Appendix A: Additional tables and figures

Table A1: The change in adherence and HMS before and after experiencing a residential relocation by HMS of origin provider. Columns 1-4 reports the estimates by quartiles 1-4 respectively. The estimates are based on the two periods before and the three periods following the separation.

	(1)	(2)	(3)	(4)
	Adherence	Adherence	Adherence	Adherence
Post	0.0428***	-0.0003	-0.0071**	-0.028***
	(0.003)	(0.003)	(0.003)	(0.003)
Observations	22,404	22,383	22,369	22,357
R-squared	0.007	0.000	0.000	0.003
Outcome mean	.796	.834	.841	.844

	(1)	(2)	(3)	(4)
	HMS	HMS	HMS	HMS
Post (x100)	0.920***	0.090***	-0.035**	-0.492***
	(0.059)	(0.015)	(0.015)	(0.040)
Observations	22,404	22,383	22,369	22,357
R-squared	0.238	0.042	0.001	0.108
Mean	-1.01	-0.11	0.11	.556

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A2: The change in adherence and HMS before and after experiencing a practice closure by HMS of origin provider. Columns 1-4 reports the estimates by quartiles 1-4 respectively. The estimates are based on the two periods before and the three periods following the separation.

	(1) Adherence	(2) Adherence	(3) Adherence	(4) Adherence
Post	0.0875***	0.0233***	-0.00208	-0.0136*
	(0.00893)	(0.00846)	(0.00761)	(0.00781)
Observations	24,152	24,182	23,846	24,009
R-squared	0.027	0.003	0.001	0.011
Mean	.793	.858	.867	.865

	(1) HMS	(2) HMS	(3) HMS	(4) HMS
Post	1.976***	0.449***	-0.138***	-1.141***
	(0.046)	(0.009)	(0.009)	(0.018)
Observations	24,152	24,182	23,846	24,009
R-squared	0.532	0.608	0.069	0.576
Mean	-2.18	-0.35	00.12	1.01

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A3: The association between physician quality and Cardio-Vascular-Disease-related hospitalization risk for single physician clinics. Linear probability regressions. Standard errors are clustered at the clinic level.

	(1)	(2)	(3)
Outcome		CVD hospitalization	
Panel A (No Individual FE)			
HMS	-0.0534*	-0.0434	-0.0492*
(x100)	(0.0279)	(0.0267)	(0.0277)
Panel B (individual FE)			
HMS	-0.0628**	-0.0605**	-0.0622**
(x100)	(0.0274)	(0.0267)	(0.0279)
Observations	1,215,964	1,215,964	1,215,964
R-squared	0.30	0.31	0.31
Time	Yes	Yes	Yes
Region	Yes	Yes	Yes
Ind. Cov	No	Yes	Yes
Comorbidities	No	No	Yes

Robust standard errors in parentheses, clustered on the clinic level
*** p<0.01, ** p<0.05, * p<0.1

Table A4: The association between physician quality and Cardio-Vascular-Disease-related expenditures risk for single physician clinics. Linear regression models. Standard errors are clustered at the clinic level.

	(1)	(2)	(3)
Outcome: Log CVD hospitalization Expenditure			
HMS	-0.231**	-0.215*	-0.234**
(x100)	(0.114)	(0.113)	(0.114)
Panel B (individual FE)			
HMS	-0.265**	-0.275**	-0.250**
(x100)	(0.108)	(0.00108)	(0.110)
Observations	1,215,710	1,215,710	1,215,710
R-squared	0.31	0.31	0.31
Time	Yes	Yes	Yes
Region	Yes	Yes	Yes
Ind. Cov	No	Yes	Yes
Comorbidities	No	No	Yes

Robust standard errors in parentheses, clustered on the clinic level
*** p<0.01, ** p<0.05, * p<0.1

Table A5: Associations between health management skills and Cardio-Vascular-Disease hospitalization. The table includes observations for all pre and post periods for individuals who are separated from their physician before t=0. Standard errors are clustered at the clinic level.

