

## Appendix

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Table EC.1 Summary definitions of control variables

Variable	Description
<b>Operational characteristics</b>	
Visit sequence percentile <sup>†</sup>	Percentile of sequence of current visit within episode
Moving average of visit length <sup>†</sup>	Average length of visit for visits that occurred prior to current visit
Moving average of days to next visit <sup>†</sup>	Average number of days to next visit for visits that occurred prior to current visit
New patient for provider <sup>†</sup>	Indicator for whether this is first visit by provider for patient
Start hour of provider	Start hour of provider's work day
Episode with subsequent episodes <sup>†</sup>	Indicator for whether current episode resulted in a subsequent episode
Episode with any resumption of care or recertification visits <sup>†</sup>	Indicator for whether current episode included any resumption of care or recertification visits
<b>Demographic characteristics</b>	
Age	Patient age in years
Male	Indicator for whether patient is male
White	Indicator for whether patient is White
Black	Indicator for whether patient is Black
Hispanic	Indicator for whether patient is Hispanic
Asian	Indicator for whether patient is Asian
<b>Health status</b>	
Temporarily heightened	Indicator for whether patient's health status is temporarily heightened
Stable	Indicator for whether patient's health status is stable
Progressively worse	Indicator for whether patient's health status is progressively worse
<b>Living conditions</b>	
Living alone	Indicator for whether patient is living alone
No assistance available	Indicator for whether patient has no assistance available
<b>Prior hospitalization reasons</b>	
Urinary incontinence	Indicator for whether patient was hospitalized for urinary incontinence
Intractable pain <sup>†</sup>	Indicator for whether patient was hospitalized for intractable pain
Impaired decision making	Indicator for whether patient was hospitalized for impaired decision making
Memory loss	Indicator for whether patient was hospitalized for memory loss
Indwelling catheter	Indicator for whether patient was hospitalized for indwelling catheter
Disruptive behavior	Indicator for whether patient was hospitalized for disruptive behavior
Unknown	Indicator for whether patient was hospitalized for an unknown reason
None of the above <sup>†</sup>	Indicator for whether patient was hospitalized for none of the above
<b>Risks for hospitalization</b>	
2+ falls in past 12 months	Indicator for whether patient has had 2+ falls in past 12 months
Currently taking 5+ medications	Indicator for whether patient is currently taking 5+ medications
2+ hospitalizations in past 6 months	Indicator for whether patient has had 2+ hospitalizations in past 6 months
Decline in mental health in past 3 months	Indicator for whether patient has had a decline in mental health in past 3 months
Other risks	Indicator for whether patient has other risks for hospitalization
<b>High risk factors</b>	
Obesity	Indicator for whether patient is obese
Smoking	Indicator for whether patient is a smoker
Alcohol	Indicator for whether patient uses alcohol
Drugs	Indicator for whether patient uses drugs

Notes. † Indicates variables that are selected by the least absolute shrinkage and selection operator (LASSO) procedure when choosing the largest lambda at which the mean-squared prediction error (MSPE) is within one standard error of the minimal MSPE.

