

“Lean Management and U.S. Public Hospital Performance: Results from a National Survey”

Supplemental Digital Content

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Table 1. Robust Linear Regression Results for Efficiency: EBITDA Margin & Adjusted Inpatient Expense Per Discharge

		EBITDA Margin (n = 250) (F = 2.03*, R ² = .0595, p > F = .0192)			Adj. Inpatient Expense (n = 126) (F = 2.71*, R ² = .212, p > F = .0023)		
		b	p > t	95% CI	b	p > t	95% CI
Intercept							
		.176*	.000	[.0881, .265]	8142*	.000	[6057, 10227]
Census Division (reference category = Midwest)							
	Northeast	.00474	.912	[-.0798, .0893]	1830**	.083	[-243, 3903]
	South	.0384	.335	[-.0399, .117]	-47.7	.960	[-1932, 1837]
	West	.0144	.577	[-.0364, .0651]	996	.286	[-843, 2836]
Core-Based Statistical Area Type (reference category = Metropolitan)							
	Micropolitan	.0414**	.098	[-.00777, .0906]	-127	.867	[-1627, 1373]
	Rural	.0143	.522	[-.0297, .0584]	2576	.130	[-768, 5919]
Hospital Bed Size (reference category = 0 - 100 beds)							
	100-399 beds	-.0191	.340	[-.0586, .0203]	-395	.653	[-2133, 1343]
	400+ beds	.0696*	.013	[.0150, .124]	-725	.305	[-2118, 668]
Member of a System or Network? (reference category = No)							
	Yes	-.0477**	.084	[-.102, .00639]	11.9	.982	[-1044, 1068]
Member of Council of Teaching Hospitals (CoTH)? (reference category = No)							
	Yes	-.0698*	.006	[-.119, -.0205]	1885*	.002	[733, 3036]
Market concentration (reference category = Unconcentrated (HHI 100 to <1500))							
	Moderately concentrated (HHI 1500 to <2500)	.0125	.557	[-.0294, .0544]	-263	.722	[-1725, 1200]
	Highly concentrated (HHI >=2500)	-.0757	.327	[-.228, .0761]	3132*	.014	[653, 5611]
	Percent Medicaid Discharges	-.000872	.615	[-.00428, .00254]	.0237	.131	[-.00714, .0546]
Hospital Started Lean by End of 2014 (reference category = had not started by end of 2014)							
	Started Lean by 2014 end	.0420*	.020	[.00672, .0773]	-730	.228	[-1924, 464]
* indicates statistical significance at $\alpha = .05$ ** indicates statistical significance at $\alpha = .10$							

Table 2. Robust Linear Regression Results for Efficiency: Percent of Patients Who Left ED without Being Seen & Severity-Adjusted Length of Stay

		% ED Patients LWBS (n = 138) (F = 3.85*, R ² = .190, p > F = .0000)			Severity-Adjusted LoS (n = 254) (F = 8.82, R ² = .192, p > F = .0000)		
		<i>b</i>	p > t	95% CI	<i>b</i>	p > t	95% CI
Intercept		1.06	.020	[.170, 1.94]	3.08*	.000	[2.50, 3.66]
Census Division (reference category = Midwest)							
	Northeast	.872	.475	[-1.54, 3.28]	1.47	.148	[-.527, 3.47]
	South	.272	.444	[-.429, .973]	.141	.511	[-.281, .564]
	West	.0548	.924	[-.904, .996]	-.337	.278	[-.947, .273]
Core-Based Statistical Area Type (reference category = Metropolitan)							
	Micropolitan	.160	.690	[-.634, .954]	-.149	.527	[-.611, .314]
	Rural	-.281	.576	[-1.27, .710]	-.155	.586	[-.715, .405]
Hospital Bed Size (reference category = 0 - 100 beds)							
	100-399 beds	.601	.143	[-.634, .954]	.736*	.005	[.229, 1.24]
	400+ beds	1.69*	.008	[-1.27, .710]	1.24*	.001	[.490, 2.00]
Member of a System or Network? (reference category = No)							
	Yes	.648*	.043	[.0198, 1.28]	-.0661	.790	[-.554, .422]
Member of Council of Teaching Hospitals? (reference category = No)							
	Yes	-.0480	.938	[-1.26, 1.17]	.115	.763	[-.637, .868]
3-Category Herfindahl-Hirschman Index (HHI) (reference category = Unconcentrated (HHI 100 to <1500))							
	Moderately concentrated (HHI 1500 to <2500)	-.388	.324	[-1.16, .387]	-.158	.535	[-.660, .344]
	Highly concentrated (HHI ≥ 2500)	.304	.556	[-.715, 1.32]	-.0654	.743	[-.459, .328]
	Percent Medicaid Discharges	.0237	.131	[-.00714, .0546]	.0127	.477	[-.0224, .0477]
Hospital Started Lean by End of 2014 (reference category = had not started by end of 2014)							
	Started Lean by 2014 end	-.610**	.068	[-1.26, .0448]	-.191	.260	[-.524, .142]
* indicates statistical significance at α = .05 ** indicates statistical significance at α = .10							