	(1)	(2)	(3)
Outcome: CVD hospitalization			
Panel A: No Patient Fixed Effects			
HMS	-0.069***	-0.089*	-0.070**
(x100)	(0.0253)	(0.052)	(0.034)
Observations	503,527	133,612	125,063
R-squared	0.054	0.056	0. 056
Panel B: Including Patient Fixed Effects			
HMS	-0.072***	-0.12***	-0.068***
(x100)	(0.023)	(0.040)	(0.032)
Observations	503,527	133,612	125,063
R-squared	00.40	00.40	00.39
Year FEs	Yes	Yes	Yes
Region	Yes	Yes	Yes
Ind. Cov	Yes	Yes	Yes
Comorbidities	Yes	Yes	Yes
Sample	All Shifters	Residential	Clinic closures

Robust standard errors in parentheses, clustered on the clinic level
*** p<0.01, ** p<0.05, * p<0.1

Table A6: Associations between health management skills and Cardio-Vascular-Disease hospitalization expenditures. The table includes observations for all pre and post periods for individuals who are separated from their physician before t=0. Standard errors are clustered at the clinic level.

	(1)	(2)	(3)
Outcome: Ln (Hospital Expenditure)			
Panel A: No Patient Fixed Effects			
HMS	-0.341***	-0.314*	-0.283**
(x100)	(0.111)	(0.185)	(0.137)
Observations	503,527	133,612	125,063
R-squared	0.057	0.062	0.058
Panel B: Including Patient Fixed Effects			
HMS	-0.282***	-0.428***	-0.29***
(x100)	(0.098)	(0.15)	(0.124)
Observations	503,527	133,612	125,063
R-squared	.35	.37	.35
Year FEs	Yes	Yes	Yes
Region	Yes	Yes	Yes
Ind. Cov	Yes	Yes	Yes
Comorbidities	Yes	Yes	Yes
Sample	All Shifters	Residential	Clinic closures

Robust standard errors in parentheses, clustered on the clinic level

*** p<0.01, ** p<0.05, * p<0.1

Table A7: ICD 10 codes used to classify admissions as CVD-hospitalization. CVD hospitalization expenditures are expenditures associated with these admission codes.

List of ICD-10 Codes used to classify Cardio-Vascular-Disease:		
	ICD-10	**Description**
Myocardial Infarction:		
	I22	Subsequent myocardial infarction
	I252	Old myocardial infarction
Congestive Heart Failure:		
	I099	Other Reumatic Heart Disease
	I220	Subsequent myocardial infarction of anterior wall
	I230	
	I232	Haemopericardium as current complication following acute myocardial infarction
	I255	Ischaemic cardiomyopathy
	I420	Dilated cardiomyopathy
	I425	Other restrictive cardiomyopathy
	I426	Alcoholic cardiomyopathy
	I427	Cardiomyopathy due to drugs and other external agents
	I428	Other cardiomyopathies
	I429	Cardiomyopathy, unspecified
	I43	Cardiomyopathy in diseases classified elsewhere
	I50	Heart failure
Peripheral Vascular Diseases:		
	I732	Other peripheral vascular diseases
	I738	Other specified peripheral vascular diseases
	I739	Peripheral vascular disease, unspecified
	I772	Rupture of artery
	I790	Aneurysm of aorta in diseases classified elsewhere
	I792	Peripheral angiopathy in diseases classified elsewhere
	K552	Angiodysplasia of colon
	K558	Other vascular disorders of intestine
	Z958	Presence of other cardiac and vascular implants and grafts
	Z959	Presence of cardiac and vascular implant and graft, unspecified
	I70	Atherosclerosis
	I72	Other aneurysm and dissection
Diabetes:		
	E11	Type 2 diabetes mellitus
	E12	Malnutrition-related diabetes mellitus
	E13	Other specified diabetes mellitus

Table A8: List of ICD-10 codes that are used to construct the clinical quality measure

