

Strategic Effort and Organizational Performance: Evidence from a Hospital Reform

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Motivation

- ▶ The emergency department (ED) serves as a critical and complex node within healthcare systems
- ▶ A lot of attention to the ED's performance in delivering urgent care
- ▶ BUT, the ED is also responsible for patient flow throughout the hospital - this role is the focus of our research

Motivation



- ▶ Our study:
 1. A routing rule based on server availability “free riding”?
 2. The ED is a key example for such strategic interactions across organizational units

What we do

- ▶ Investigate the effects of an ED routing rule on hospital outcomes within a multi-department hospital environment offering similar services
- ▶ Use as a natural experiment a 2019 reform in “Emek” hospital that implemented a switch in patient routing strategy:
 - From a “first-available-bed” approach
 - To evenly distributing patients across departments

Related literature

- ▶ ED congestion and health outcomes: Woodworth and Holmes (2020), Sung et al. (2013), Derlet and Richards (2000)
- ▶ Policy has a considerable impact on patients health: Gruber et al. (2021)
- ▶ Physician incentives and patient outcomes: Chan (2016), Chan (2018), Silver (2021), Song et al. (2015)

Policy reform details

- ▶ **Allocation method:** Post-reform, patients are assigned based on a fixed sequence tied to departmental capacity, not on current bed occupancy

(Implemented using a computer program)
- ▶ Care responsibility maintained by the original department, even if patients overflow to another department
- ▶ No major changes in hospital policy, budget, or staffing concurrent with the reform
- ▶ The reform was implemented across all hospital internal departments starting October 6, 2019
- ▶ **Key assumption:** Absent the reform, trends in hospital activity during the treatment and comparison years would be similar

Sample construction

- ▶ **Treatment period:** 20 weeks before and after the Reform enactment on October 6, 2019 (total of 40 weeks)

The end of the period is set just before the COVID-19 pandemic onset in 2020 (First Covid case 21 February 2020)

- ▶ **Comparison Group:** corresponding 40 weeks period around October 6 of the preceding year (2018)
- ▶ Analysis of Internal ED - ED departments network:
 - Total visits to the internal ED: 38,848
 - Admitted: 12,950 visits
 - The remainder were discharged without admission
 - Visits to other ED units, e.g., surgical, are not in the sample (and not available to us)

Empirical Specification

- ▶ Difference-in-difference specification:

$$Y_{jt} = \beta \cdot \text{Reform}_j \cdot \text{Post}_t + \mu \cdot \text{Reform}_j + \eta \cdot \text{Post}_t + X_{jt} \cdot \delta + u_{jt},$$

- ▶ Where:

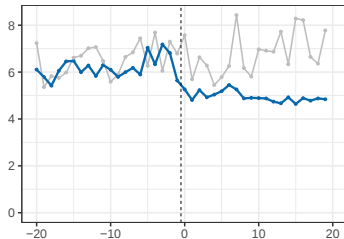
- Y_{jt} is the outcome for patient j at time t
- Reform_j indicates the treatment period (the 40 weeks around the reform)
- Post_t indicates the post-reform period (20 weeks after October 6)
- X_{jt} includes controls for patient gender, age, minority ethnicity, and holidays

Summary statistics of main study sample

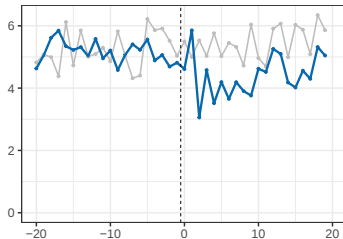
	Mean (1)	S.D (2)
A. ED Visit Characteristics		
After-hours visit Share	0.488	
Weekday Visit	0.740	
Minority Patient	0.471	
Patient Age	58.807	20.115
Female Patient	0.474	
B. ED Visit Outcomes		
ED Visit Duration (Hours)	6.134	5.032
Inpatient Admission from the ED	0.333	
Inpatient Length of Stay (Days)	5.054	6.355
30-Day Readmission	0.128	
90-Day All-Cause Mortality Rate	0.144	

