The effect of publishing hospital charges on healthcare costs: Evidence from Singapore

Parinduri, Rasyad

Nottingham University Business School, University of Nottingham, Malaysia Campus

2012

The effect of publishing hospital charges on healthcare costs: Evidence from Singapore

Rasyad A. Parinduri*

Nottingham University Business School, University of Nottingham,
Malaysia Campus, Jalan Broga, Semenyih, 43550, Selangor, Malaysia

Abstract

This paper examines the effect of publishing hospital charges on healthcare costs. We compare hospital charges before and after Singapore's Ministry of Health started publishing the statistics of hospital charges on its website in the late 2003. We do not find evidence of a decrease in healthcare costs. However, we find some evidence of an increase in cost dispersion, a decrease in patients' length of stay at hospitals, and an increase in hospital care cost per day.

Keywords: hospital charges publication, healthcare costs, cost dispersion, Singapore
JEL classification: D83, I11, L10

* Tel.: +60 3 8924 8287; fax: +60 3 8924 8019.
Email address: rasyad.parinduri@nottingham.edu.my.

1. Introduction

Does publishing hospital charges reduce healthcare costs?

Publishing hospital charges makes patients and medical doctors more informed about healthcare costs. Theoretically, an increase in price transparency lowers search costs, which decreases both prices and price dispersion (see, for example, Stigler (1961), Salop and Stiglitz (1977), and Stahl (1989)). However, the characteristics of healthcare services are different from those of other products so that patients may not necessarily go to the cheapest hospital to get treatments. Demand for healthcare services are irregular and unpredictable; physicians and insurance companies play an important role in the industry; patients do not have full knowledge of treatments and diseases; the quality of healthcare services are highly uncertain (see, for example, Arrow (1963)). Therefore, whether publishing hospital charges reduces healthcare costs remains an empirical question.

Singapore's Ministry of Health (MOH) started publishing the statistics of hospital charges on its website in the late 2003 to inform patients and medical doctors about healthcare costs, and to induce hospitals to be more competitive.[1] We use this MOH's initiative, by comparing hospital care costs in Singapore before and after the MOH started publishing hospital charges, to examine whether, as predicted by theories and intended by the Singapore's MOH, publishing hospital charges reduces healthcare costs.

Section 2 describes the data and the methodology. Section 3 discusses the results. Section 4 concludes.

[1] See Ministry of Health's (2003) press release on this initiative. Initially, in September 2003, the MOH published statistics of hospital charges for 28 most common illnesses. In November 2003, the MOH added 22 common conditions. Since December 2003, the MOH has published the statistics of hospital charges for 70 conditions or procedures.

2. Data and methodology

We get the data from the MOH's website, archived by Internet Archive: Wayback Machine.[2] The statistics are published monthly; they include the median of hospital care costs, the 90th percentile of costs, the average of patients' length of stay, and the number of cases, by hospitals, wards or room types, and health conditions or procedures, based on a twelve-month period of moving averages. The data covers 18 hospitals, 10 wards or room types, and 70 conditions or procedures.[3]

Internet Archive does not have all reports around the time when the MOH started publishing hospital charges. It has reports for three relevant periods, however. One is the period of May 2003 to April 2004. We call this period *Year 2003* and use it as the base year, with which healthcare costs after the publication of hospital charges are compared. The other two are the periods of November 2004 to October 2005 and October 2005 to September 2006, which we call *Year 2005* and *Year 2006*, respectively. This three-period data has 2,646 observations, which includes about 886 thousand cases.

To examine the effect of the publication of hospital charges, we estimate the following regression model:[4]

$$y_{ijkt} = \alpha + \beta_1 Year\ 2005 + \beta_2 Year\ 2006 + \xi_i + \xi_j + \xi_k + \varepsilon_{ijkt} \quad (1)$$

[2] Singapore's MOH does not provide past reports of hospital charges. Current reports are available at http://www.moh.gov.sg/content/moh_web/home/costs_and_financing/HospitalBillSize.html. The archives are available at the Internet Archive's website: http://wayback.archive.org/web/*/www.moh.gov.sg/corp/charges/common/procedures.do. Both are accessed on 23 June 2012.