**Table EC.2 Effect of visit length on hospital readmission, including coefficients for all control variables**

VARIABLES	(1) First stage	(2) 2SLS	(3) OLS	(4) 2SRI	(5) Probit
Leave-out IV	0.63305*** (0.01170)				
Visit length		-0.00022*** (0.00004)	0.00003+ (0.00002)	-0.00681*** (0.00122)	0.00010 (0.00046)
<i>AME of visit length</i>				-0.00022*** (0.00004)	0.00000 (0.00002)
<b>Operational characteristics</b>					
Visit sequence percentile	-0.27658* (0.13564)	0.03313*** (0.00117)	0.03266*** (0.00116)	1.28791*** (0.03197)	1.27631*** (0.03304)
Moving average of visit length	0.20981*** (0.00445)	0.00029*** (0.00003)	0.00020*** (0.00002)	0.00934*** (0.00068)	0.00692*** (0.00058)
Moving average of days to next visit	-0.32895*** (0.02238)	0.00857*** (0.00033)	0.00866*** (0.00033)	0.09685*** (0.00266)	0.09932*** (0.00361)
New patient for provider	2.19951*** (0.15327)	0.00782*** (0.00069)	0.00735*** (0.00069)	0.20639*** (0.01848)	0.19447*** (0.01853)
Start hour of provider	-0.06334* (0.03047)	-0.00024* (0.00012)	-0.00026* (0.00012)	-0.00461 (0.00341)	-0.00518 (0.00369)
Episode with subsequent episodes	0.92244*** (0.19633)	-0.14460*** (0.00381)	-0.14480*** (0.00381)	-1.16443*** (0.02490)	-1.16891*** (0.02417)
Episode with any resumption of care or recertification visits	0.42116* (0.16983)	0.15957*** (0.00376)	0.15946*** (0.00376)	1.61867*** (0.01962)	1.61500*** (0.01933)
<b>Demographic characteristics</b>					
Age	-0.01057*** (0.00305)	0.00006** (0.00002)	0.00006** (0.00002)	0.00117* (0.00052)	0.00120* (0.00050)
Male	-0.07873 (0.06322)	0.00015 (0.00044)	0.00017 (0.00044)	0.01396 (0.01293)	0.01509 (0.01278)
White	0.58111 (0.39450)	0.01193*** (0.00308)	0.01192*** (0.00307)	0.24863*** (0.07377)	0.24277*** (0.06699)
Black	-0.07983 (0.41218)	0.01350*** (0.00317)	0.01364*** (0.00317)	0.31197*** (0.07547)	0.31104*** (0.06848)
Hispanic	-0.61412 (0.41047)	0.01229*** (0.00326)	0.01247*** (0.00325)	0.28856*** (0.07497)	0.28872*** (0.06906)
Asian	0.00414 (0.47240)	0.01143** (0.00365)	0.01132** (0.00365)	0.26562** (0.08728)	0.25814** (0.08572)
<b>Health status</b>					
Temporarily heightened	-0.19807* (0.09102)	-0.00460*** (0.00056)	-0.00460*** (0.00056)	-0.13088*** (0.01335)	-0.13175*** (0.01392)
Stable	-0.09268 (0.15498)	-0.00774*** (0.00080)	-0.00777*** (0.00080)	-0.24018*** (0.02482)	-0.24295*** (0.02686)
Progressively worse	0.36494+ (0.19372)	0.00458** (0.00175)	0.00447* (0.00175)	0.09755** (0.03401)	0.09473** (0.03223)
<b>Living conditions</b>					
Living alone	0.10518 (0.07779)	-0.00059 (0.00047)	-0.00058 (0.00047)	-0.01827 (0.01483)	-0.01707 (0.01428)
No assistance available	-0.52565* (0.25325)	-0.00245 (0.00170)	-0.00239 (0.00169)	-0.02350 (0.04706)	-0.02288 (0.04929)

**Table EC.2 Effect of visit length on hospital readmission, including coefficients for all control variables — Continued**

