-86.53	<.0001	-67.97	<.0001
Age	-77.97	<.0001	-70.47	<.0001	-66.75	<.0001	-55.99	<.0001
Age >= 35 and < 45	859.32	<.0001	569.72	<.0001	388.65	<.0001	315.62	<.0001
Age >= 45 and < 55	1,721.96	<.0001	1,385.35	<.0001	1,180.31	<.0001	1,012.35	<.0001
Age >= 55 and < 65	2,462.72	<.0001	2,000.97	<.0001	1,678.13	<.0001	1,406.07	<.0001
Age >= 65 and < 75	3,061.28	<.0001	2,571.87	<.0001	2,244.80	<.0001	1,777.33	<.0001
Age >= 75	4,344.88	<.0001	3,806.32	<.0001	3,498.61	<.0001	2,859.28	<.0001
Gender (Female)	-496.82	<.0001	-552.94	<.0001	-645.58	<.0001	-675.75	<.0001
Marital Status (Married)	-703.73	<.0001	-692.95	<.0001	-745.69	<.0001	-733.76	<.0001
Racial Status (White)	-1,259.93	<.0001	-1,025.06	<.0001	-584.00	<.0001	301.20	<.0001
Racial Status (Black)	-1,706.00	<.0001	-1,337.13	<.0001	-780.14	<.0001	116.91	0.0005
Enrolled in Medicare	110.23	<.0001	124.16	<.0001	211.89	<.0001	278.69	<.0001
Enrolled in Medicaid	170.72	0.0095	458.03	<.0001	130.89	0.0544	303.57	<.0001
Covered by Private Insurance	-1,446.96	<.0001	-1,524.10	<.0001	-1,593.83	<.0001	-1,562.93	<.0001
Disability Rating (%)	-9.33	<.0001	-9.64	<.0001	-9.22	<.0001	-8.42	<.0001
Disability Rating 70%+ (% of patients)	98.50	0.0055	76.31	0.025	124.64	0.0003	119.27	0.0005
Drive Time to Closest VHA PCP (Min)	-3.34	<.0001	-3.66	<.0001	-3.59	<.0001	-3.84	<.0001
CPM Risk Score	378.73	<.0001	381.23	<.0001	399.91	<.0001	411.87	<.0001

Notes: The fixed effects of the 140 hospitals are not shown here. Age < 35, racial status (other) were used as reference groups.

s-Table 3. Multivariate Linear Model Estimate of PC Visit Effect on Total Patient Care Cost (Effect of Discrete Visits; by Fiscal Year: FY2016-2019)