[3] The health conditions are based on the Australian National Diagnosis-Related Group.

[4] Brown and Goolsbee (2002) use a similar specification for their basic results.

where y_{ijkt} is the median of healthcare costs of condition *i* set by hospital *j* for ward or room type *k* at time *t* deflated by the Singapore's Consumer Price Index; *Year 2005* and *Year 2006* are time dummies for year 2005 and 2006, respectively, i.e., dummies for periods after the publication of hospital charges; ξ_i is the health condition fixed-effects, which control for observed- and unobserved condition-specific factors that are similar across hospitals and wards such as the typical medical procedures required and the technology commonly used; ξ_j is the hospital fixed-effects, which control for hospital-specific factors such as the reputation of the hospitals; ξ_k is the ward- or room-type fixed-effects, which control for ward-specific factors such as the medical services provided in each ward and the amount of subsidies provided by the government. Negative estimates of the βs would indicate that the publication of hospital charges leads to a decrease in healthcare costs compared to real costs in 2003 before the MOH started publishing hospital charges.

Because *Year 2003* includes the first few months of 2004 when MOH has published hospital charges, the median of costs in *Year 2003* is lower than that in the period of, say, January 2003 to December 2003. Therefore, if publishing hospital charges reduces healthcare costs, the estimates of the βs in Equation 1 would provide the lower bound of the effect of publishing hospital charges on costs. To make sure that the results are robust, we also use the 90th percentile of costs as the dependent variable. Arguably, the 90th percentile of costs in *Year 2003* is much closer to the 90th percentile of costs before the MOH started publishing hospital charges.

In addition to examining the effect of publishing hospital charges on healthcare costs, we also analyze the effects of publishing hospital charges on (1) cost dispersion, which we define as the difference between the 90th percentile and the median of costs; (2) patients' length of stay at hospitals; and (3) healthcare costs per day, which we define as the median, or the 90th percentile, of costs divided by the length of stay.

3. Results

Table 1 presents the results. Each column provides a different specification, with or without hospital-, ward-, and health condition fixed-effects. Some specifications use the number of cases as weights, or exclude observations with more than 1,000 cases.[5]

<Insert Table 1 here.>

The publication of hospital charges does not seem to decrease healthcare costs. Regressions without hospital-, ward-, and condition fixed-effects in Columns 1-3 show that the median of healthcare costs in 2005 and 2006 were lower compared to real costs in 2003 before the MOH started publishing hospital charges, but the estimates are not significant statistically. (All estimates are multiplied by a hundred.) After controlling for the fixed effects in Columns 4-6, healthcare costs in 2005 and 2006 were not lower either. In fact, costs in 2006 were 1-2% higher, though the estimates are insignificant statistically.

Table 2 presents the effects of the publication of hospital charges on the 90th percentile of costs, costs dispersion, patients' length of stay at hospitals, and costs per day. Each column includes hospital-, ward-, and condition fixed-effects, excludes observations with more than 1,000 cases, and uses the number of cases as weights.

<Insert Table 2 here.>

Column 1 shows that the 90th percentile of healthcare costs in 2006 was 4% higher relative to real costs in 2003. There is also some evidence that the initiative increases cost dispersion and reduces patients' length of stay at hospitals. As Column 2 shows, cost dispersion increased by 11% in 2006. Column 3 shows that, in 2005, the average length of stay was 3% shorter; in 2006, it was 4% shorter. Because there is no evidence of lower costs

[5] Only a few conditions have more than 1,000 cases.

and some evidence of shorter length of stay, the publication of hospital charges seems to increase healthcare costs per day. Columns 4-5 show that, in 2006, the median and the 90th percentile of healthcare costs per day were, respectively, 6% and 8% higher that cost per day in 2003. Unlike the estimates in Table 1, those in Table 2, in particular the estimates of *Year 2006* dummy, are significant statistically.

4. Concluding remarks

We show that the publication of hospital charges in Singapore does not lead to lower healthcare costs. If anything, costs seem to increase and become more dispersed. Hospitals also tend to reduce patients' length of stay, which, along with the effect on costs, increases healthcare costs per day.

