Better Relationship or More Information? Using Matched Patient-Doctor Panel Data to Estimate Physician-Patient Effects on Invasive Care

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December 14, 2018

Outline

Medical Spending at the End of Life (EOL)

Table: Medical spending on people in 9 countries at EOL as a percentage of overall spending, by category of spending

	Percent spending			
	in the last 12 months of life		in the last 3 years of life	
	All medical care	Hospital care	All medical care	Hospital care
Denmark	11.0	10.0	22.2	18.7
England	-	14.6	-	29.8
France	-	15.0	-	22.1
Germany	11.0	21.2	21.4	29.9
Japan	-	8.2	-	13.5
Netherlands	10.0	8.9	19.4	15.1
Quebec	-	22.7	-	25.7
Taiwan	11.2	15.5	24.5	34.9
United States	8.5	9.9	16.7	16.3

Note: This table is adapted from French et al. (2017), Exhibit 3.

- The large variation in EOL spending percentages across countries leads to a concern about **overuse**, especially chronic diseases.

Concerns about Potential Wastes

- Past investigations on potential wastes have looked into non-EOL patients with non-chronic conditions:
  1. **Information asymmetry:**
     - Compare C-session use between physician- vs nonphysician-mothers (Chou et al. 2006; John and Rehavi 2016)
     - Control experiment by Ubel et al. (2011), who study colon cancer.
  2. Defensive medicine: Tort reforms with penalty caps on noneconomic damages increase procedure use but those with the deep pocket rule reduces it (Currie and MacLeod 2008).
  3. Financial incentives: Clemens and Gottlieb (2014); see McGuire (2000) and Johnson (2014) for reviews

Agency Problems with Physicians Treating Physicians

We study issues with information asymmetry regarding the use of invasive procedures at EOL, by estimating the causal effect of physician-patients on invasive care in the last six months of life.

Past literature on:

- Compare home sales where real estate agents are hired to when an agent sells his own house (Levitt and Syverson 2008).
- Ubel et al. (2011) randomize two clinical colon-cancer scenarios to representative samples of general internists and family medicine specialists.
- Use of a C-session for physician- versus nonphysician- mothers (Chou et al. 2006; Johnson and Rehavi 2016).

The existing literature has omitted the attributes of experts (or attending doctors), except for Johnson and Rehavi's study on Texas.

The Previous Empirical Strategy

Our Empirical Strategy: Within-Doctor Comparison

- This study uses matched doctor-patient data to remove the attending doctor's fixed effect (e.g., unobserved skills and practicing style).
- We also control for doctor experience at the time of attending.

National Health Insurance Database

Using NHID, we combine the following data sources:

1. **Death Registry:** 2000-2006
2. **NHID Registry of Beneficiaries:** sex, birthday, income, district, salary work
3. **Reimbursement Claim Data:** inpatient spending by procedure per admission, hospital type and district, and the attending doctor's unique ID
4. **Registry for Medical Personnel:** sex, birthday, date of certification
5. **Board-Certified Specialists:** each doctor's specialty, practice location and history
6. **Details of Physician Orders for Inpatient:** identify invasive procedure use for each admission, i.e., each matched doctor-patient pair by admission date.

Summary Statistics of Beneficiaries at End of Life I

Table: Hospital utilization of beneficiaries in last 6 months of life

	Nonphysicians' mean	Physicians minus Nonphysicians	Standard Error
Number of beneficiaries	765,649	766,638	-
Number of hospital admissions	1,366,507	1,364,840	-
Hospital utilization			
Ever checked into a hospital	0.75	0.10	0.011*
Number of admissions	1.53	0.21	0.041*
Total number of days in hospital	64.4	16.0	2.143*
Average number of days per admission	32.5	8.59	1.016*
Ever use an invasive procedure			
Any invasive procedure	0.51	0.08	0.013*
Nasogastric intubation feeding	0.40	0.09	0.014*
Mechanical ventilation	0.30	0.07	0.013*
Urinary catheterization	0.36	0.06	0.013*
Endotracheal intubation	0.21	0.04	0.012*
Used volume in percentile if > 0			
Total expenditure in NHI items	61.8	5.74	0.779*
Total reimbursement for hospital care	61.8	6.01	0.775*
Out-of-pocket payment on NHI items	57.3	-6.93	0.957*
Hemodialysis	58.0	2.03	0.944*
Any invasive procedure	60.1	3.58	0.885*
Nasogastric intubation feeding	58.4	4.16	0.930*
Mechanical ventilation	56.8	3.86	0.987*
Urinary catheterization	57.7	0.81	0.948
Endotracheal intubation	55.4	1.11	1.009