ACSC - ICD-10 Codes										
Chronic Obstructive Pulmonary Disease										
3-level	J40	J41	J42	J44	J45	Q33	E84	Q34	Q39	P27
4-level	J439	J479	J471	J209	E849	Q311	Q313	Q318	Q321	Q893
	Q254									
Dehydration										
3-Level	N19									
4-level	E861	E869	E860	E870	A080	A082	A081	A083	A088	A090
	K528	K529	N170	N171	N172	N178	N179	N998	I120	I131
	I132	N185	N186							
Bacterial Pneumonia										
3-Level	J13	J14								
4-level	J181	J154	J153	J152	J159	J157	J160	J168	J180	J189
	D574	D571	D572	D578						
Urinary Tract Infection										
3-Level	N10	N39								
4-level	N151	N159	N110	N118	Q602	Q612	Q614	Q615	Q630	Q624
	Q642	Q645	Q649	N288	N300	N137	Q610	Q611	Q613	Q621
	Q623	Q641								

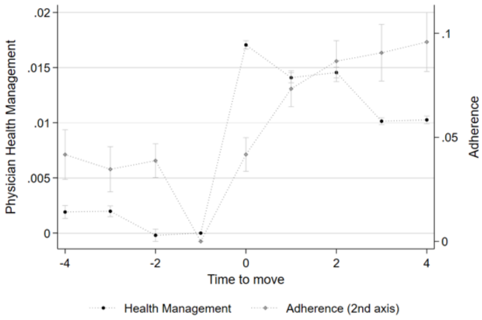
Table A8: Associations between practice quality metrics and provider characteristics for single physician practices. All models include time and regional dummies. Standard errors are clustered at the regional level

	(1) Std. HMS	(2) Std. HMS	(3) Std. HMS
Female	0.160*	0.172*	0.007
	(0.0824)	(0.0844)	(0.0629)
Immigrant		-0.350**	-0.442**
		(0.145)	(0.161)
Age			-0.046***
			(0.014)
Observations	7,352	7,352	7,352
R-squared	0.014	0.015	0.025

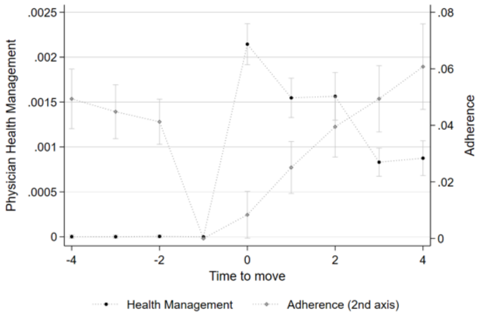
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure A1: Event graphs for re-locators

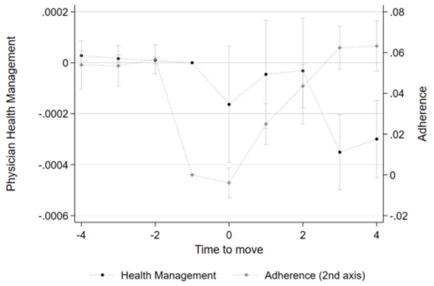
Panel A: 1st quartile pre-HMS



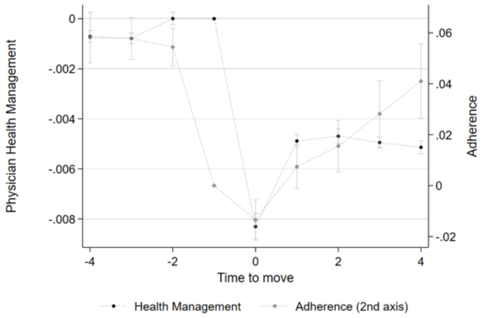
Panel B: 2nd quartile pre-HMS



Panel C: 3rd quartile pre-HMS



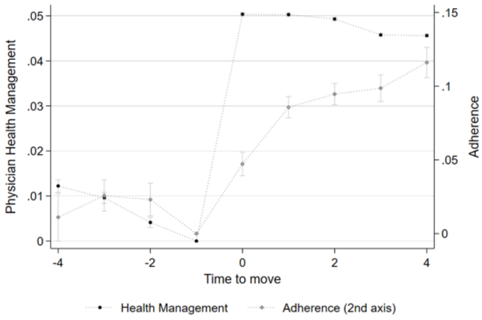
Panel D: 4th quartile pre-HMS



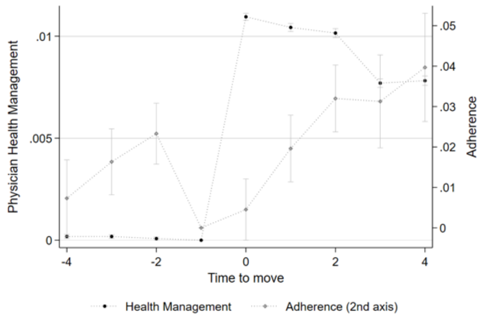
Notes: Physician health management skill and adherence for individuals relocating by quartile of pre-closure level of physician health management skill. Individuals are measured relative to the last period where the old physician is encountered (t=-1)