	FY2016 (N=5,186,112)		FY2017 (N=5,261,550)		FY2018 (N=5,373,568)		FY2019 (N=5,410,034)	
Variable	Parameter Estimate	Pr > |t|	Parameter Estimate	Pr > |t|	Parameter Estimate	Pr > |t|	Parameter Estimate	Pr > |t|
Intercept	-19,201.00	<.0001	-18,680.00	<.0001	-19,648.00	<.0001	-21,010.00	<.0001
In-person Visit 1	-3,619.13	<.0001	-3,751.82	<.0001	-4,142.74	<.0001	-4,300.50	<.0001
In-person Visit 2	-4,657.11	<.0001	-4,826.61	<.0001	-5,345.76	<.0001	-5,521.71	<.0001
In-person Visit 3	-5,486.79	<.0001	-5,667.00	<.0001	-6,276.39	<.0001	-6,493.52	<.0001
In-person Visit 4	-6,258.09	<.0001	-6,375.59	<.0001	-7,058.65	<.0001	-7,271.77	<.0001
In-person Visit 5	-6,886.23	<.0001	-6,991.64	<.0001	-7,714.18	<.0001	-8,002.15	<.0001
In-person Visit 6	-7,447.49	<.0001	-7,535.69	<.0001	-8,349.57	<.0001	-8,781.84	<.0001
In-person Visit 7	-7,986.95	<.0001	-8,201.90	<.0001	-8,884.67	<.0001	-9,298.70	<.0001
In-person Visit 8	-8,440.93	<.0001	-8,796.20	<.0001	-9,437.74	<.0001	-9,719.15	<.0001
In-person Visit 9	-8,965.80	<.0001	-9,057.08	<.0001	-9,815.41	<.0001	-10,472.00	<.0001
In-person Visit 10	-9,331.83	<.0001	-9,461.16	<.0001	-9,944.35	<.0001	-10,613.00	<.0001
In-person Visit 11	-9,529.83	<.0001	-9,288.34	<.0001	-9,952.73	<.0001	-10,379.00	<.0001
In-person Visit 12	-8,208.09	<.0001	-8,461.78	<.0001	-9,616.80	<.0001	-9,968.56	<.0001
In-person Visits >12	-7,694.79	<.0001	-6,744.19	<.0001	-7,608.13	<.0001	-8,253.23	<.0001
Number of Visits (tele-health)	-442.13	<.0001	-267.77	<.0001	-289.27	<.0001	-356.26	<.0001
Number of Visits (phone)	-65.08	<.0001	-28.78	<.0001	-58.03	<.0001	-41.12	<.0001
Age	-67.82	<.0001	-68.75	<.0001	-60.78	<.0001	-52.00	<.0001
Age >= 35 and < 45	904.21	<.0001	667.41	<.0001	481.22	<.0001	427.90	<.0001
Age >= 45 and < 55	1,751.57	<.0001	1,557.00	<.0001	1,322.80	<.0001	1,216.43	<.0001
Age >= 55 and < 65	2,472.83	<.0001	2,232.60	<.0001	1,835.47	<.0001	1,650.60	<.0001
Age >= 65 and < 75	3,027.94	<.0001	2,827.47	<.0001	2,389.22	<.0001	2,037.82	<.0001
Age >= 75	4,083.99	<.0001	3,922.07	<.0001	3,413.62	<.0001	2,902.48	<.0001
Gender (Female)	-414.49	<.0001	-477.30	<.0001	-553.38	<.0001	-589.11	<.0001
Marital Status (Married)	-662.22	<.0001	-645.28	<.0001	-678.81	<.0001	-659.52	<.0001
Racial Status (White)	-923.15	<.0001	-659.19	<.0001	-65.65	0.0023	365.18	<.0001
Racial Status (Black)	-1,390.36	<.0001	-998.05	<.0001	-290.06	<.0001	167.54	<.0001
Enrolled in Medicare	103.00	<.0001	130.47	<.0001	207.15	<.0001	282.15	<.0001
Enrolled in Medicaid	169.38	0.0099	438.40	<.0001	85.64	0.2069	262.76	0.0001
Covered by Private Insurance	-1,416.44	<.0001	-1,490.44	<.0001	-1,540.30	<.0001	-1,499.76	<.0001
Disability Rating (%)	-8.81	<.0001	-9.15	<.0001	-8.34	<.0001	-7.30	<.0001
Disability Rating 70%+ (% of patients)	77.23	0.0291	55.08	0.1048	87.21	0.0108	75.09	0.0286
Drive Time to Closest VHA PCP (Min)	-3.42	<.0001	-3.68	<.0001	-3.80	<.0001	-4.18	<.0001
CPM Risk Score	379.07	<.0001	381.45	<.0001	399.65	<.0001	411.34	<.0001

Notes: The fixed effects of the 140 hospitals are not shown here. Visit 0 or no visit, age < 35, racial status (other) were used as reference groups.

s-Table 4. Annual Average Patient Care Costs by Risk Decile, Number of PC Visits and Medicare Eligibility Age (Pooled FY2016-2019)