Summary Statistics of Beneficiaries at End of Life II

Table: Deceased beneficiaries' attributes, sorting, and causes of death

	Nonphysicians' mean	Physicians minus Nonphysicians	Standard Error
Demographics 1 year before death			
Male	0.62	0.36	0.005
Age at death	69.10	6.11	0.444
Full time work	0.68	0.12	0.013*
Certified low income	0.02	-0.02	0.001*
Income percentile	50.01	-2.14	1.286
Sorting			
Beneficiary checked into a chosen hospital	0.64	0.21	0.011*
Beneficiary saw a chosen doctor	0.21	0.65	0.011*
Heart attack	0.03	0.00	0.006
Acute disease	0.15	-0.03	0.010*
Accident	0.06	-0.02	0.006*
Suicide	0.03	-0.02	0.003*
Chronic disease	0.76	0.07	0.012*
Cancer	0.22	0.05	0.014*

Note: All the 989 deceased physician-patients had 1,667 hospital admissions at the last 6 months of life, including those who had never checked into hospital. We cluster standard errors at the patient level. We measure medical spending in percentile among the 578,436 deceased beneficiaries, including 846 medical doctors, who had ever checked into hospital in last 6 months of life. Only 742,961 beneficiaries have self-reported their income.

Doctors' Attributes I

Table: Attributes of Doctors Who Attended End-of-Life Patients

	In Chosen hospitals		Nonchosen doctors	
Doctors' attributes	Nonchosen doctors mean	Chosen minus nonchosen doctors	In nonchosen hospitals mean	In chosen minus nonchosen hospitals
Number of doctors	13248	+2390	1763	+13248
Years of experience at attending	7.10	+1.93*	8.56	-1.46*
Number of licenses	1.24	-0.04*	1.22	+0.02
Female	10.1%	-4ppt*	7.0%	+3ppt*
External medicine	48.6%	-22ppt*	40.8%	+8ppt*
Practice in multiple districts	48.1%	+10ppt*	44.9%	+3ppt*
Practice in multiple counties	34.5%	+5ppt*	31.7%	+3ppt*
Hospital characteristics:				
Teaching hospital	11.3%	+3.7ppt	0.3%	+11.0ppt*
Veteran hospital	8.3%	+5.8ppt	0.0%	+8.4ppt*
Private hospital	33.7%	+0.1ppt*	17.8%	+0.2ppt*
Number of providers in district	159	+9	113	+45*
Number of beds in district	106	-3	69	+37*
Use invasive care:	55.8%	+6.6ppt*	44.1%	+0.1ppt*
Nasogastric intubation feeding	38.7%	+10.4ppt*	28.7%	+0.1ppt*
Mechanical ventilation	25.8%	+9.3ppt*	15.1%	+ 0.1ppt*
Urinary catheterization	39.3%	+3.9ppt*	30.8%	+0.1ppt*
Endotracheal intubation	16.7%	+4.4ppt*	9.0%	+0.1ppt*

Doctors' Attributes II

Table: Attributes of the Attending Doctors for End-of-Life Patients

	In Chosen hospitals:		Nonchosen doctors:	
Doctors' attributes	Nonchosen doctors mean	Chosen minus nonchosen doctors	Nonchosen hospitals mean	Chosen minus nonchosen hospitals
Percent physician-patients	-	+1.1%*	-	-
Percent choosy-patients	6.98%	+51.8ppt*	4.56%	+2.42ppt*
Specialty-specific market share	0.17%	+0.12 ppt*	0.21%	-0.04ppt
Volume per patient in percentile:				
Any of the four invasive procedures	45	+6*	39	+7*
Nasogastric intubation feeding	45	+6*	41	+4*
Mechanical ventilation	46	+6*	41	+5*
Urinary catheterization	48	+3*	43	+5*
Endotracheal intubation	47	+2*	44	+4*
Reimbursement	46	+5*	30	+16*
Out of pocket	52	-3*	48	+5*
Total cost	46	+5*	30	+17*