Table 3. Robust Linear Regression Results for Patient Outcomes: 30-Day Risk Adjusted Mortality Index & HCAHPS Score

		Risk Adj. Mortality (n = 74) (F = n/a, R ² = .199, p > F = n/a)			HCAHPS Score (n = 205) (F = 3.37*, R ² = .154, p > F = .0001)		
		<i>b</i>	<i>p</i> > <i>t</i>	95% CI	<i>b</i>	<i>p</i> > <i>t</i>	95% CI
Intercept		14.8*	.000	[13.7, 15.9]	269*	.000	[264, 274]
Census Division (reference category = Midwest)							
	Northeast	-.814**	.059	[-1.66, .0326]	-14.8*	.001	[-23.7, -5.92]
	South	-.214	.383	[-.701, .273]	-1.95	.301	[-5.66, 1.76]
	West	.0240	.954	[-.812, .860]	-4.08	.125	[-9.30, 1.14]
Core-Based Statistical Area Type (reference category = Metropolitan)							
	Micropolitan	.0847	.759	[-.464, .634]	.284	.901	[-4.22, 4.79]
	Rural	-.947**	.057	[-1.92, .0309]	2.76	.280	[-2.26, 7.79]
Hospital Bed Size (reference category = 0 - 100 beds)							
	100-399 beds	-.605	.186	[-1.51, .299]	-2.39	.269	[-6.63, 1.86]
	400+ beds	-.671	.158	[-1.61, .267]	-1.16	.663	[-6.39, 4.08]
Member of a System or Network? (reference category = No)							
	Yes	-.282	.158	[-.675, .112]	-.417	.813	[-3.90, 3.06]
Member of Council of Teaching Hospitals? (reference category = No)							
	Yes	-.432	.155	[-1.03, .168]	.166	.955	[-5.57, 5.90]
Market concentration (reference category = Unconcentrated (HHI 100 to <1500))							
	Moderately concentrated (HHI 1500 to <2500)	-.686	.318	[-2.05, .678]	6.18**	.082	[-.787, 13.1]
	Highly concentrated (HHI >=2500)	.343	.306	[-.322, 1.01]	-.881	.712	[-5.58, 3.82]
	Percent Medicaid Discharges	.00371	.725	[-.017, .025]	-.182**	.050	[-.363, -.000]
Hospital Started Lean by End of 2014 (reference category = had not started by end of 2014)							
	Started Lean by 2014 end	.158	.497	[-.306, .623]	1.12	.559	[-2.65, 4.88]
* indicates statistical significance at $\alpha = .05$ ** indicates statistical significance at $\alpha = .10$ n/a indicates no data available							

Table 4. Robust Linear Regression Results for Patient Outcomes: Death Rate in Low-Mortality DRGs & 30-Day Unplanned Readmission Rate

	Death Rate in Low-Mortality DRGs (n = 184) (F = 0.92, R ² = .0252, p > F = .530)			30-Day Unplanned Readmission (n = 227) (F = 2.96*, R ² = .153, p > F = .0005)		
	<i>b</i>	p > t	95% CI	<i>b</i>	p > t	95% CI
Intercept	1.43	.357	[-1.63, 4.49]	15.5*	.000	[15.2, 15.8]
Census Division (reference category = Midwest)						
Northeast	-.736	.560	[-3.23, 1.76]	1.05*	.014	[.213, 1.90]
South	-.299	.806	[-2.70, 2.10]	.00506	.969	[-.249, .259]
West	-1.70	.190	[-4.26, .852]	-.193	.136	[-.448, .0614]
Core-Based Statistical Area Type (reference category = Metropolitan)						
Micropolitan	.480	.608	[-1.37, 2.33]	-.0653	.704	[-.404, .273]
Rural	1.32	.216	[-.781, 3.42]	.118	.372	[-.143, .379]
Hospital Bed Size (reference category = 0 - 100 beds)						
100-399 beds	.0346	.966	[-1.58, 1.65]	.140	.283	[-.116, .396]
400+ beds	1.06	.229	[-.674, 2.80]	.469	.223	[-.288, 1.23]
Member of a System or Network? (reference category = No)						
Yes	.0638	.954	[-2.14, 2.27]	-.0653	.557	[-.284, .153]
Member of Council of Teaching Hospitals? (reference category = No)						
Yes	.469	.613	[-1.36, 2.30]	.322	.384	[-.405, 1.05]
Market concentration (reference category = Unconcentrated (HHI 100 to <1500))						
Moderately concentrated (HHI 1500 to <2500)	-.694	.689	[-4.11, 2.73]	.128	.492	[-.238, .494]
Highly concentrated (HHI ≥ 2500)	-1.77	.122	[-4.02, .480]	-.0701	.574	[-.316, .175]
Percent Medicaid Discharges	.0140	.689	[-.0549, .0829]	.00469	.420	[-.00675, .0161]
Hospital Started Lean by End of 2014 (reference category = had not started by end of 2014)						
Started Lean by 2014 end	1.11	.133	[-2.55, .341]	-.102	.402	[-.342, .138]
* indicates statistical significance at α = .05						
** indicates statistical significance at α = .10						