Figure A2: Event graphs for clinics closing

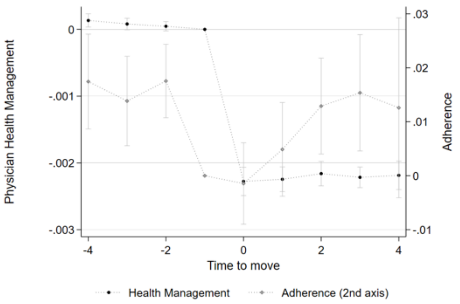
Panel A: 1st quartile pre-HMS



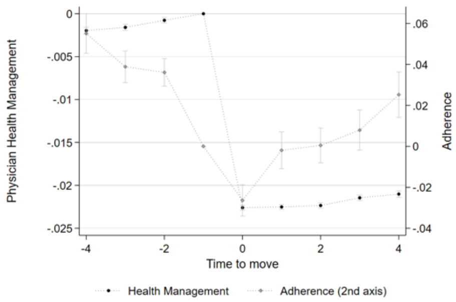
Panel B: 2nd quartile pre-HMS



Panel C: 3rd quartile pre-HMS



Panel D: 4th quartile pre-HMS



Notes: Physician health management skill and adherence for individuals experiencing a clinic closure by quartile of pre-closure level of physician health management skill. Individuals are measured relative to the last period where the old physician is encountered (t=-1)

Figure A3: Associations between changes in health management skills and changes in adherence for re-locators

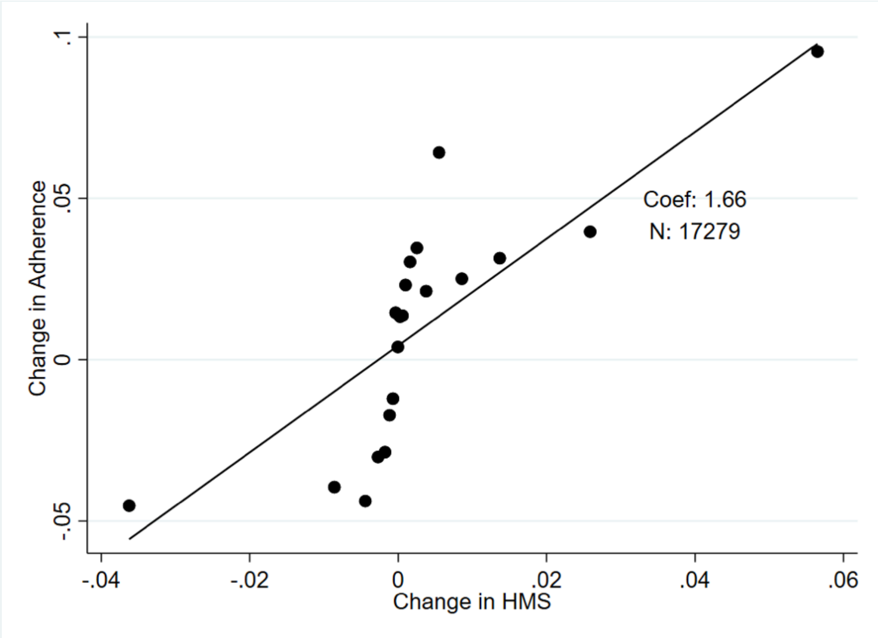


Figure A4: Associations between changes in health management skills and changes in adherence for patients experiencing clinic closures

