Is Physician Gender Associated with the Patient Recovery Time?

Author: Ruixi Li
MACSS, University of Chicago
Email: rxli@uchicago.edu
Date: June 5, 2019

OVERVIEW

Research Question:
Is Physician Gender Associated with the Patient Recovery Time?

Summary:
Based on 2333 questionnaires collected from hospitals in three provinces and cities in China, we examined the relationship between the physician gender and the patient recovery time, adjusted for patient characteristics, physician characteristics, hospital and regional characteristics. Despite variables with economic meaning, we use Ridge and Lasso to select other features. We adopted the ordinal logistic regression approach for analysis and recovered a significant empirical result. Patients treated by female physicians had shorter recovery time than patients cared for by male physicians. This may have important clinical implications for Chinas outgoing medical reform, for example, an on-job training provided for male physicians to enhancing mental comfort skills.

Acknowledgment:
Thanks to the instructions and help from Professor Richard Evans.

DATA

Summary Statistics

	Level	Physician Gender: Female	Physician Gender: Male	P value
observations		1293	1040	
total time	long	592 (45.8)	424 (40.8)	0.017
	medium	368 (28.5)	349 (33.6)	
	short	333 (25.8)	267 (25.7)	
patient age	0-5	289 (22.4)	193 (18.6)	<0.001
	43593	339 (26.2)	330 (31.7)	
	43689	581 (44.9)	410 (39.4)	
	above 12	84 (6.5)	107 (10.3)	
patient gender	Female	785 (60.7)	338 (32.5)	<0.001
	Male	508 (39.3)	702 (67.5)	
illness type	Allergic cough	123 (9.5)	116 (11.2)	0.41
	Cough after respiratory infection	684 (52.9)	546 (52.5)	
	Cough variant asthma	60 (4.6)	56 (5.4)	
	Upper respiratory cough syndrome	426 (32.9)	322 (31.0)	
province code	Beijing	384 (29.7)	218 (21.0)	<0.001
	Heilongjiang	754 (58.3)	712 (68.5)	
	Shanxi	155 (12.0)	110 (10.6)	
hospital type	Children Specialist Hospital	359 (27.8)	266 (25.6)	0.004
	Clinic	604 (46.7)	446 (42.9)	
	First-class Hospital	269 (20.8)	250 (24.0)	
	General Hospital	61 (4.7)	78 (7.5)	
physician age	20-30	46 (3.6)	34 (3.3)	0.01
	30-35	235 (18.2)	203 (19.5)	
	35-40	415 (32.1)	396 (38.1)	
	40-50	477 (36.9)	324 (31.2)	
	above 50	120 (9.3)	83 (8.0)	
physician title	Attending doctor	548 (42.4)	462 (44.4)	0.569
	Chief physician	400 (30.9)	296 (28.5)	
	Deputy director	283 (21.9)	227 (21.8)	
	Resident physician	62 (4.8)	55 (5.3)	
num. of hospital	0	423 (32.7)	273 (26.2)	0.003
	1	794 (61.4)	704 (67.7)	
	2	76 (5.9)	63 (6.1)	
num. of visits	0	564 (43.6)	525 (50.5)	0.01
	1	613 (47.4)	420 (40.4)	
	2	40 (3.1)	35 (3.4)	
	3	21 (1.6)	21 (2.0)	
	4	55 (4.3)	39 (3.8)	

METHODS

Dependent Variable: total recovery time
Independent Variable: physician gender

Choose control variables with economic meaning

Patient attributes
- patient age
- patient gender
- illness type

Hospital attributes
- province code
- hospital type

Physician attributes
- physician age
- physician title

Choose control variables with statistical meaning
Using Ridge and Lasso to select other features
- number of hospital visited
- number of visits

Feature Importance of Unselected Features

	Ridge	Lasso	Mean
num. of hospital	1	1	0.87
num. of visits	0.85	0.84	0.76
drug info	0.33	0.33	0.27
asking length	0.21	0.21	0.17
understanding	0.19	0.19	0.16
asking history	0.11	0.11	0.1

Run the regression with selected features
Apply ordinal logistic regression

$$\log\left(\frac{P(TotalTime \leq j)}{1-P(TotalTime \leq j)}\right) = \alpha_j - (\beta_1 PhysicianGender + \beta_k Z_k)$$

TotalTime is the dependent variable total recovery time with three category (short, medium and long), PhysicianGender is the independent variable with two categories (1 for male and 0 for female), Z is a group of confounding variables.

Check robustness using cross-validation
We ensure the robustness of estimate by using 5-fold cross-validation.

RESULT

Association Between Physician Gender and Total Recovery Time

	Model A	Model B	Model C	Model D
	Total Time	Total Time	Total Time	Total Time
physician gender	0.123	0.306***	0.306***	0.395***
	-1.54	-3.69	-3.68	-4.61
patient age	-0.0845***	-0.0597*	-0.0587*	-0.0679**
	(-3.41)	(-2.36)	(-2.30)	(-2.60)
patient gender	-0.0579	-0.135	-0.124	-0.0633
	(-0.73)	(-1.66)	(-1.51)	(-0.76)
illness type	-0.0301	-0.0561	-0.0308	-0.0511
	(-0.55)	(-1.00)	(-0.54)	(-0.89)
hospital type		0.0385	0.052	0.0603
		-0.91	-1.22	-1.36
province code		0.608***	0.587***	0.505***
		-12.66	-12.14	-8.83
physician age			-0.128**	-0.0682
			(-3.00)	(-1.55)
physician title			-0.032	-0.0224
			(-0.70)	(-0.48)
num. of hospital visited				0.994***
				-12.85
num. of visits				-0.507***
				(-9.32)
cut1				
_cons	-1.621***	0.0348	-0.405	-0.0877
	(-7.61)	-0.13	(-1.35)	(-0.26)
cut2				
_cons	-0.293	1.449***	1.016***	1.460***
	(-1.39)	-5.32	-3.38	-4.29
N	2333	2333	2333	2333

CONCLUSION

Based on Model D, we can get the following estimation (Agrestiand Kateri, 2011):

$$\log\left(\frac{P(TotalTime \leq 2)}{1-P(TotalTime \leq 2)}\right) = 1.460 - (0.395 PhysicianGender + \beta_k Z_k)$$

$$\log\left(\frac{P(TotalTime \leq 1)}{1-P(TotalTime \leq 1)}\right) = -0.0877 - (0.395 PhysicianGender + \beta_k Z_k)$$

Then, the odds ratio for physician gender is:

$$e^{-\beta_1} = e^{-0.395} = 0.67$$

Thus the recovery time of patients treated by male physician are **0.67** times more likely than the recovery time of patients treated by female physician to be in the short category. This indicates that patient treated by male physician averagely recovered faster than those treated by female patient.