Overall vs Matched Nonphysician Patients at End of Life I

Table: Hospital utilization and cause of death data in the analysis

	Nonphysician-patients' admissions:			
	Overall		Matched only	
Dependent variables	Mean	SD	Nean	SD
Length of hospital stay	41.97	25.37	44.35	27.33
Any of the four invasive procedures	0.61	0.49	0.61	0.49
Nasogastric intubation feeding	0.48	0.50	0.48	0.50
Mechanical ventilation	0.32	0.46	0.32	0.47
Urinary catheterization	0.42	0.49	0.41	0.49
Endotracheal intubation	0.22	0.41	0.21	0.41
Used volume in percentile				
Any of the four invasive procedures	49.49	28.87	49.65	29.29
Nasogastric intubation feeding	49.49	28.87	50.07	29.26
Mechanical ventilation	49.49	28.86	49.73	29.14
Urinary catheterization	49.50	28.87	48.95	28.88
Endotracheal intubation	49.50	28.87	48.84	28.98
Reimbursement	49.49	28.86	52.61	28.29
Out of pocket	49.49	28.87	45.55	28.70
Cause of death				
AMI	0.02	0.12	0.01	0.11
Accident	0.02	0.15	0.01	0.12
Suicide	0.01	0.09	0.00	0.07
Chronic disease	0.86	0.34	0.90	0.31
Cancer	0.32	0.46	0.40	0.49
Number of admissions	1,152,248		321,655	

Overall vs Matched Nonphysician Patients at End of Life II

Table: Descriptive statistics of covariates in the analysis

	Nonphysician-patients' admissions:					
	Overall			Matched only		
Covariates:	Mean	SD	Within hospital & doctor SD	Mean	SD	Within hospital & doctor SD
Dying patients' characteristics:						
Male	0.63	0.48	0.47	0.65	0.48	0.47
Age	70.17	14.24	12.95	69.68	14.14	12.80
Salaried worker	0.68	0.47	0.45	0.68	0.47	0.45
Low income	0.03	0.16	0.16	0.02	0.15	0.45
Income in percentile	50.01	28.94	27.58	50.58	30.07	28.75
Percent seeing chosen doctor	0.33	0.35	0.22	0.70	0.27	0.26
Utilization in penultimate 6 months						
Check in frequency	0.47	0.50	0.49	0.49	0.50	0.49
Days in hospital per admission	19.69	27.31	26.37	21.32	29.06	28.28
Total cost in relative quantity	100	100	100	112	106	107
Invasive care in relative quantity	100	100	100	105	106	107
Attending doctors' experience in years	9.03	4.47	1.37	9.87	4.21	1.47
District-level time-varying factors:						
Number of NHI providers	154	106	9	174	101	11
Number of hospital beds	106	74	26	108	64	27

(1) Basic Model

- Following the previous literature, we include overall (including the unmatched) patients' hospital admissions during the last 6 months of life.
- Temporarily assume treatment choice and hospital utilization Y_{iht} of patient i in hospital h at time t are determined by

$$Y_{iht} = \beta_{ht} + \beta_1 D_i + X_{it}'\beta_2 + u_{iht}. \quad (1)$$

β_{ht} is hospital, department and year-month fixed effects;
D_i is the physician-patient indicator;
X_{it} includes

  - **patient attributes:** sex, age, income percentile, and full-time work;
  - **past utilization:** whether has checked into a hospital and how many units of services in the penultimate 6 months;
  - local competition, measured by the numbers of health providers and hospital beds in district upon upon patient i's admission at time t.

- We cluster standard deviations at the patient level.

(1) Results in the Basic Model

Table: Hospital utilization in the last 6 months of life

	1	2	3	4	5
	Nonphysician patients' admissions		Within hospital		
Dependent variables	Mean	SD	SD	Coefficient on physician-patient	Standard errors
Days in hospital	41.97	25.37	24.54	0.836	0.768
Any invasive procedure:	0.61	0.49	0.48	0.011	0.013
Nasogastric intubation feeding	0.48	0.50	0.49	0.025	0.013
Mechanical ventilation	0.32	0.46	0.46	0.018	0.011
Urinary catheterization	0.42	0.49	0.48	0.022	0.013
Endotracheal intubation	0.22	0.41	0.41	0.019	0.010
Volume in percentile:					
Any invasive procedure	49.49	28.87	28.12	1.242	0.768
Nasogastric intubation feeding	49.49	28.87	28.14	1.780	0.778*
Mechanical ventilation	49.49	28.86	28.40	1.849	0.711*
Urinary catheterization	49.50	28.87	28.39	1.648	0.751*
Endotracheal intubation	49.50	28.87	28.59	0.164	0.698
Reimbursement	49.49	28.86	27.31	0.535	0.777
Out of pocket	49.49	28.87	28.04	-4.324	0.762*