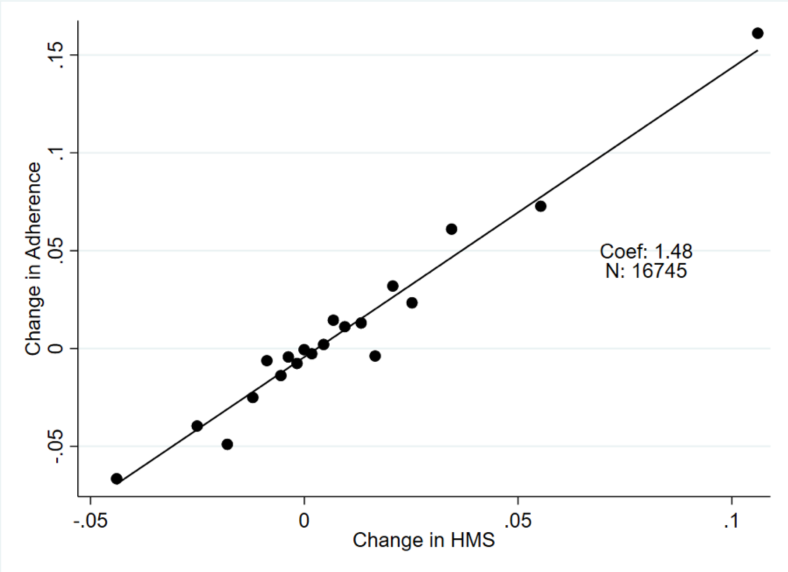
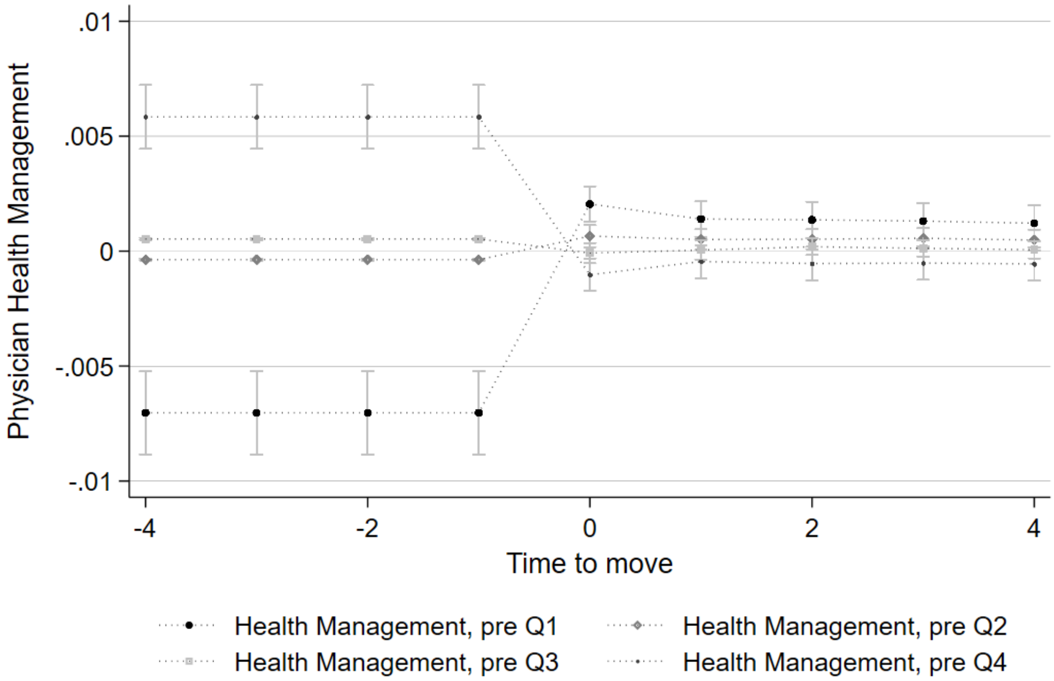
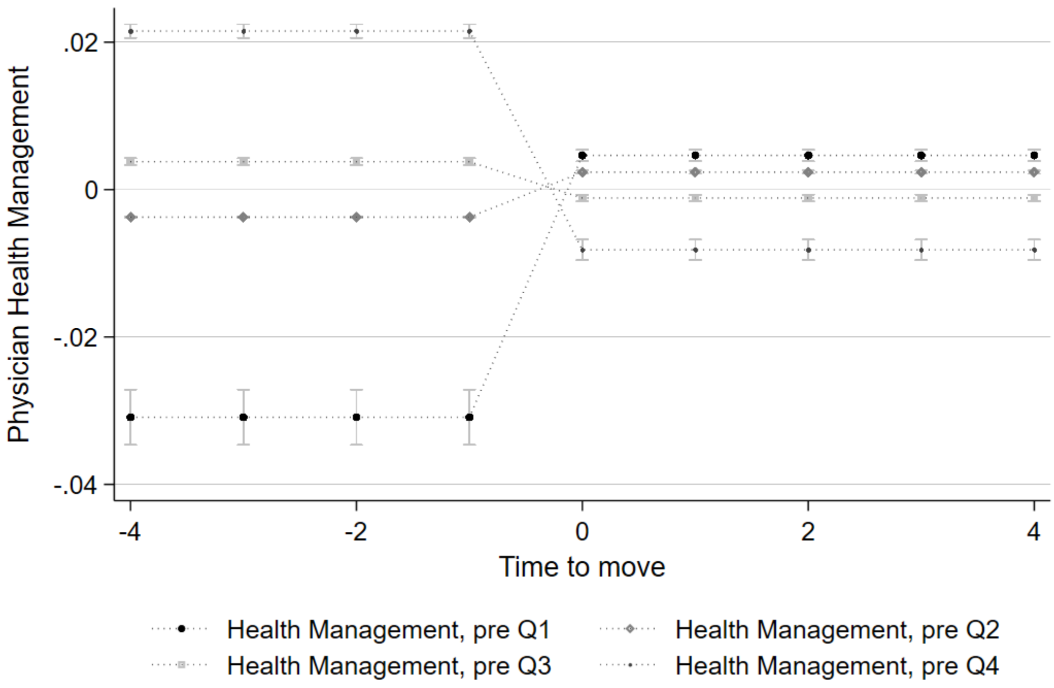


