

# Impact of CABG Report Cards in Pennsylvania

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## Abstract

Since 1991, Pennsylvania Health Care Cost Containment Council (PHC4) has published cardiac care report cards. The report cards publicly disclose patient health outcomes of coronary artery bypass graft (CABG) surgery at the hospital- and surgeon- level and aims to improve the quality and efficiency of medical care.

We first examine the impact of CABG report cards on provider's volume. Then we develop a nested logit model to investigate the matching between patients and providers. Finally, we use the predicted demand from the nested logit model to construct the report card induced market concentration measure and analyze the impact of cardiac surgeon's market concentration on patients' health outcomes and resources used.

The evidence in this paper suggests that the report card lowers poor performing surgeon's volume but does not have an impact on hospital-level volume. In addition, we show that report card publication improves the matching between patients and providers, particularly for the high severity patients and the privately insured patients. Furthermore, we find the report card induced market concentration does not have an impact on patients' in-hospital mortality but reduces the amount of resources used for all patients except the high severity patients.

## Motivation

- Cardiac disease is leading cause of death in the United States. (CDC)
- Problem of information asymmetry exists in health market.
- Is there evidence of market efficiency in health care market?
- How do health care consumers react to new information?

## CABG Report Cards in PA

Hospital	Number of Cases	Mortality		Readmissions		Length of Stay	Average Charges
		In-Hospital	30-Day	7-Day	30-Day		
Abington Memorial	231	⊙	⊙	⊙	⊙	6.9	\$206,663
Albert Einstein	102	⊙	⊙	⊙	⊙	5.7	\$187,121
Allegheny General	320	⊙	⊙	⊙	⊙	7.1	\$80,027
Altoona Regional	175	⊙	⊙	⊙	⊙	5.2	\$55,009
Bon Secours *	72	⊙	⊙	⊙	⊙	6.7	\$54,848
Brandywine	56	⊙	⊙	⊙	⊙	7.7	\$269,097
Butler Memorial	170	⊙	⊙	⊙	⊙	6.4	\$44,473
Chester County	99	⊙	⊙	⊙	⊙	5.4	\$64,801
Community/Scranton	237	⊙	⊙	⊙	⊙	5.7	\$60,860
Conemaugh Valley Memorial	277	⊙	⊙	⊙	⊙	4.7	\$59,436
Crozer-Chester	177	⊙	⊙	⊙	⊙	5.7	\$214,248
Doylestown	207	⊙	⊙	⊙	⊙	5.6	\$81,676
DuBois Regional	170	⊙	⊙	⊙	⊙	5.1	\$62,837
Easton	123	⊙	⊙	⊙	⊙	5.9	\$182,692
Frankford	214	⊙	⊙	⊙	●	6.4	\$100,941
Gelsinger Wyoming Valley	95	⊙	⊙	⊙	⊙	5.2	\$75,313
Gelsinger/Danville	323	⊙	⊙	⊙	⊙	4.6	\$81,036
Graduate	61	⊙	NR	NR	NR	5.2	\$225,024
Hahnemann University	196	●	⊙	⊙	⊙	7.8	\$280,871
Hamot	461	⊙	⊙	⊙	⊙	5.7	\$84,332
Holy Spirit	247	●	●	⊙	⊙	5.4	\$66,335

## Data

- Pennsylvania Inpatient Hospital Discharge Data collected by Pennsylvania Health Care Cost Containment Council
- Pennsylvania's Guide to Coronary Artery Bypass Graft Surgery
- Pennsylvania Department of State Bureau of Professional and Occupational Affairs

## Methodology

- Provider-volume analysis
  - Volume = F (report card ratings, provider characteristics)
- Patient-provider matching analysis
  - We employ the nested logit model at patient level to predict the probabilities that patients with different severity will receive the treatment from each hospital-surgeon pair.
- Report-card induced market concentration
  - We construct a zipcode-level HHI using the predicted market share from nested logit estimation.
  - Mortality/charge = F (HHI, hospital characteristics, patient characteristics)