		Age <= 65						Age > 65					
Risk Decile	Number of PC Visits (Annual)	Number of Patients	VA Outpatient Cost	VA Inpatient Cost	Community Care Cost	Prescription Drug Cost	Total Cost	Number of Patients	VA Outpatient Cost	VA Inpatient Cost	Community Care Cost	Prescription Drug Cost	Total Cost
1	0	301,880	$844	$158	$138	$89	$1,141	262,456	$1,292	$258	$99	$138	$1,648
1	1	551,031	$865	$1	$29	$56	$894	720,153	$903	$3	$29	$125	$934
1	2	97,113	$1,392	$0	$40	$86	$1,432	141,093	$1,358	$0	$32	$165	$1,390
1	3	15,951	$1,848	$0	$47	$107	$1,895	22,761	$1,728	$0	$41	$168	$1,769
1	4	3,282	$2,248	$0	$90	$112	$2,338	4,159	$2,228	$0	$34	$186	$2,262
1	5	936	$2,522	$0	$81	$110	$2,602	1,003	$2,651	$0	$63	$205	$2,714
1	6	300	$2,909	$0	$43	$116	$2,952	319	$3,132	$0	$117	$228	$3,249
1	7	109	$3,216	$0	$72	$128	$3,288	118	$2,974	$0	$131	$151	$3,106
1	8	47	$4,440	$0	$44	$70	$4,484	80	$3,338	$0	$7	$229	$3,345
1	9	28	$3,795	$0	$94	$176	$3,890	47	$4,020	$0	$0	$227	$4,020
1	10	25	$4,094	$0	$40	$99	$4,134	42	$3,279	$0	$0	$161	$3,279
1	11	19	$4,897	$0	$0	$132	$4,897	51	$3,347	$0	$4	$211	$3,351
1	12	15	$3,506	$0	$9	$75	$3,515	80	$3,924	$0	$13	$210	$3,937
1	>12	67	$5,330	$0	$29	$211	$5,359	133	$4,288	$0	$30	$216	$4,318
2	0	205,840	$1,457	$231	$241	$159	$1,929	115,345	$2,045	$436	$425	$261	$2,906
2	1	555,009	$1,323	$5	$58	$106	$1,386	659,286	$1,276	$4	$68	$208	$1,349
2	2	191,877	$1,790	$1	$70	$134	$1,861	253,253	$1,733	$2	$58	$246	$1,794
2	3	44,273	$2,214	$0	$80	$147	$2,294	61,941	$2,094	$0	$66	$247	$2,161
2	4	10,312	$2,608	$0	$90	$159	$2,698	14,421	$2,510	$0	$77	$258	$2,587
2	5	2,866	$3,020	$0	$100	$170	$3,120	3,798	$2,973	$0	$108	$332	$3,081
2	6	854	$3,391	$0	$96	$211	$3,487	1,204	$3,183	$0	$168	$240	$3,351
2	7	346	$3,740	$0	$75	$171	$3,816	523	$3,537	$0	$125	$409	$3,662
2	8	176	$4,160	$0	$95	$248	$4,254	224	$3,797	$0	$369	$306	$4,166
2	9	94	$4,726	$0	$83	$698	$4,809	153	$3,862	$0	$140	$245	$4,002
2	10	54	$3,981	$0	$88	$208	$4,069	105	$3,957	$0	$2	$237	$3,959
2	11	46	$5,701	$0	$55	$1,186	$5,756	118	$3,869	$0	$33	$250	$3,902
2	12	41	$6,898	$0	$19	$1,886	$6,917	208	$4,080	$0	$23	$249	$4,103
2	>12	162	$6,280	$0	$60	$340	$6,341	426	$5,566	$0	$36	$410	$5,602
3	0	135,517	$2,366	$235	$340	$264	$2,941	68,709	$2,995	$523	$829	$376	$4,346
3	1	520,046	$1,893	$6	$103	$160	$2,003	555,012	$1,770	$12	$135	$302	$1,916
3	2	267,367	$2,314	$5	$107	$190	$2,426	312,915	$2,219	$3	$108	$330	$2,330
3	3	81,672	$2,721	$6	$121	$204	$2,848	101,699	$2,615	$0	$115	$331	$2,730
3	4	22,964	$3,145	$3	$139	$227	$3,286	29,822	$2,978	$1	$121	$357	$3,100
3	5	6,859	$3,476	$1	$151	$238	$3,628	8,909	$3,350	$9	$151	$359	$3,510
3	6	2,362	$3,944	$15	$179	$392	$4,139	2,979	$3,814	$0	$205	$380	$4,019
3	7	803	$4,593	$0	$126	$570	$4,719	1,223	$4,038	$11	$290	$413	$4,339
3	8	409	$4,967	$0	$166	$447	$5,133	556	$4,304	$0	$280	$424	$4,584
3	9	174	$5,480	$0	$79	$811	$5,559	358	$4,643	$0	$169	$454	$4,812
3	10	122	$5,542	$0	$415	$606	$5,957	232	$4,773	$0	$236	$378	$5,009
3	11	111	$6,165	$0	$70	$862	$6,235	188	$4,774	$0	$146	$476	$4,920
3	12	105	$6,035	$0	$83	$886	$6,119	310	$6,153	$0	$130	$765	$6,283
3	>12	345	$7,198	$0	$48	$353	$7,245	838	$6,629	$3	$208	$851	$6,840

s-Table 4. Annual Average Patient Care Costs by Risk Decile, Number of PC Visits and Medicare Eligibility Age (Pooled FY2016-2019)