VARIABLES	(1) First stage	(2) 2SRI	(3) Probit	(4) 2SLS	(5) OLS
<b>Prior hospitalization reasons</b>					
Urinary incontinence	0.19442+ (0.10377)	0.00173* (0.00076)	0.00170* (0.00076)	0.05363** (0.02071)	0.05371** (0.02078)
Intractable pain	0.65206*** (0.12965)	0.00230** (0.00084)	0.00209* (0.00084)	0.04478* (0.02244)	0.03947+ (0.02273)
Impaired decision making	-0.53400*** (0.11272)	0.00148+ (0.00080)	0.00156+ (0.00080)	0.04034+ (0.02115)	0.04267* (0.02156)
Memory loss	-0.21210+ (0.11605)	0.00128 (0.00082)	0.00132 (0.00082)	0.04141+ (0.02319)	0.04280+ (0.02227)
Indwelling catheter	0.53389* (0.24047)	0.00233 (0.00200)	0.00217 (0.00201)	0.08892* (0.04030)	0.08399* (0.03979)
Disruptive behavior	-0.38013 (0.25396)	0.00126 (0.00218)	0.00137 (0.00217)	0.06210 (0.05239)	0.06488 (0.04826)
Unknown	0.15559 (0.42629)	0.00105 (0.00243)	0.00119 (0.00256)	0.07893 (0.06361)	0.08391 (0.07287)
None of the above	-0.13622 (0.11413)	0.00168+ (0.00087)	0.00175* (0.00087)	0.06114* (0.02410)	0.06350** (0.02358)
<b>Risks for hospitalization</b>					
2+ falls in past 12 months	0.36783*** (0.07489)	0.00159** (0.00055)	0.00144** (0.00055)	0.03433* (0.01517)	0.03023+ (0.01543)
Currently taking 5+ medications	0.14459 (0.09268)	-0.00229*** (0.00051)	-0.00241*** (0.00051)	-0.12320*** (0.01803)	-0.12666*** (0.01809)
2+ hospitalizations in past 6 months	0.02020 (0.12621)	0.00147 (0.00091)	0.00141 (0.00091)	0.06844* (0.02695)	0.06751** (0.02510)
Decline in mental health in past 3 months	0.28961+ (0.16621)	0.00047 (0.00117)	0.00043 (0.00117)	-0.01185 (0.03938)	-0.01347 (0.03447)
Other risks	-0.10816 (0.12022)	0.00143* (0.00070)	0.00142* (0.00071)	0.03441+ (0.01966)	0.03468+ (0.01904)
<b>High risk factors</b>					
Obesity	0.19755* (0.07791)	-0.00065 (0.00052)	-0.00073 (0.00052)	-0.02649 (0.01626)	-0.02901+ (0.01545)
Smoking	-0.69461*** (0.09267)	0.00143* (0.00065)	0.00157* (0.00065)	0.05879*** (0.01733)	0.06243*** (0.01708)
Alcohol	-0.74504*** (0.17673)	-0.00279* (0.00128)	-0.00265* (0.00128)	-0.06540+ (0.03695)	-0.06079+ (0.03584)
Drugs	-0.15452 (0.25132)	0.00077 (0.00200)	0.00075 (0.00200)	0.03197 (0.04740)	0.03185 (0.04647)
Residuals				0.00812*** (0.00132)	
Observations	393,858	393,858	393,858	393,858	393,858
$R^2$	0.25542		0.06603		

*Notes.* Leave-out instrumental variable (IV) is the within-provider average visit length of all other episodes' visits conducted by each provider in the 30-day period before and after the focal home health visit. All models are estimated at the home health visit level. Robust standard errors (in parentheses) allow for arbitrary correlation within a given home health provider. + $p < 0.10$ , \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Table EC.3** Effect of visit length on hospital readmission, using hazard models, including coefficients for all control variables

VARIABLES	(1) First stage	(2) Cox proportional hazards model	(3) Proportional hazard model with competing risk of subsequent home health visit
Leave-out IV	0.63071*** (0.00233)		
Visit length		-0.01799*** (0.00261)	-0.01684*** (0.00260)
<i>Visit length subhazard ratio</i>		0.98217*** (0.00257)	0.98330*** (0.00256)
<b>Operational characteristics</b>			
Visit sequence percentile	-0.22375* (0.08812)	-0.96284*** (0.08694)	2.50896*** (0.08624)
Moving average of visit length	0.21254*** (0.00168)	0.02346*** (0.00154)	0.01921*** (0.00158)
Moving average of days to next visit	-0.34758*** (0.01086)	0.07758*** (0.00341)	0.12491*** (0.00463)
New patient for provider	2.17532*** (0.05820)	0.55046*** (0.04036)	0.40562*** (0.04753)
Episode with subsequent episodes	0.94917*** (0.12634)	-2.42309*** (0.04374)	-2.29651*** (0.04446)
Episode with any resumption of care or recertification visits	0.44159*** (0.11379)	3.02660*** (0.02894)	3.38049*** (0.02818)
<b>Prior hospitalization reasons</b>			
Intractable pain	0.68637*** (0.05909)	-0.00500 (0.04146)	-0.04488 (0.04272)
None of the above	-0.12488** (0.04155)	-0.04270 (0.02877)	-0.05820+ (0.02984)
Residuals		0.01867*** (0.00280)	0.01736*** (0.00294)
Observations	392,864	392,864	392,864
$R^2$	0.25398		