ED visits and hospitalizations around the reform

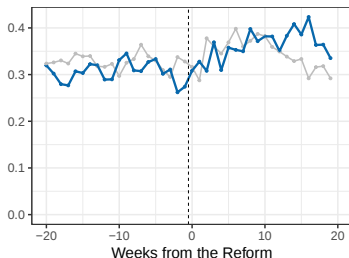
A) ED Visit Duration, Hours



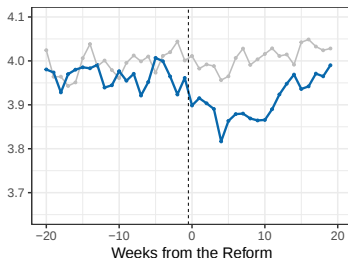
B) Inpatient LOS, Days



C) ED Hospitalization Rate



D) Log Number of Occupied Beds



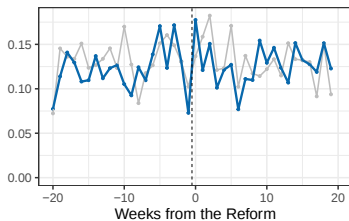
— Comparison Year — Treatment Year

The impact of the Reform on admissions & hospitalization

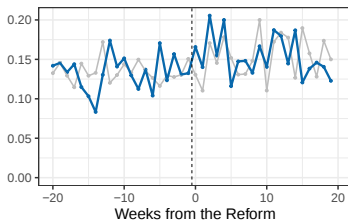
	ED Visit Duration (Hours)		Inpatient Length of Stay (Days)		Inpatient Admission from the ED		Log Occupancy	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post*Treat	-1.529 (0.101)	-1.560 (0.100)	-0.972 (0.222)	-0.957 (0.222)	0.040 (0.010)	0.047 (0.009)	-0.070 (0.010)	-0.077 (0.010)
Post	0.310 (0.082)	0.277 (0.081)	0.250 (0.161)	0.204 (0.161)	0.015 (0.007)	-0.002 (0.006)	0.014 (0.007)	0.016 (0.007)
Treatment	-0.360 (0.073)	-0.316 (0.072)	-0.058 (0.148)	-0.046 (0.147)	-0.022 (0.007)	-0.019 (0.006)	-0.029 (0.007)	-0.023 (0.007)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
N	38,848	38,848	12,950	12,950	38,848	38,848	2,800	2,800
Mean Dep. Var	6.174	6.174	5.152	5.152	0.305	0.305	3.965	3.965

Patient Outcomes

A) 30-Day Readmission



B) 90-Day Mortality



— Comparison Year — Treatment Year

The impact of the Reform on patient outcomes

	<u>30-Day Readmission</u>		<u>90-Day All-Cause Mortality</u>	
	(1)	(2)	(3)	(4)
Post*Treat	0.0072 (0.0117)	0.0080 (0.0118)	0.0022 (0.0123)	0.0044 (0.0121)
Post	0.0005 (0.0084)	-0.0014 (0.0084)	0.0190 (0.0087)	0.0143 (0.0086)
Treatment	-0.0093 (0.0084)	-0.0085 (0.0084)	-0.0025 (0.0086)	-0.0008 (0.0085)
Controls	No	Yes	No	Yes
N	12,950	12,950	12,950	12,950
Mean Dep. Var	0.1208	0.1208	0.1322	0.1322

Falsification table for covariates

The Association of the Reform with the Rate and Characteristics of Incoming ED Visits

	Number of ED Visits	Patient Age	Minority Patient	Female Patient	After-Hours Visit	Weekday Visit	Predicted LOS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post*Treat	-2.435 (2.053)	-0.674 (0.408)	-0.002 (0.010)	0.012 (0.010)	0.006 (0.010)	-0.019 (0.009)	-0.051 (0.112)
Post	-2.129 (1.475)	2.097 (0.289)	-0.018 (0.007)	-0.007 (0.007)	-0.042 (0.007)	0.010 (0.006)	0.042 (0.077)
Treatment	1.093 (1.478)	-0.238 (0.287)	-0.012 (0.007)	0.003 (0.007)	0.008 (0.007)	0.001 (0.006)	0.024 (0.080)
N	561	38,848	38,848	38,848	38,848	38848	12828
Mean Dep. Var	71.471	57.827	0.474	0.475	0.511	0.740	5.482

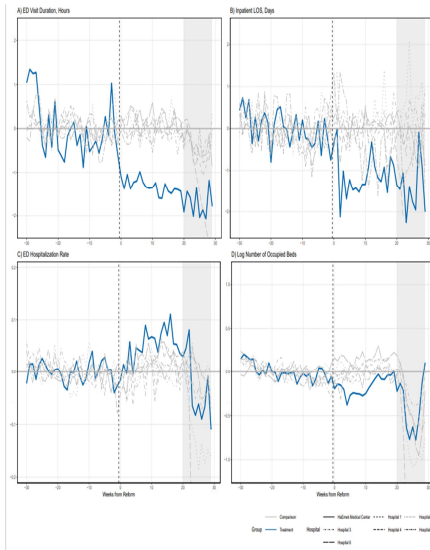
Notes: This table presents the DD estimates of the average effect of the reform for selected covariates that should not have been affected by the reform. The mean dependent variable is calculated during the comparison year. Robust standard errors appear in parentheses.

Summary and discussion

- ▶ The implementation of the routing reform shortened ED visit duration and Hospital LOS
- ▶ Findings are consistent with a strategic response of hospital departments to free-ride incentives created by first-available-bed routing
- ▶ Our results imply that a balanced routing can improve resource allocation and overall hospital efficiency
- ▶ These findings have implications for hospital management and beyond

Thank You!

Appendix: ED visits and hospitalizations – New Results



Appendix: Patient outcomes – New Results