		Age < = 65						Age > 65					
Risk Decile	Number of PC Visits (Annual)	Number of Patients	VA Outpatient Cost	VA Inpatient Cost	Community Care Cost	Prescription Drug Cost	Total Cost	Number of Patients	VA Outpatient Cost	VA Inpatient Cost	Community Care Cost	Prescription Drug Cost	Total Cost
4	0	100,695	$3,387	$361	$426	$380	$4,174	49,854	$4,325	$651	$1,364	$593	$6,340
4	1	465,620	$2,633	$17	$155	$240	$2,805	445,742	$2,427	$17	$241	$419	$2,685
4	2	316,459	$3,020	$9	$161	$272	$3,190	339,301	$2,880	$6	$173	$444	$3,059
4	3	123,493	$3,391	$3	$189	$277	$3,582	138,841	$3,260	$11	$189	$426	$3,459
4	4	41,566	$3,773	$8	$202	$289	$3,982	49,034	$3,642	$4	$211	$437	$3,858
4	5	13,893	$4,159	$5	$205	$335	$4,368	16,676	$4,011	$19	$222	$470	$4,251
4	6	4,921	$4,579	$5	$234	$360	$4,817	6,196	$4,430	$2	$331	$489	$4,764
4	7	1,871	$4,791	$11	$215	$362	$5,017	2,571	$4,661	$6	$426	$448	$5,093
4	8	838	$5,438	$0	$287	$471	$5,725	1,152	$4,972	$5	$282	$502	$5,259
4	9	460	$5,938	$0	$357	$548	$6,295	692	$5,126	$59	$168	$573	$5,353
4	10	247	$5,919	$0	$207	$499	$6,126	473	$5,227	$0	$296	$497	$5,523
4	11	166	$6,016	$0	$174	$432	$6,190	387	$5,395	$0	$126	$561	$5,522
4	12	178	$7,727	$0	$67	$1,147	$7,793	474	$6,325	$0	$331	$1,153	$6,657
4	>12	681	$8,280	$0	$163	$870	$8,443	1,457	$6,919	$0	$186	$689	$7,105
5	0	80,836	$4,685	$512	$580	$577	$5,777	38,978	$5,748	$1,089	$2,040	$838	$8,878
5	1	402,470	$3,610	$33	$246	$347	$3,889	350,199	$3,384	$39	$413	$589	$3,835
5	2	343,281	$3,948	$24	$232	$371	$4,204	341,853	$3,764	$24	$288	$579	$4,076
5	3	163,653	$4,300	$11	$263	$371	$4,574	172,652	$4,137	$14	$280	$556	$4,431
5	4	64,217	$4,672	$18	$274	$468	$4,964	71,369	$4,526	$19	$298	$549	$4,843
5	5	23,941	$5,053	$13	$313	$392	$5,380	27,658	$4,852	$10	$387	$534	$5,249
5	6	9,274	$5,432	$12	$317	$890	$5,760	11,133	$5,267	$13	$352	$569	$5,633
5	7	3,705	$5,891	$20	$376	$450	$6,286	4,846	$5,501	$9	$481	$595	$5,991
5	8	1,734	$6,475	$11	$623	$579	$7,109	2,167	$5,820	$138	$381	$621	$6,339
5	9	821	$6,827	$3	$325	$485	$7,155	1,289	$6,115	$0	$383	$640	$6,498
5	10	497	$7,185	$37	$306	$837	$7,528	748	$6,400	$0	$397	$714	$6,797
5	11	330	$7,699	$80	$346	$843	$8,125	606	$6,668	$8	$392	$656	$7,068
5	12	292	$7,263	$22	$207	$988	$7,492	685	$6,354	$14	$341	$726	$6,709