*Notes.* Leave-out instrumental variable (IV) is the within-provider average visit length of all other episodes' visits conducted by each provider in the 30-day period before and after the focal home health visit. All models are estimated at the home health visit level. Due to computational intractability when using a long set of control variables, we use an alternate set of control variables that are selected as the most predictive elements as determined by the least absolute shrinkage and selection operator (LASSO) procedure (see the relevant discussion in section 7.2 and the list of control variables in Table EC.1). Robust standard errors (in parentheses) allow for arbitrary correlation within a given home health provider. + $p < 0.10$ , \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Table EC.4 Heterogeneous effects of visit length on hospital readmission, by patient characteristics, including coefficients for all control variables**

VARIABLES	(1) 2SLS, by OASIS items	(2) 2SLS, by HRRP target status
Visit length	-0.00025*** (0.00005)	-0.00022*** (0.00004)
Visit length × Stable	0.00024** (0.00009)	
Visit length × Living alone	0.00009 (0.00007)	
Visit length × Intractable pain	-0.00015+ (0.00008)	
Visit length × Decline in mental health in past 3 months	0.00033* (0.00015)	
Targeted by HRRP		0.00612 (0.00580)
Visit length × Targeted by HRRP		-0.00005 (0.00013)
<b>Operational characteristics</b>		
Visit sequence percentile	0.03315*** (0.00117)	0.03318*** (0.00117)
Moving average of visit length	0.00029*** (0.00003)	0.00029*** (0.00003)
Moving average of days to next visit	0.00857*** (0.00033)	0.00856*** (0.00033)
New patient for provider	0.00781*** (0.00069)	0.00780*** (0.00069)
Start hour of provider	-0.00024* (0.00012)	-0.00024* (0.00012)
Episode with subsequent episodes	-0.14459*** (0.00381)	-0.14458*** (0.00381)
Episode with any resumption of care or recertification visits	0.15957*** (0.00377)	0.15954*** (0.00377)
<b>Demographic characteristics</b>		
Age	0.00006** (0.00002)	0.00005** (0.00002)
Male	0.00015 (0.00044)	0.00014 (0.00044)
White	0.01196*** (0.00308)	0.01199*** (0.00308)
Black	0.01351*** (0.00317)	0.01361*** (0.00318)
Hispanic	0.01230*** (0.00325)	0.01237*** (0.00326)
Asian	0.01142** (0.00365)	0.01148** (0.00366)
<b>Health status</b>		
Temporarily heightened	-0.00459*** (0.00056)	-0.00450*** (0.00056)
Stable	-0.01833*** (0.00410)	-0.00760*** (0.00080)
Progressively worse	0.00460** (0.00175)	0.00447* (0.00175)

**Table EC.4 Heterogeneous effects of visit length on hospital readmission, by patient characteristics, including coefficients for all control variables — Continued**