## Surgeon-level Volume Analysis

Dep Var = Physician Quarterly Volume  
Time period: 1998.2 - 2006.1

Dep. Var	Volume on all CABG Cases			Volume on Low-Severity CABG Cases			Volume on High-Severity CABG Cases		
	n=6586			n=6586			n=6586		
Mean of the Dep. Var	21.90	13.00	8.70	21.90	13.00	8.70	21.90	13.00	8.70
(Std. Dev. Of the Dep. Var)	(14.90)	(9.30)	(6.80)	(14.90)	(9.30)	(6.80)	(14.90)	(9.30)	(6.80)
High mortality flag	-7.293***	-7.340***	-4.762***	-4.505***	-4.609***	-3.147***	-2.609***	-2.636***	-1.527**
	(2.025)	(1.924)	(1.407)	(1.242)	(1.232)	(0.845)	(0.891)	(0.772)	(0.679)
Low mortality flag	6.01*	2.861	4.634	4.044**	2.393*	4.076**	2.194	0.588	0.921
	(3.554)	(2.937)	(3.79)	(1.749)	(1.446)	(1.71)	(1.834)	(1.524)	(1.865)
Not rated	-10.476***	-10.616***	-8.042***	-6.141***	-6.282***	-5.168***	-4.321***	-4.301***	-3.695***
	(1.261)	(1.175)	(1.163)	(0.745)	(0.688)	(0.675)	(0.543)	(0.502)	(0.524)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hospital Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hospital Fixed Effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Physician Fixed Effects	No	No	Yes	No	No	Yes	No	No	Yes

Standard deviations are in parentheses.  
Standard errors are in brackets.  
Note: All standard errors are clustered by surgeon.  
\*, \*\*, \*\*\* Significant at the 10%, 5%, 1% level (two-tail test).  
Hospital characteristics include not-for-profit dummy, hospital beds, and teaching status dummy.

## Nested Logit Results

Table 6: Nested Logit

Year in which data was collected	2000		2002		2003			
Time period in which the report card is matched to	1998/3 - 2002/2	2002/3 - 2004/1	2004/2 - 2005/1	2004/2 - 2005/1	2005/2 - 2006/1	2005/2 - 2006/1		
Surgeon Characteristics								
Experience	-0.008*	[0.005]	0.009*	[0.006]	-0.001	[0.004]	0.011**	[0.005]
Experience squared	0.000***	[0.000]	0.000	[0.000]	0.000	[0.000]	0.000***	[0.000]
High mortality flag	-0.370***	[0.058]	-0.278***	[0.072]	-0.353***	[0.050]	-1.294***	[0.090]
Not rated	-0.241***	[0.033]	0.031	[0.041]	-0.601***	[0.041]	-0.608***	[0.038]
Hospital Characteristics								
High mortality flag	2.243***	[0.291]	0.217	[0.329]	-2.855	[7.051]	0.874	[1.377]
Distance	-0.366***	[0.006]	-0.380***	[0.008]	-0.351***	[0.006]	-0.366***	[0.006]
Distance squared	0.004***	[0.000]	0.004***	[0.000]	0.003***	[0.000]	0.004***	[0.000]
Number of Observation	807259	515883	598283	598283	527460	527460		

Standard errors are in brackets.  
\*, \*\*, \*\*\* Significant at the 10%, 5%, 1% level (two-tail test).

## Conclusions

- Surgical volume is negatively associated with surgeon's poor or no rating that the aggregate level, regardless of patient severity.
- We do not find hospital-level report cards have an impact in hospital-level surgical volume.
- Our patient-level choice model suggests the demand side is aware of the report cards publication and use the inflation to select high-quality surgeon.
- The CABG market in Pennsylvania has become more concentrated over time.
- The report card induced market concentration leads to lower mortality and low resources used for healthier patient, though the impacts on mortality are not precisely estimated.