5	>12	1,197	$9,529	$1	$227	$1,124	$9,757	2,155	$8,368	$0	$404	$1,095	$8,771
6	0	64,233	$6,324	$1,150	$853	$800	$8,328	32,341	$7,750	$1,780	$2,773	$1,115	$12,302
6	1	338,200	$5,009	$108	$376	$541	$5,492	269,474	$4,730	$122	$689	$817	$5,541
6	2	352,318	$5,236	$59	$343	$534	$5,638	328,459	$5,020	$56	$467	$777	$5,543
6	3	198,671	$5,577	$36	$366	$535	$5,979	200,117	$5,336	$52	$428	$717	$5,816
6	4	91,037	$5,935	$40	$406	$532	$6,381	95,500	$5,685	$40	$457	$699	$6,182
6	5	38,422	$6,261	$21	$430	$524	$6,712	42,262	$6,013	$33	$500	$690	$6,546
6	6	16,042	$6,627	$32	$459	$551	$7,118	18,689	$6,342	$34	$537	$717	$6,913
6	7	6,828	$6,944	$44	$487	$576	$7,475	8,530	$6,707	$90	$592	$753	$7,390
6	8	3,175	$7,471	$37	$434	$615	$7,941	4,329	$6,923	$16	$648	$681	$7,586
6	9	1,582	$8,191	$2	$534	$894	$8,727	2,285	$7,268	$13	$646	$753	$7,927
6	10	879	$8,151	$0	$527	$710	$8,678	1,414	$7,549	$15	$649	$888	$8,213
6	11	552	$8,509	$29	$458	$996	$8,995	1,014	$7,716	$39	$574	$891	$8,329
6	12	491	$9,741	$38	$701	$1,410	$10,480	958	$7,883	$45	$446	$1,091	$8,373
6	>12	2,022	$10,843	$6	$430	$1,495	$11,279	3,336	$9,705	$10	$339	$1,400	$10,054
7	0	53,638	$8,381	$2,504	$1,628	$1,208	$12,513	31,067	$10,774	$3,075	$3,999	$1,421	$17,848
7	1	274,120	$7,082	$319	$594	$868	$7,995	204,194	$6,798	$382	$1,158	$1,233	$8,338
7	2	337,871	$7,167	$172	$532	$787	$7,871	300,034	$6,934	$186	$749	$1,074	$7,870
7	3	226,929	$7,411	$136	$556	$744	$8,103	218,473	$7,162	$145	$690	$993	$7,997
7	4	118,845	$7,707	$109	$598	$730	$8,413	121,607	$7,462	$135	$703	$936	$8,300
7	5	56,169	$8,077	$93	$627	$737	$8,797	60,747	$7,774	$124	$746	$934	$8,644
7	6	26,187	$8,351	$75	$678	$746	$9,104	29,391	$8,045	$113	$796	$909	$8,954
7	7	12,424	$8,725	$67	$713	$763	$9,505	14,368	$8,387	$71	$798	$905	$9,256
7	8	5,895	$9,091	$128	$751	$789	$9,971	7,330	$8,554	$81	$879	$1,132	$9,514
7	9	3,003	$9,588	$91	$737	$811	$10,417	4,089	$8,872	$45	$887	$926	$9,803
7	10	1,742	$10,466	$36	$804	$929	$11,306	2,429	$9,188	$98	$974	$1,310	$10,260
7	11	1,055	$10,790	$26	$686	$1,158	$11,502	1,593	$9,829	$78	$775	$1,159	$10,682
7	12	859	$11,219	$67	$596	$1,370	$11,882	1,390	$9,810	$91	$609	$1,272	$10,510
7	>12	3,237	$13,012	$55	$671	$1,618	$13,739	4,973	$11,696	$41	$669	$1,422	$12,405