Note: We include the 578,436 nonphysician-patients and 989 physician-patients, who had ever checked into hospital at the last six months of life, at the age 33 or older, including retirees. Their number of admissions with nonmissing self-reported income is 1,152,248 and 1,667, respectively. Column 3 presents information after removing hospital fixed effects and year-month fixed effects. We cluster standard errors at the patient level.

(2) Control for Doctor Fixed Effect and Experience

- The basic model were valid if doctors within hospitals could have been identical.
- We allow within-hospital variation in doctor quality by including doctor-hospital fixed effects and doctor experience:

$$\begin{aligned} Y_{ijht} &= \beta_{ht} + \beta_1 D_i + X'_{iht}\beta_2 + u_{ijht} \\ &\quad + \theta_{jh} + \beta_3 W_{jt}. \end{aligned} \tag{2}$$

θ_{jh} is the doctor-hospital fixed effect, which captures the attending doctor j's skill and practice style specific to the hospital h.

W_{jt} is doctor j's practicing experience since the initial certification.

- Equation (2) allows the same doctor to have different practicing styles if in different hospitals.

(2) Results in the Modified Model

Table: Hospital utilization in the last 6 months of life

	3	4	5	6	7	8
		Within hospital			Within hospital and doctor	
					adding doctor experience	
Dependent variables	SD	Coefficient on physician-patient	Standard error	SD	Coefficient on physician-patient	Standard error
Days in hospital	24.54	0.836	0.768	23.78	0.783	0.761
Any invasive procedure:	0.48	0.011	0.013	0.45	0.019	0.013
Nasogastric intubation feeding	0.49	0.025	0.013	0.46	0.032	0.013*
Mechanical ventilation	0.46	0.018	0.011	0.41	0.022	0.010*
Urinary catheterization	0.48	0.022	0.013	0.47	0.024	0.013
Endotracheal intubation	0.41	0.019	0.010	0.39	0.020	0.010*
Volume in percentile:						
Any invasive procedure	28.12	1.242	0.768	25.65	1.599	0.739*
Nasogastric intubation feeding	28.14	1.780	0.778*	26.50	2.192	0.762*
Mechanical ventilation	28.40	1.849	0.711*	26.16	2.079	0.667*
Urinary catheterization	28.39	1.648	0.751*	27.34	1.708	0.750*
Endotracheal intubation	28.59	0.164	0.698	27.67	0.133	0.683
Reimbursement	27.31	0.535	0.777	25.86	0.507	0.769
Out of pocket	28.04	-4.324	0.762*	26.17	-4.197	0.746*

Note: We include 578,436 nonphysician-patients and 989 physician-patients, who had ever checked into hospital at the last six months of life, at the age 33 or older. Their number of admissions with nonmissing self-reported income is 1,152,248 and 1,667. Column 3 presents information after removing hospital fixed effects and year-month fixed effects. Column 6 additionally removes doctor-hospital fixed effects. We cluster standard errors at the patient level.

(3) Control for the Patient's Choosiness

- Choosier patients are more likely physician-patients and less likely to opt for invasive care.
- If so, the observed difference in the use of invasive care between physician- and nonphysician- patients *understates* the information premium of physician-patients.
- We control for patient i's degree of *choosiness* using **the fraction of his or her hospital admissions attended by a chosen doctor**, denoted by C_i.

$$\begin{aligned} Y_{ijht} &= \beta_{ht} + \beta_1 D_i + X'_{iht}\beta_2 + u_{ijht} \\ &\quad + \theta_{hj} + W'_{jt}\beta_3 \\ &\quad + \beta_4 C_i \end{aligned} \tag{3}$$