Figure A5: Changes in physician health management skill for relocators



Notes: Changes in physician health management skill for relocators. The sample is restricted to those who only have one physician prior to the relocation and those who are in the sample for all 9 periods of observation ($t \subset [-4;4]$) app. 20% of the complete sample of individual experiencing a residential relocation.

Figure A6: Changes in physician health management skill for individuals experiencing a clinic closure



Notes: Changes in physician health management skill for individuals experiencing a clinic closure. The sample is restricted to those who only have one physician prior to the relocation and those who are in the sample for all 9 periods of observation ($t \subset [-4; 4]$) this constitutes X observations or X% of the complete sample of individual experiencing a clinic closure.

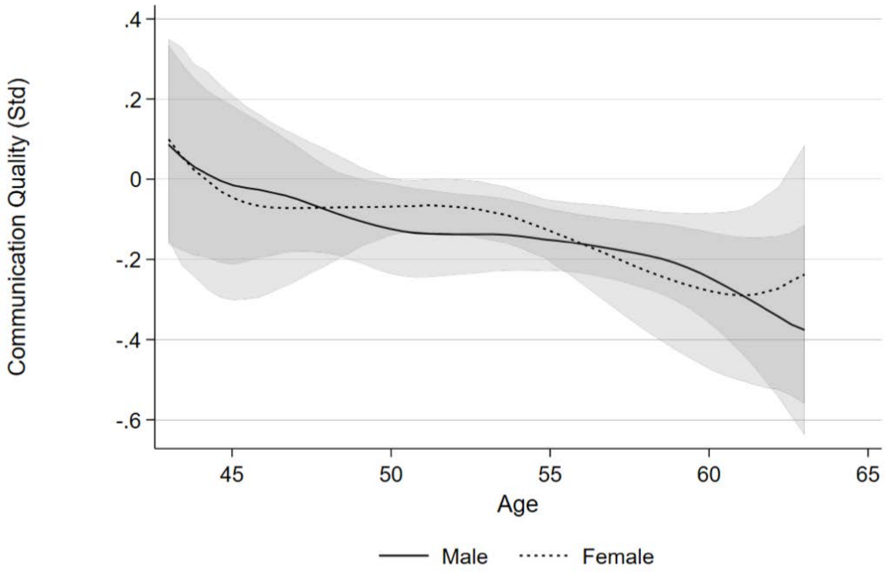


Figure A7 Local linear regressions of communication quality and age by provider gender. Only for single physician practices.