s-Table 4. Annual Average Patient Care Costs by Risk Decile, Number of PC Visits and Medicare Eligibility Age (Pooled FY2016-2019)

		Age < = 65						Age > 65					
Risk Decile	Number of PC Visits (Annual)	Number of Patients	VA Outpatient Cost	VA Inpatient Cost	Community Care Cost	Prescription Drug Cost	Total Cost	Number of Patients	VA Outpatient Cost	VA Inpatient Cost	Community Care Cost	Prescription Drug Cost	Total Cost
8	0	48,771	$12,109	$4,729	$2,290	$3,032	$19,128	35,504	$15,043	$4,902	$5,540	$1,935	$25,485
8	1	211,832	$10,204	$1,047	$1,059	$1,508	$12,309	153,568	$9,829	$1,246	$2,123	$1,700	$13,198
8	2	301,628	$10,210	$612	$885	$1,312	$11,707	261,974	$9,814	$661	$1,288	$1,470	$11,762
8	3	237,764	$10,365	$457	$866	$1,172	$11,688	226,295	$10,009	$525	$1,154	$1,372	$11,688
8	4	144,888	$10,603	$373	$886	$1,123	$11,862	145,863	$10,224	$437	$1,133	$1,306	$11,793
8	5	78,487	$10,919	$333	$993	$1,106	$12,244	82,083	$10,432	$379	$1,199	$1,246	$12,010
8	6	40,884	$11,198	$259	$987	$1,097	$12,444	44,031	$10,718	$339	$1,210	$1,242	$12,266
8	7	20,439	$11,708	$262	$1,113	$1,126	$13,084	23,418	$10,994	$354	$1,302	$1,258	$12,650
8	8	10,800	$12,109	$188	$1,182	$1,139	$13,478	12,751	$11,415	$293	$1,259	$1,282	$12,967
8	9	5,817	$12,603	$276	$1,215	$1,255	$14,094	7,164	$11,670	$301	$1,411	$1,297	$13,382
8	10	3,405	$12,877	$251	$1,184	$1,174	$14,312	4,268	$11,830	$240	$1,389	$1,292	$13,458
8	11	2,074	$13,093	$306	$1,349	$1,279	$14,748	2,929	$11,980	$416	$1,146	$1,298	$13,542
8	12	1,527	$13,878	$220	$1,211	$1,516	$15,310	2,267	$12,752	$277	$1,224	$1,471	$14,253
8	>12	5,467	$15,985	$166	$887	$1,875	$17,038	7,800	$14,693	$191	$1,101	$2,023	$15,985
9	0	50,479	$16,998	$10,673	$3,650	$4,978	$31,321	50,906	$20,924	$9,038	$7,222	$2,702	$37,184
9	1	154,370	$15,269	$4,108	$2,175	$2,721	$21,552	112,886	$15,135	$4,684	$4,276	$2,670	$24,096
9	2	243,242	$15,488	$2,546	$1,751	$2,350	$19,785	213,117	$14,905	$2,840	$2,651	$2,342	$20,395
9	3	225,179	$15,638	$1,992	$1,673	$2,090	$19,302	218,028	$14,983	$2,251	$2,244	$2,092	$19,478
9	4	162,809	$15,930	$1,653	$1,645	$1,934	$19,227	165,962	$15,152	$1,963	$2,182	$1,967	$19,296
9	5	101,455	$16,237	$1,398	$1,672	$1,837	$19,307	106,648	$15,362	$1,717	$2,162	$1,877	$19,240
9	6	59,831	$16,597	$1,262	$1,752	$1,790	$19,610	64,594	$15,648	$1,480	$2,238	$1,806	$19,366
9	7	34,382	$16,860	$1,161	$1,827	$1,749	$19,849	37,976	$15,912	$1,343	$2,279	$1,790	$19,533
9	8	19,426	$17,544	$1,085	$1,832	$1,797	$20,461	22,248	$16,253	$1,330	$2,236	$1,771	$19,819
9	9	11,472	$17,886	$1,046	$1,897	$1,834	$20,830	13,315	$16,458	$1,132	$2,368	$1,797	$19,959
9	10	6,830	$17,972	$823	$1,859	$1,712	$20,654	8,322	$16,747	$1,153	$2,340	$1,731	$20,239
9	11	4,306	$18,568	$1,044	$2,076	$1,838	$21,688	5,393	$17,084	$1,061	$2,508	$1,807	$20,652
9	12	2,922	$19,389	$1,277	$2,009	$2,025	$22,675	3,882	$17,375	$1,197	$2,316	$1,877	$20,888
9	>12	9,753	$21,436	$1,054	$1,731	$2,370	$24,221	12,953	$19,769	$847	$2,074	$2,334	$22,689
10	0	63,515	$29,628	$45,532	$11,567	$7,986	$86,726	89,692	$32,955	$38,167	$13,841	$5,074	$84,964
10	1	105,394	$26,287	$31,246	$7,860	$5,536	$65,393	97,980	$26,924	$34,775	$11,779	$5,522	$73,478
10	2	158,899	$27,324	$22,984	$6,464	$5,130	$56,773	156,824	$27,181	$25,344	$8,756	$5,142	$61,281
10	3	168,840	$28,399	$19,593	$6,096	$4,867	$54,088	182,131	$27,891	$21,499	$7,623	$4,890	$57,013
10	4	145,419	$29,375	$17,999	$6,024	$4,583	$53,398	164,556	$28,552	$19,873	$7,147	$4,590	$55,572
10	5	110,566	$30,657	$17,228	$6,054	$4,530	$53,939	128,432	$29,378	$19,299	$7,249	$4,449	$55,926
10	6	78,396	$31,658	$16,763	$6,310	$4,419	$54,731	91,934	$30,432	$19,329	$7,361	$4,384	$57,121
10	7	53,141	$32,794	$17,152	$6,433	$4,384	$56,378	62,894	$31,566	$19,186	$7,515	$4,421	$58,267
10	8	36,163	$34,237	$17,327	$6,733	$4,476	$58,297	42,193	$32,455	$19,327	$7,604	$4,450	$59,386
10	9	24,274	$35,515	$17,557	$6,976	$4,495	$60,048	28,125	$33,253	$18,827	$7,893	$4,339	$59,973
10	10	16,550	$36,627	$17,786	$6,921	$4,353	$61,335	19,096	$34,254	$19,020	$8,212	$4,635	$61,486
10	11	11,229	$38,218	$19,005	$7,295	$4,717	$64,518	13,068	$35,070	$19,174	$8,265	$4,405	$62,509
10	12	8,037	$39,399	$19,037	$7,238	$4,663	$65,674	9,430	$35,665	$19,682	$8,380	$4,553	$63,727
10	>12	25,735	$43,845	$19,510	$7,114	$5,377	$70,469	30,165	$39,040	$17,930	$8,050	$4,952	$65,020

s-Table 5. Multivariate Linear Model Estimate of PC Visit Effect on Total Patient Care Cost (by Medicare Eligible Age; Pooled Data: FY2016-2019)