(3) Results in the Full Model

Table: Hospital utilization in the last 6 months of life

	7	8	9	10
	Within hospital and doctor, including doctor experience			
			adding patient choosiness	
Dependent variables:	Coefficient on physician-patient	SE	Coefficient on physician-patient	SE
Days in hospital	0.783	0.761	0.999	0.762
Any invasive procedure	0.019	0.013	0.041	0.013*
Nasogastric intubation feeding	0.032	0.013*	0.052	0.013*
Mechanical ventilation	0.022	0.010*	0.040	0.010*
Urinary catheterization	0.024	0.013	0.039	0.013*
Endotracheal intubation	0.020	0.010*	0.034	0.010*
Volume in percentile				
Any invasive procedure	1.599	0.739*	2.917	0.740*
Nasogastric intubation feeding	2.192	0.762*	3.200	0.764*
Mechanical ventilation	2.079	0.667*	2.986	0.668*
Urinary catheterization	1.708	0.750*	2.550	0.751*
Endotracheal intubation	0.133	0.683	1.007	0.684
Reimbursement	0.507	0.769	1.267	0.771
Out of pocket	-4.197	0.746*	-3.094	0.747*

Note: Here we include 578,436 nonphysician-patients and 989 physician-patients, who had ever checked into hospital at the last six months of life, at the age 33 or older, including retirees. Their number of admissions with nonmissing self-reported income is 1,152,248 and 1,667, respectively. We control for doctor-hospital fixed effects and year-month fixed effects, and cluster standard errors at the patient level.

(4) Comparing Results Using All versus Matched Patients

Table: Fixed-effect results in the full model

	9	10	11	12
	All patients		Matched patients	
Dependent variables:	Coefficient on physician-patient	SE	Coefficient on physician-patient	SE
Days in hospital	0.999	0.762	0.826	0.762
Any invasive procedure	0.041	0.013*	0.018	0.013
Nasogastric intubation feeding	0.052	0.013*	0.032	0.013*
Mechanical ventilation	0.040	0.010*	0.007	0.010
Urinary catheterization	0.039	0.013*	0.022	0.013
Endotracheal intubation	0.034	0.010*	-0.002	0.010
Volume in percentile				
Any invasive procedure	2.917	0.740*	1.436	0.740
Nasogastric intubation feeding	3.200	0.764*	2.520	0.762*
Mechanical ventilation	2.986	0.668*	1.564	0.670*
Urinary catheterization	2.550	0.751*	1.700	0.751*
Endotracheal intubation	1.007	0.684	-0.839	0.684
Reimbursement	1.267	0.771	0.472	0.770
Out of pocket	-3.094	0.747*	-3.912	0.744*
Number of admissions	1,153,915		321,655	

Incorporate Doctor-Patient Relations

- The rest of analysis only includes chosen doctors and matched patients.

Aim: separate the sources of physician-patient effects driven by information asymmetry versus the doctor-patient relation.

- Adding relational variables in the full model:

$$\begin{aligned} Y_{ijht} &= \beta_{ht} + \beta_1 D_i + X'_{iht}\beta_2 + \theta_{hj} + W'_{jt}\beta_3 + \beta_4 C_i + u_{ijht} \\ &\quad + \phi M_i D_i + \gamma_1 r_{1ij} D_i + \gamma_2 r_{2ij} D_i + \gamma_3 r_{3ij} D_i + \beta_5 R_{ij} \end{aligned}$$

M_i =1 if physician-patient i's specialty involves surgery so is more informed than other physician-patients.

r_{1ij} =1 if both patient and doctor share the same specialty category.

r_{2ij} =1 if both are in the same cohort;

r_{3ij} =1 if patient i is less experienced than doctor j;

R_{ij} =1 if patient i has previously visited j.