VARIABLES	(1) 2SLS, by OASIS items	(2) 2SLS, by HRRP target status
<b>Living conditions</b>		
Living alone	-0.00462 (0.00311)	-0.00060 (0.00047)
No assistance available	-0.00242 (0.00169)	-0.00253 (0.00169)
<b>Prior hospitalization reason</b>		
Urinary incontinence	0.00173* (0.00076)	0.00168* (0.00076)
Intractable pain	0.00901* (0.00376)	0.00240** (0.00084)
Impaired decision making	0.00149+ (0.00080)	0.00147+ (0.00080)
Memory loss	0.00129 (0.00082)	0.00129 (0.00082)
Indwelling catheter	0.00235 (0.00200)	0.00239 (0.00200)
Disruptive behavior	0.00127 (0.00217)	0.00121 (0.00217)
Unknown	0.00106 (0.00247)	0.00106 (0.00248)
None of the above	0.00168+ (0.00087)	0.00167+ (0.00087)
<b>Risks for hospitalization</b>		
2+ falls in past 12 months	0.00158** (0.00055)	0.00169** (0.00055)
Currently taking 5+ medications	-0.00228*** (0.00051)	-0.00230*** (0.00051)
2+ hospitalizations in past 6 months	0.00147 (0.00091)	0.00142 (0.00091)
Decline in mental health in past 3 months	-0.01418* (0.00676)	0.00059 (0.00117)
Other risks	0.00148* (0.00070)	0.00143* (0.00070)
<b>High risk factors</b>		
Obesity	-0.00066 (0.00052)	-0.00066 (0.00052)
Smoking	0.00144* (0.00065)	0.00116+ (0.00065)
Alcohol	-0.00284* (0.00128)	-0.00266* (0.00128)
Drugs	0.00078 (0.00200)	0.00077 (0.00200)
Observations	393,858	393,858

*Notes.* All models are estimated at the home health visit level. Robust standard errors (in parentheses) allow for arbitrary correlation within a given home health provider. + $p < 0.10$ , \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Table EC.5 Heterogeneous effects of visit length on hospital readmission, by visit characteristics, including coefficients for all control variables**

VARIABLES	(1) 2SLS, by visit sequence	(2) 2SLS, by visit type
Visit length	-0.00053*** (0.00007)	
Visit sequence	-0.00101*** (0.00020)	
Visit length × Visit sequence	0.00004*** (0.00000)	
Visit length × Nursing visit		-0.00028*** (0.00004)
Visit length × Therapy visit		-0.00022*** (0.00004)
<b>Operational characteristics</b>		
Visit sequence percentile		0.03319*** (0.00106)
Moving average of visit length	-0.00032*** (0.00003)	0.00030*** (0.00002)
Moving average of days to next visit	0.03044*** (0.00088)	0.00867*** (0.00027)
New patient for provider	-0.00323*** (0.00067)	0.00800*** (0.00068)
Start hour of provider	-0.00035** (0.00013)	-0.00022+ (0.00012)
Episode with subsequent episodes		-0.14443*** (0.00378)
Episode with any resumption of care or recertification visits		0.15984*** (0.00369)
<b>Demographic characteristics</b>		
Age		0.00005* (0.00002)
Male		0.00022 (0.00044)
White		0.01194*** (0.00323)
Black		0.01345*** (0.00331)
Hispanic		0.01230*** (0.00338)
Asian		0.01125** (0.00360)
<b>Health status</b>		
Temporarily heightened		-0.00470*** (0.00055)
Stable		-0.00810*** (0.00074)
Progressively worse		0.00468** (0.00172)

**Table EC.5 Heterogeneous effects of visit length on hospital readmission, by visit characteristics, including coefficients for all control variables — Continued**

VARIABLES	(1) 2SLS, by visit sequence	(2) 2SLS, by visit type
<b>Living conditions</b>		
Living alone		-0.00050 (0.00049)
No assistance available		-0.00239 (0.00156)
<b>Prior hospitalization reason</b>		
Urinary incontinence		0.00173* (0.00077)
Intractable pain		0.00218* (0.00085)
Impaired decision making		0.00149+ (0.00081)
Memory loss		0.00120 (0.00086)
Indwelling catheter		0.00251 (0.00209)
Disruptive behavior		0.00124 (0.00240)
Unknown		0.00118 (0.00223)
None of the above		0.00177* (0.00089)
<b>Risks for hospitalization</b>		
2+ falls in past 12 months		0.00137* (0.00053)
Currently taking 5+ medications		-0.00238*** (0.00053)
2+ hospitalizations in past 6 months		0.00159+ (0.00096)
Decline in mental health in past 3 months		0.00044 (0.00138)
Other risks		0.00155* (0.00075)
<b>High risk factors</b>		
Obesity		-0.00057 (0.00054)
Smoking		0.00149* (0.00065)
Alcohol		-0.00284* (0.00133)
Drugs		0.00079 (0.00196)
Observations	387,319	393,858
Episode fixed effect	Y	N
<i>F</i> -statistic for coefficients		28.15878***