	Age < = 65 (N=10,631,768)			Age > 65 (N=10,599,496)		
Variable	Parameter Estimate	Standard Error	Pr > |t|	Parameter Estimate	Standard Error	Pr > |t|
Intercept	-23,475.00	61.56	<.0001	-22,124.00	115.01	<.0001
Number of PC Visits (in person)	-630.23	2.59	<.0001	-798.03	2.72	<.0001
Number of PC Visits (telehealth)	-283.65	9.50	<.0001	-321.79	12.69	<.0001
Number of PC Visits (phone)	-78.73	2.53	<.0001	-78.10	2.34	<.0001
Age	-40.82	0.63	<.0001	-16.70	1.36	<.0001
Age >= 35 and < 45	-30.67	15.76	0.0516			
Age >= 45 and < 55	358.27	16.30	<.0001			
Age >= 55 and < 65	488.74	18.99	<.0001			
Age >= 75				661.27	20.54	<.0001
Gender (Female)	-699.86	13.79	<.0001	195.09	38.72	<.0001
Marital Status (Married)	-329.54	10.06	<.0001	-1,033.47	11.45	<.0001
Racial Status (White)	-277.59	13.59	<.0001	-1,240.31	16.29	<.0001
Racial Status (Black)	-794.28	16.37	<.0001	-1,029.64	23.98	<.0001
Enrolled in Medicare	528.56	17.09	<.0001	116.15	15.26	<.0001
Enrolled in Medicaid	123.85	32.98	0.0002	1,310.13	126.13	<.0001
Covered by Private Insurance	-1,590.65	12.06	<.0001	-1,576.74	33.34	<.0001
Disability Rating (%)	-15.03	0.26	<.0001	-6.02	0.33	<.0001
Disability Rating 70%+ (% of patients)	10.29	21.20	0.6274	384.42	28.62	<.0001
Drive Time to Closest VHA PCP (Min)	-0.17	0.32	0.6046	-5.84	0.32	<.0001
CPM Risk Score	393.62	0.11	<.0001	391.74	0.11	<.0001
FY17	110.81	13.55	<.0001	61.65	15.22	<.0001
FY18	708.97	13.52	<.0001	734.91	15.24	<.0001
FY19	1,180.44	13.59	<.0001	1,301.27	15.48	<.0001

Notes: The fixed effects of the 140 hospitals are not shown here. Age < 35 (left panel), 65 < age < 75 (right panel), racial status (other), and FY2016 were used as reference groups.

s-Table 6. Multivariate Linear Model Estimate of PC Visit Effect on Total Patient Care Cost Including Medicare Expenditure (Pooled data: FY2016-2019; N = 21,231,264)

Variable	Parameter Estimate	Standard Error	Pr > |t|
Intercept	-25,072.00	69.43	<.0001
Number of PC Visits (in person)	-1,157.17	2.55	<.0001
Number of PC Visits (telehealth)	-400.94	10.49	<.0001
Number of PC Visits (phone)	134.50	2.33	<.0001
Age	78.09	1.28	<.0001
Age >= 35 and < 45	-962.35	27.29	<.0001
Age >= 45 and < 55	-1,258.69	34.59	<.0001
Age >= 55 and < 65	-1,365.09	44.54	<.0001
Age >= 65 and < 75	14.60	55.24	0.79
Age >= 75	3,621.74	71.59	<.0001
Gender (Female)	-682.12	18.36	<.0001
Marital Status (Married)	-431.10	10.31	<.0001
Racial Status (White)	-5,006.90	14.20	<.0001
Racial Status (Black)	-5,365.87	18.49	<.0001
Enrolled in Medicare	2,136.97	14.84	<.0001
Enrolled in Medicaid	455.87	45.28	<.0001
Covered by Private Insurance	-1,744.42	16.00	<.0001
Disability Rating (%)	-0.65	0.28	0.02
Disability Rating 70%+ (% of patients)	113.47	23.51	<.0001
Drive Time to Closest VHA PCP (Min)	-1.24	0.31	<.0001
CPM Risk Score	413.78	0.11	<.0001
FY17	239.75	13.84	<.0001
FY18	1,133.12	13.82	<.0001
FY19	1,964.36	13.94	<.0001

Notes: The fixed effects of the 140 hospitals are not shown here. Age < 35, racial status (other), and FY2016 were used as reference groups.

s-Table 7. Multivariate Linear Model Estimate of PC Visit Effect on Total Patient Care Cost Including Medicare Expenditure (by Fiscal Year: 2016-2019)