Information versus Relations I

Explanatory variable	Volume in percentile					
	Out of pocket, -3.094*			Any invasive procedure, 2.917*		
Physician-patient	-1.31	-1.13	-0.75	2.35	1.20	1.67
	(1.84)	(1.90)	(2.62)	(2.12)	(2.12)	(2.73)
More informed physician-patient	-2.01	-1.71	-0.75	0.71	-1.13	-0.13
	(2.01)	(2.18)	(2.32)	(2.26)	(2.61)	(2.88)
Physician-patient is in the same specialty category		-0.61	-0.43		3.76 *	4.03 *
		(1.61)	(1.62)		(1.82)	(1.81)
Physician-patient is in the same cohort			0.58			0.35
			(1.46)			(1.47)
Physcian-patient is less experienced			-2.00			-2.15
			(2.06)			(1.93)
Previous patient			-2.30 *			-4.62 *
			(0.09)			(0.08)
	Days in hospital, 0.999			Any invasive procedure, 0.041*		
Physician-patient	-2.31	-2.94	-2.93	0.06	0.04	0.04
	(2.34)	(2.26)	(2.75)	(0.04)	(0.04)	(0.05)
More informed physician-patient	3.91	2.89	2.87	-0.02	-0.04	-0.04
	(2.47)	(2.85)	(3.12)	(0.04)	(0.05)	(0.05)
Physcian-patient is in the same specialty category		2.09	2.04		0.05	0.05
		(1.85)	(1.85)		(0.03)	(0.03)
Physician-patient is in the same cohort			0.07			0.00
			(1.59)			(0.02)
Physcian-patient is less experienced			0.04			-0.02
			(2.08)			(0.03)
Previous patient			1.23 *			-0.08 *
			(0.09)			(0.00)

Information versus Relations II

Explanatory variable	Nasogastric intubation feeding, 0.052*			Mechanical ventilation, 0.040*		
Physician-patient	0.041	0.032	0.049	0.039	0.027	0.027
	(0.038)	(0.038)	(0.047)	(0.030)	(0.031)	(0.039)
More informed physician-patient	0.013	-0.002	0.005	0.001	-0.018	-0.006
	(0.040)	(0.045)	(0.050)	(0.032)	(0.035)	(0.036)
Physician-patient is in the same specialty category		0.030	0.034		0.039	0.042*
		(0.030)	(0.030)		(0.026)	(0.026)
Physician-patient is in the same cohort			-0.012			0.008
			(0.025)			(0.021)
Physcian-patient is less experienced			-0.025			-0.022
			(0.033)			(0.029)
Previous patient			-0.073*			-0.063*
			(0.002)			(0.001)
	Urinal catheterlization, 0.039*			Endotracheal intubation, 0.034*		
Physician-patient	0.072*	0.064	0.101*	0.062*	0.062*	0.073
	(0.035)	(0.035)	(0.044)	(0.026)	(0.027)	(0.037)
More informed physician-patient	-0.039	-0.052	-0.044	-0.033	-0.033	-0.030
	(0.038)	(0.043)	(0.049)	(0.028)	(0.030)	(0.032)
Physcian-patient is in the same specialty category		0.027	0.031		0.001	0.002
		(0.030)	(0.030)		(0.024)	(0.024)
Physician-patient is in the same cohort			-0.024			-0.007
			(0.025)			(0.020)
Physcian-patient is less experienced			-0.044			-0.014
			(0.034)			(0.029)
Previous patient			-0.055*			-0.033*
			(0.001)			(0.001)

Information versus Relations III

	Volume in percentile					
Explanatory variable	Nasogastric intubation feeding, 3.200*			Mechanical ventilation, 2.986*		
Physician-patient	1.143	0.509	2.964	3.251	2.226	1.118
	(2.112)	(2.133)	(2.729)	(2.014)	(2.082)	(2.733)
More informed physician-patient	2.468	1.450	2.718	-0.283	-1.926	-1.295
	(2.262)	(2.462)	(2.683)	(2.131)	(2.338)	(2.388)
Physician-patient is in the same specialty category		2.078	2.377		3.355	3.517*
		(1.729)	(1.729)		(1.681)	(1.682)
Physician-patient is in the same cohort			-0.735			1.199
			(1.490)			(1.401)
Physician-patient is less experienced			-4.191*			-0.249
			(1.898)			(1.729)
Previous patient			-3.546*			-3.496*
			(0.089)			(0.084)
	Urinal catheterization, 2.550*			Endotracheal intubation, 1.007		
Physician-patient	3.739	2.683	4.803	1.871	1.870	1.883
	(2.016)	(2.019)	(2.501)	(1.778)	(1.880)	(2.447)
More informed physician-patient	-1.385	-3.079	-2.092	-1.017	-1.017	-1.406
	(2.171)	(2.502)	(2.801)	(1.924)	(2.014)	(2.188)
Physician-patient is in the same specialty category		3.458*	3.707*		0.001	0.044
		(1.725)	(1.709)		(1.617)	(1.613)
Physician-patient is in the same cohort			-0.749			-0.600
			(1.453)			(1.489)
Physician-patient is less experienced			-3.433			0.647
			(1.943)			(1.946)
Previous patient			-3.053*			-1.972*
			(0.088)			(0.087)

Interpretations

- **The doctor-patient relationship** is more important than the information asymmetry in explaining why physician-patients tend to use more invasive care and pay less out of pocket,
- except for endotracheal intubation, a breathing machine used mainly in emergency rooms;
- only a handful of physician-patients in our data checked into that department.