Appendix C:

If there is a physician component in determining hospitalizations from Ambulatory Care Sensitive Conditions, we can estimate the physician quality dimension from means of residualized individual level indicators for admission with an ACSC. Our goal is to combine the available ACSCs into one time-constant physician specific measure based on all individuals affiliated with a physician, Q_j^C. We do this in several steps. First we calculate *leave one* out measures for each individual *i* and type *k* of ACSC at time *t as*

$$ACSC_{-itj(i,t)}^{k} = \frac{\sum_{h \neq i} ACSC_h}{n_{jt} - 1}.$$

This denotes the fraction of patients with a ACSC of type *k* at physician *j* at time *t* excluding individual *i*.
Next, we combine the *leave one out* measure of the *k* different types of ACSCs into one metric. Let HI_{it} denote this index comprised of *k* categories of ACSCs using information on all patients affiliated with physician *j* except individual *i*:

$$HI_{it} = \sum_{r=1}^{k} \omega_r \, ACSC_{-itj(i,t)}^{k}$$

Where ω_r is the correlation between CVD hospitalization and ACSC hospitalization. We choose to construct the weights in this way because we are ultimately interested in estimating the effects of clinical quality on the probability CVD-related hospitalizations. In this way, we have used information on all of the doctor's patients other than individual *i* to construct the health index, such that it varies across individuals within physician.
To account for patient composition and calculate the time constant physician quality we first residualize the patient level health index and then collapse the calculated residualized means across time on a physician level using information of patients other than individual *i* affiliated with the same physician as individual *i*. Letting Q_j^C denote the estimate of the clinical quality of physician j, we start of by residualizing HI_{it}:

$$HI_{it} = \alpha_i + \boldsymbol{X}_{it}\delta_1 + \mu_{it} \ (Q1)$$

Where $\boldsymbol{X}_{it}$ contains time varying covariates of individual i – including dummies for comorbidities[27]. . If there exist systematic differences attributable to the physician, the error-term in (3) must have the following structure:

$$\mu_{it} = \gamma_{j(i,t)}^{c} + \vartheta_{it}$$

Where $\gamma_{j(i,t)}^{c}$ denotes a physician fixed effect, and ϑ_{it} is normal distributed with mean zero and constant variance.

[27] The comorbidities are measured as an aggregated Charlson comorbidity index that varies across time. Details are presented in the data section.

After obtaining the residuals from an estimation of equation (Q1) by OLS, we calculate leave-one-out means on the physician-year level:

$$Q_{jt}^{c} = \frac{1}{n_{jt} - 1} \sum_{h \neq i} \hat{\mu}_{ht}$$

where n_{jt} is the number of patients affiliated with physician j at time t. Finally, letting T_j denote the number of periods we observe physician j, we collapse the estimated Q_{jt}^{c} to construct a time constant physician specific measure of clinical quality.

$$Q_j^c = \frac{1}{T_j} \sum_{\tau=1}^{T_j} Q_{jt}^{c}$$

In this way we use information on all other patients across time, at your chosen physician to construct a time constant measure of clinical quality, Q_j^h.

The Interactive quality metric is constructed in a similar fashion. On the base of all statin users with at least 2 claims, m_{jt},starting from the analogue to equation (Q1):

$$Adh_{it} = \alpha_i + \boldsymbol{X}_{it}\delta_2 + \mu_{it} \ (Q2)$$

Following similar steps, we estimate the interactive metric as

$$Q_j^I = \frac{1}{T_j} \sum_{\tau=1}^{T_j} \left(\frac{1}{n_{jt} - 1} \sum_{h \neq i} \hat{\mu}_{ht} \right)$$

Where $\hat{\mu}_{ht}$ are residuals from a linear regression of Q2.