	FY2016 (N=5,186,112)		FY2017 (N=5,261,550)		FY2018 (N=5,373,568)		FY2019 (N=5,410,034)	
Variable	Parameter Estimate	Pr > |t|	Parameter Estimate	Pr > |t|	Parameter Estimate	Pr > |t|	Parameter Estimate	Pr > |t|
Intercept	-21,573.00	<.0001	-22,923.00	<.0001	-24,543.00	<.0001	-30,006.00	<.0001
Number of PC Visits (in person)	-1,023.05	<.0001	-1,034.18	<.0001	-1,163.05	<.0001	-1,348.85	<.0001
Number of PC Visits (telehealth)	-477.36	<.0001	-322.84	<.0001	-349.86	<.0001	-486.63	<.0001
Number of PC Visits (phone)	97.26	<.0001	158.08	<.0001	141.32	<.0001	151.49	<.0001
Age	29.83	<.0001	73.64	<.0001	85.05	<.0001	93.14	<.0001
Age >= 35 and < 45	-78.88	0.1593	-683.29	<.0001	-1,119.19	<.0001	-1,456.25	<.0001
Age >= 45 and < 55	165.44	0.0173	-854.20	<.0001	-1,476.19	<.0001	-2,039.26	<.0001
Age >= 55 and < 65	577.67	<.0001	-907.19	<.0001	-1,634.65	<.0001	-2,394.29	<.0001
Age >= 65 and < 75	1,950.60	<.0001	255.69	0.0217	-33.65	0.7611	-1,068.10	<.0001
Age >= 75	5,412.37	<.0001	3,544.40	<.0001	3,748.43	<.0001	2,774.75	<.0001
Gender (Female)	-469.64	<.0001	-574.16	<.0001	-754.21	<.0001	-852.58	<.0001
Marital Status (Married)	-367.19	<.0001	-380.35	<.0001	-463.99	<.0001	-461.64	<.0001
Racial Status (White)	-6,370.99	<.0001	-6,345.17	<.0001	-5,228.62	<.0001	672.30	<.0001
Racial Status (Black)	-6,730.65	<.0001	-6,629.08	<.0001	-5,493.35	<.0001	29.78	0.5162
Enrolled in Medicare	2,488.77	<.0001	2,405.83	<.0001	1,773.28	<.0001	1,858.67	<.0001
Enrolled in Medicaid	431.50	<.0001	766.44	<.0001	250.63	0.0068	358.89	0.0001
Covered by Private Insurance	-1,556.88	<.0001	-1,675.44	<.0001	-1,909.81	<.0001	-1,848.67	<.0001
Disability Rating (%)	1.67	0.003	0.49	0.3787	-0.71	0.2044	-1.06	0.0633
Disability Rating 70%+ (% of patients)	73.45	0.1242	52.50	0.2574	120.14	0.0101	130.86	0.0054
Drive Time to Closest VHA PCP (Min)	-1.35	0.0251	-1.54	0.0131	-0.39	0.5312	-2.41	0.0001
CPM Risk Score	395.67	<.0001	400.28	<.0001	421.32	<.0001	435.76	<.0001

Notes: The fixed effects of the 140 hospitals are not shown here. Age < 35, and racial status (other) were used as reference groups.

s-Table 8. Random Effect Model Estimates of PC Visit Effect on Total Patient Care Cost (FY 2019)

Effect	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	-24,505.00	65.33	-375.07	<.0001
Number of PC Visits (in person)	-783.21	3.78	-207.45	<.0001
Number of PC Visits (telehealth)	-369.78	13.39	-27.62	<.0001
Number of PC Visits (phone)	-105.30	3.48	-30.26	<.0001
Age	-52.92	1.85	-28.66	<.0001
Age >= 35 and < 45	231.83	39.70	5.84	<.0001
Age >= 45 and < 55	809.60	50.88	15.91	<.0001
Age >= 55 and < 65	1,215.56	65.13	18.66	<.0001
Age >= 65 and < 75	1,772.89	81.46	21.76	<.0001
Age >= 75	2,886.56	103.89	27.78	<.0001
Gender (Female)	-721.13	26.54	-27.18	<.0001
Marital Status (Married)	-871.18	15.33	-56.84	<.0001
Racial Status (White)	-39.77	28.27	-1.41	0.1596
Racial Status (Black)	-230.50	31.84	-7.24	<.0001
Enrolled in Medicare	73.81	22.45	3.29	0.001
Enrolled in Medicaid	774.12	68.31	11.33	<.0001
Covered by Private Insurance	-1,538.56	23.87	-64.45	<.0001
Disability Rating (%)	-7.94	0.42	-19.09	<.0001
Disability Rating 70%+ (% of patients)	152.77	34.51	4.43	<.0001
Drive Time to Closest VHA PCP (Min)	-6.46	0.44	-14.57	<.0001
Health Risk Score	411.18	0.16	2568.85	<.0001