*Notes.* All models are estimated at the home health visit level. Robust standard errors (in parentheses) allow for arbitrary correlation within a given home health provider. + $p < 0.10$ , \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Table EC.6 Effect of visit length on hospital readmission, using fixed effects**

VARIABLES	(1)	(2)	(3)
	2SLS	2SLS	2SLS
Visit length	-0.00022*** (0.00004)	-0.00026*** (0.00004)	-0.00026*** (0.00004)
Observations	393,858	393,858	393,858
Operational characteristics	Y	Y	Y
Demographic characteristics	Y	Y	Y
Health status	Y	Y	Y
Living conditions	Y	Y	Y
Prior hospitalization reasons	Y	Y	Y
Risks for hospitalization	Y	Y	Y
High risk factors	Y	Y	Y
Quarter fixed effect	Y	N	N
Provider type fixed effect	N	Y	N
Quarter-Provider type fixed effect	N	N	Y

*Notes.* All models are estimated at the home health visit level. Robust standard errors (in parentheses) allow for arbitrary correlation within a given home health provider. Controls not shown include operational characteristics (visit sequence percentile, moving average of visit length, moving average of days to next visit, new patient for provider, start hour of provider, episode with subsequent episodes, episode with any resumption of care or recertification visits), demographic characteristics (age, male, white, black, Hispanic, Asian), health status (temporarily heightened, stable, progressively worse), living conditions (living alone, no assistance available), prior hospitalization reasons (urinary incontinence, intractable pain, impaired decision making, memory loss, indwelling catheter, disruptive behavior, unknown, none of the above), risks for hospitalization (2+ falls in past 12 months, currently taking 5+ medications, 2+ hospitalizations in past 6 months, decline in mental health in past 3 months, other risks), and high risk factors (obesity, smoking, alcohol, drugs). + $p < 0.10$ , \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Table EC.7** Effect of leave-out IV on pre-planned readmission and on hospitalization following discharge from a lower-acuity facility

VARIABLES	(1) Pre-planned readmission	(2) Pre-planned readmission	(3) Hospitalization following discharge from a lower- acuity facility	(4) Hospitalization following discharge from a lower- acuity facility
Leave-out IV	0.00001 (0.00001)		-0.00006 (0.00005)	
Visit length		-0.00001 (0.00001)		-0.00007 (0.00006)
Observations	397,508	397,508	104,960	104,960
Operational characteristics	Y	Y	Y	Y
Demographic characteristics	Y	Y	Y	Y
Health status	Y	Y	Y	Y
Living conditions	Y	Y	Y	Y
Prior hospitalization reasons	Y	Y	Y	Y
Risks for hospitalization	Y	Y	Y	Y
High risk factors	Y	Y	Y	Y
Model	OLS	2SLS	OLS	2SLS
Sample	Main analysis sample expanded to include patients with a pre-planned readmission		Patients admitted to home health following discharge from an inpatient rehabilitation facility	

*Notes.* Leave-out instrumental variable (IV) is the within-provider average visit length of all other episodes' visits conducted by each provider in the 30-day period before and after the focal home health visit. All models are estimated at the home health visit level. Robust standard errors (in parentheses) allow for arbitrary correlation within a given home health provider. Controls not shown include operational characteristics (visit sequence percentile, moving average of visit length, moving average of days to next visit, new patient for provider, start hour of provider, episode with subsequent episodes, episode with any resumption of care or recertification visits), demographic characteristics (age, male, white, black, Hispanic, Asian), health status (temporarily heightened, stable, progressively worse), living conditions (living alone, no assistance available), prior hospitalization reasons (urinary incontinence, intractable pain, impaired decision making, memory loss, indwelling catheter, disruptive behavior, unknown, none of the above), risks for hospitalization (2+ falls in past 12 months, currently taking 5+ medications, 2+ hospitalizations in past 6 months, decline in mental health in past 3 months, other risks), and high risk factors (obesity, smoking, alcohol, drugs).  $+p < 0.10$ ,  $*p < 0.05$ ,  $**p < 0.01$ ,  $***p < 0.001$ .