Looking into the treatment of heart attacks

- If information is essential in explaining physician-patient effects at the end of life, the use of intensive care should prolong life.
- Justification of our investigation on heart attacks (AMI, Acute Myocardial Infarction):
  1. AMI is independent of the physician-patient dummy.
  2. A leading cause of death in many economies.
  3. AMI requires an immediate treatment so there is less concern of patient selection.

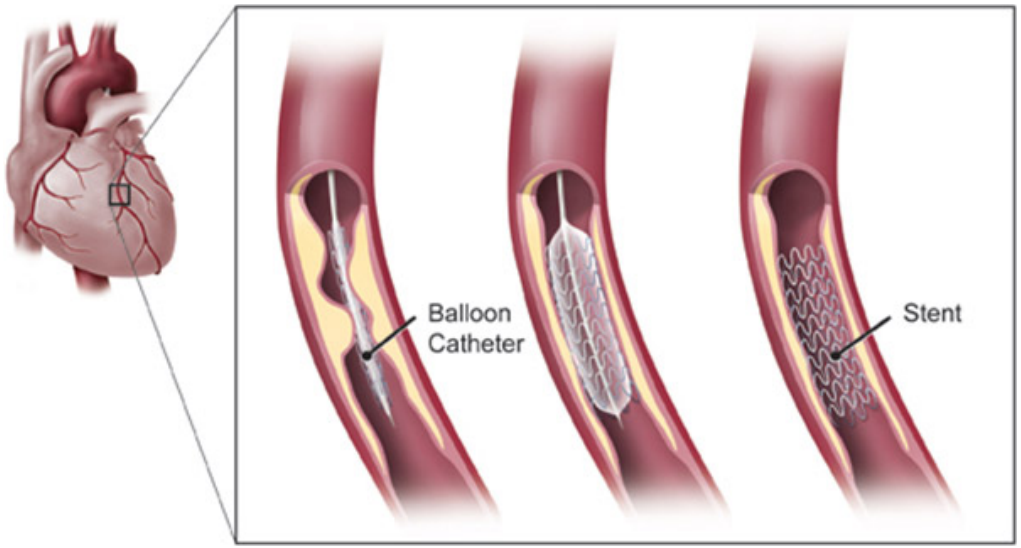
AMI treatments

- Only 2 treatment options, both covered by Taiwan's National Health Insurance:

Balloon non-intensive/necessary: Percutaneous transluminal coronary angioplasty (PCTA) baloon catheter;

Stent intensive/optional

- Using all AMI patients in the admin, including survivors, we find the use of stent only slightly increase short-term survival rates.



Findings

- Conventional methods — which omit attending doctors' quality — suggest physician-patients use 1ppt-2ppt more of non-ER invasive care procedures (e.g., nasogastric intubation feeding, mechanical ventilation, and urinal catheterization) and pay 4ppt less out of pocket.
- After controlling for doctor-hospital fixed effects and experience, we find a larger physician-patient effect on the invasive care (by 2ppt-3ppt).
- Additionally adding patient choosiness can further increases the degree of precision.
- The doctor-patient relationship seems more important than information premiums in explaining the physician-patient effects on treatment choices.

Findings

- Our preliminary results about AMI suggest little impact of intensive care on survival rates, using data that include survivors.
- Physician-patients tend to use invasive care mostly, while paying less OOP, because of **closer relations** with the attending, not because of better information.

Implications

- While chronic diseases dominate end-of-life medical spending. The existing literature focuses on AMI or stroke, or other acute diseases might not look at the right place.
- Looking into only a single disease prohibits researchers from separating the information effects and the doctor-patient relation effects.

policy: guidelines and monitoring systems

Limitations

Even with a set of comprehensive controls, we might still not get a right answer because physician-patients might have unobserved traits (e.g., grit or risk aversion) that can be positively or negatively correlated with higher use of invasive care than other patients.