Like Wong, Wu and Wong (2007), we find some evidence of lower healthcare costs about 1.5 years after the publication of hospital charges. However, the estimates are insignificant statistically.[6] Moreover, we find some evidence of a cost increase one year later. Our results are also different from, for example, Brown and Goolsbee (2002) and Orlov (2011) who find that the availability of price information on the internet lowers the prices of life insurance and airline fares, respectively. Like these two papers, we, however, find an increase in price dispersion.

Our finding on shorter patients' length of stay at hospitals indicates a more efficient use of resources. The effect of the publication of hospital charges on healthcare quality is unclear, however.

[6] Wong, Wu, and Wong (2007) do not do a formal hypothesis testing of the effect of publishing hospital charges on healthcare costs.

References

Arrow, K.J., 1963. Uncertainty and the welfare economics of medical care. American Economic Review 53, 141-149.

Brown, J.R., Goolsbee, A., 2002. Does the internet make markets more competitive? Evidence from the life insurance industry. Journal of Political Economy 110, 481-507.

Orlov, E., 2011. How does the internet influence price dispersion? Evidence from the airline industry. Journal of Industrial Economics 59, 21-37.

Ministry of Health, 2003. Data on hospital bills for common illnesses. Press Release, 29 September 2003. Available at http://www.moh.gov.sg/content/moh_web/home/pressRoom/pressRoomItemRelease/2003/data_on_hospital_bills_for_common_illnesses.html

Salop, S.S., Stiglitz, J.E., 1977. Bargains and ripoffs: A model of monopolistically competitive price dispersion. Review of Economic Studies 44, 493-510.

Stahl, D.O., 1989. Oligopolistic pricing with sequential consumer search. American Economic Review 79, 700-712.

Stigler, G.J., 1961. The economics of Information. Journal of Political Economy 69, 213-225.

Wong, C.Y., Wu, E., and Wong, T.Y., 2007. Examining the effect of publishing of charges to reduce information asymmetry on healthcare costs. Singapore Medical Journal 48, 16-24.

Table 1 The effect of publishing hospital charges on healthcare costs

Dependent variable: ln(Costs)						
	(1)	(2)	(3)	(4)	(5)	(6)
Year 2005	-5.4	-13.3	-10.6	-2.4	-2.4	-1.5
	(4.8)	(9.9)	(8.0)	(1.2)	(1.6)	(1.3)
Year 2006	-1.3	-9.2	-11.6	2.0	0.7	2.1
	(4.8)	(9.8)	(7.9)	(1.2)	(1.7)	(1.3)
Fixed effects						
Hospitals				✓	✓	✓
Wards				✓	✓	✓
Conditions				✓	✓	✓
Weighted by the number of cases		✓	✓		✓	✓
Obs. with more than 1,000 cases are excluded			✓			✓
R^2	0.001	0.003	0.002	0.94	0.96	0.96
Number of obs.	2,646	2,646	2,553	2,646	2,646	2,553

Notes: The dependent variable is the logarithm of the median of costs. All estimates are multiplied by a hundred. The numbers in parentheses are robust standard errors.

Table 2 The effects on healthcare costs, cost dispersion, and length of stay

Dependent variable	Costs (the 90th percentile)	Cost dispersion	Average length of stay	Median costs per day	The 90th percentile costs per day
	(1)	(2)	(3)	(4)	(5)
Year 2005	-0.5	3.2	-3.0	1.5	2.5
	(1.5)	(4.8)	(0.8)	(1.3)	(1.4)
Year 2006	4.2	10.7	-3.8	5.9	8.0
	(1.5)	(4.1)	(0.8)	(1.3)	(1.4)
R^2	0.94	0.81	0.96	0.97	0.94
Number of obs.	2,553	2,529	2,553	2,553	2,553

Notes: The dependent variable is the logarithm of the 90th percentile of costs, that of cost dispersion, that of average length of stay, that of the median costs per day, and that of the 90th percentile costs per day. All estimates are multiplied by a hundred. All regressions include hospital-, ward-, and condition fixed-effects, exclude observations with more than 1,000 cases, and use the number of cases as weights. The numbers in parentheses are robust standard errors.