**Table EC.8** Effect of visit length on hospital readmission, using alternate set of control variables

VARIABLES	(1) First stage	(2) 2SLS	(3) OLS	(4) 2SRI	(5) Probit
Leave-out IV	0.63104*** (0.01170)				
Visit length		-0.00023*** (0.00004)	0.00003 (0.00002)	-0.00733*** (0.00121)	-0.00000 (0.00046)
<i>AME of visit length</i>				-0.00024*** (0.00004)	-0.00000 (0.00002)
<b>Operational characteristics</b>					
Visit sequence percentile	-0.21931 (0.13655)	0.03282*** (0.00117)	0.03232*** (0.00116)	1.28230*** (0.03205)	1.26944*** (0.03310)
Moving average of visit length	0.21248*** (0.00452)	0.00027*** (0.00003)	0.00018*** (0.00002)	0.00884*** (0.00068)	0.00625*** (0.00058)
Moving average of days to next visit	-0.34468*** (0.02322)	0.00859*** (0.00032)	0.00868*** (0.00032)	0.09763*** (0.00264)	0.10038*** (0.00349)
New patient for provider	2.17248*** (0.15391)	0.00797*** (0.00069)	0.00750*** (0.00069)	0.21359*** (0.01847)	0.20072*** (0.01852)
Episode with subsequent episodes	0.94140*** (0.19610)	-0.14491*** (0.00381)	-0.14511*** (0.00382)	-1.16433*** (0.02432)	-1.16921*** (0.02395)
Episode with any resumption of care or recertification visits	0.44906** (0.17051)	0.16055*** (0.00378)	0.16043*** (0.00378)	1.63430*** (0.01928)	1.62995*** (0.01930)
<b>Prior hospitalization reasons</b>					
Intractable pain	0.68743*** (0.11881)	-0.00056 (0.00063)	-0.00077 (0.00063)	-0.02499 (0.01849)	-0.03145+ (0.01907)
None of the above	-0.12341 (0.08452)	-0.00217*** (0.00046)	-0.00209*** (0.00046)	-0.04806*** (0.01329)	-0.04611*** (0.01307)
Residuals				0.00860*** (0.00131)	
Observations	393,858	393,858	393,858	393,858	393,858
$R^2$	0.25383		0.06514		

*Notes.* Leave-out instrumental variable (IV) is the within-provider average visit length of all other episodes' visits conducted by each provider in the 30-day period before and after the focal home health visit. All models are estimated at the home health visit level. Robust standard errors (in parentheses) allow for arbitrary correlation within a given home health provider. + $p < 0.10$ , \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Table EC.9** Effect of visit length on hospital readmission, using alternate estimation models

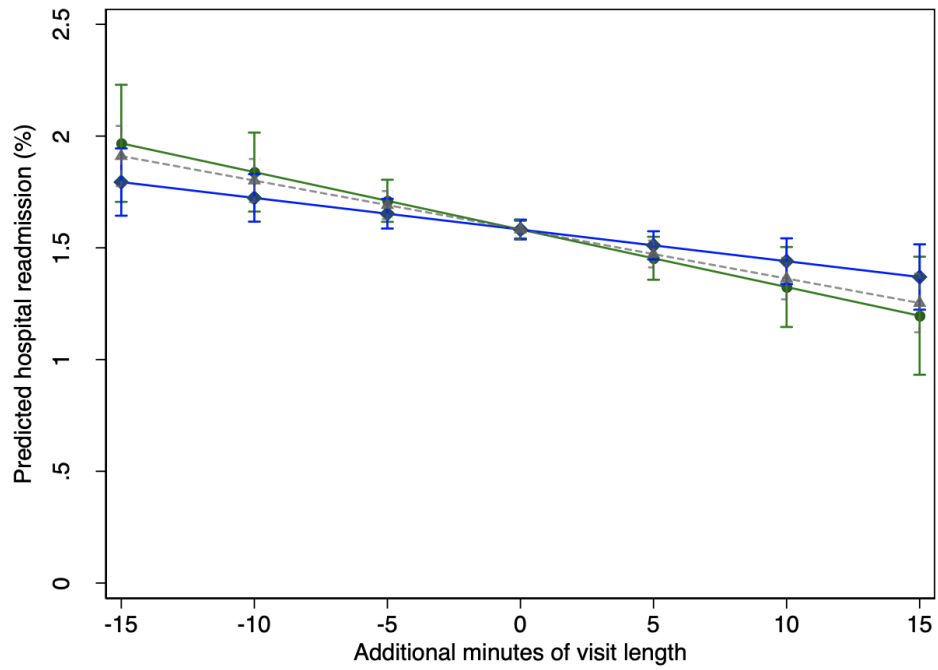
VARIABLES	(1)	(2)
	Two-stage skewed logit model	Two-stage multi-level model
Visit length	-0.02334*** (0.00452)	-0.00018*** (0.00004)
<i>AME of visit length</i>	-0.00022*** (0.00004)	
Observations	393,858	393,858
Operational characteristics	Y	Y
Demographic characteristics	Y	Y
Health status	Y	Y
Living conditions	Y	Y
Prior hospitalization reasons	Y	Y
Risks for hospitalization	Y	Y
High risk factors	Y	Y

*Notes.* All models are estimated at the home health visit level. Robust standard errors (in parentheses) allow for arbitrary correlation within a given home health provider. Controls not shown include operational characteristics (visit sequence percentile, moving average of visit length, moving average of days to next visit, new patient for provider, start hour of provider, episode with subsequent episodes, episode with any resumption of care or recertification visits), demographic characteristics (age, male, white, black, Hispanic, Asian), health status (temporarily heightened, stable, progressively worse), living conditions (living alone, no assistance available), prior hospitalization reasons (urinary incontinence, intractable pain, impaired decision making, memory loss, indwelling catheter, disruptive behavior, unknown, none of the above), risks for hospitalization (2+ falls in past 12 months, currently taking 5+ medications, 2+ hospitalizations in past 6 months, decline in mental health in past 3 months, other risks), and high risk factors (obesity, smoking, alcohol, drugs). + $p < 0.10$ , \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Table EC.10** Effect of visit length on hospitalization, using sample not restricted to patients previously discharged from short-term acute care hospital

VARIABLES	(1)	(2)	(3)	(4)	(5)
	First stage	2SLS	OLS	2SRI	Probit
Leave-out IV	0.79125*** (0.00813)				
Visit length		-0.00020*** (0.00002)	0.00001 (0.00001)	-0.00742*** (0.00064)	-0.00006 (0.00031)
<i>AME of visit length</i>				-0.00020*** (0.00002)	-0.00000 (0.00001)
Residuals				0.00907*** (0.00072)	
Observations	1,189,183	1,189,183	1,189,183	1,189,183	1,189,183
$R^2$	0.29944		0.04589		

*Notes.* Leave-out instrumental variable (IV) is the within-provider average visit length of all other episodes' visits conducted by each provider in the 30-day period before and after the focal home health visit. All models are estimated at the home health visit level. Robust standard errors (in parentheses) allow for arbitrary correlation within a given home health provider. + $p < 0.10$ , \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Figure EC.1 Predicted probability of hospital readmission using alternate non-linear models**

*Note.* This figure plots the predicted probabilities of hospital readmission given various amounts of additional minutes of visit length using estimates from a linear 2SLS model (grey triangles), a non-linear piecewise model (green circles), and a non-linear quadratic model (blue diamonds). Bars show the 95% confidence intervals using standard errors that are clustered by the home health provider and bootstrapped based on 1,000 replications.