

OFFICIAL MEMO

To: Abraham Gage
From: Soryn Lurding
Date: July 30, 2024
Subject: Comparing spinal operation costs between hospitals with a distinction
and those without

I'm writing to inform you of my statistical findings regarding whether there is a significant price difference between various spinal operations with hospitals that have a Blue Cross Blue Shield distinction and those that do not. I furthered this research by examining the difference between Blue Cross Blue Shield's distinction plus to regular distinctions as well as no distinctions. To conduct this research, I used hospital data from Louisiana and Kentucky.

The types of spinal operations include combined anterior and posterior spinal fusion with MCC, combined anterior and posterior spinal fusion with CC, combined anterior and posterior spinal fusion without CC/MCC, spinal fusion except cervical with spinal curvature, malignancy, infection O, spinal fusion except cervical with MCC, spinal fusion except cervical without MCC, cervical spinal fusion with MCC, cervical spinal fusion with CC, and cervical spinal fusion without CC/MCC.

I conducted this research by assigning hospitals with a distinction binary code, allowing me to separate the data. Once the data had been encoded, I took the averages for each operation and conducted a t-test. I decided to use a two-sample assuming unequal variances. I will be using a confidence level of 95% for all statistical analyses.

This data was collected through insurance companies through their compliance with the Transparency in Coverage rule.

Kentucky findings:

DISTINCTION +		
t-Test: Two-Sample Assuming Unequal Variances		
	W/O DISTINCTION +	W DISTINCTION +
Mean	11726.224	12332.5645
Variance	221.658503	1428363.234
Observations	11	11
Hypothesized Mean Difference	0	
df	10	
t Stat	-1.682518683	
P(T<=t) one-tail	0.06168982	
t Critical one-tail	1.812461123	
P(T<=t) two-tail	0.12337964	
t Critical two-tail	2.228138852	

As shown by the data, the p-value is approximately 0.12337. Since we are testing at a 95% confidence level, this concludes the cost difference between distinction plus and without distinction plus is not significant in Kentucky.

DISTINCTION		
t-Test: Two-Sample Assuming Unequal Variances		
	W/O DISTINCTION	W DISTINCTION
Mean	11188.38537	14710.02463
Variance	326.2471612	206778.7579
Observations	11	11
Hypothesized Mean Difference	0	
df	10	
t Stat	-25.66527444	
P(T<=t) one-tail	9.26013E-11	
t Critical one-tail	1.812461123	
P(T<=t) two-tail	1.85203E-10	
t Critical two-tail	2.228138852	

Within this distinction sample, I included the distinction plus as well in an effort to get a sample size large enough. Hospitals in Kentucky with a distinction include 10 hospitals within the state.

The data shows a p-value of approximately 1.852E-10. At the 95% confidence level, there is a statistically significant difference in the cost of spinal surgery between hospitals with a Blue Cross Blue Shield distinction and those without in Kentucky.

Louisiana findings:

DISTINCTION +		
t-Test: Two-Sample Assuming Unequal Variances		
	W/O DISTINCTION +	W DISTINCTION +
Mean	11394.14778	11590.39557
Variance	55615.24521	25442.04538
Observations	11	11
Hypothesized Mean Difference	0	
df	18	
t Stat	-2.286151845	
P(T<=t) one-tail	0.017291492	
t Critical one-tail	1.734063607	
P(T<=t) two-tail	0.034582984	
t Critical two-tail	2.10092204	

Louisiana has 5 hospitals with distinction plus. The data shows a p-value of approximately 0.0345. With a 95% confidence level, the cost difference between hospitals with distinction plus and those without distinction plus is statistically significant in Louisiana.

DISTINCTION		
t-Test: Two-Sample Assuming Unequal Variances		
	W/O DISTINCTION	W DISTINCTION
Mean	11275.51347	12704.48597
Variance	54622.81533	39334.56873
Observations	11	11
Hypothesized Mean Difference	0	
df	19	
t Stat	-15.46161153	
P(T<=t) one-tail	1.61283E-12	
t Critical one-tail	1.729132812	
P(T<=t) two-tail	3.22566E-12	
t Critical two-tail	2.093024054	

Louisiana has 6 hospitals with a Blue Cross Blue Shield distinction. This data includes distinction plus, as there is only one hospital with a distinction that is not distinction plus.

The data shows a p-value of approximately 3.225E-12. At the 95% confidence level, there is a significant difference in cost between hospitals with distinction and those with no distinction in Louisiana.

In effort to try to combat the underlying issue of scarcity of hospitals with a distinction in both Kentucky and Louisiana, I combined both states data.

DISTINCTION +		
t-Test: Two-Sample Assuming Unequal Variances		
	W/O DISTINCTION +	W DISTINCTION +
Mean	11560.18589	11961.48003
Variance	55470.44774	836549.2257
Observations	22	22
Hypothesized Mean Difference	0	
df	24	
t Stat	-1.992906611	
P(T<=t) one-tail	0.028880278	
t Critical one-tail	1.71088208	
P(T<=t) two-tail	0.057760556	
t Critical two-tail	2.063898562	

As shown in the data, the p-value is approximately 0.0577. At the 95% confidence level, there is no statistically significant difference between cost with distinction plus and without.

DISTINCTION		
t-Test: Two-Sample Assuming Unequal Variances		
	W/O DISTINCTION	W DISTINCTION
Mean	11231.94942	13707.2553
Variance	28154.41921	1170626.309
Observations	22	22
Hypothesized Mean Difference	0	
df	22	
t Stat	-10.60401513	
P(T<=t) one-tail	2.05468E-10	
t Critical one-tail	1.717144374	
P(T<=t) two-tail	4.10936E-10	
t Critical two-tail	2.073873068	

As shown by the table above, comparing both states data with a distinction and without, we get a p-value of approximately 4.109E-10. At the 95% confidence level, there is a significant difference in cost between spinal operations in hospitals that have a Blue Cross Blue Shield distinction and those that do not.

Every test conducted in regards with a distinction compared to one without, proved to be statistically significant at the 95% confidence level. These hospitals with a distinction included those with distinction plus. However, test conducted with only distinction plus compared hospitals with distinction plus with those without any distinction, as well as those with a normal distinction. I believe these findings skewed the data, resulting in a not statistically significant finding when testing distinction plus by itself. As seen in the Kentucky as well as the combined data, both are not statistically significant. I believe the Louisiana distinction plus data is only statistically significant due to there being only one hospital in the state with a regular distinction. Therefore, from this data we cannot conclude that hospitals with distinction plus has a statistically significant cost difference from regular distinctions and those without any distinction at all.

In conclusion, we found a statistically significant difference in cost between hospitals with a Blue Cross Blue Shield distinction in regard to spinal operations in both Kentucky and Louisiana. We can conclude with a 95% certainty that there is a significant difference in cost with a distinction from the Blue Cross Blue Shield and those without. Therefore, insurance companies are paying more to hospitals that they have determined have higher quality standards.

Sincerely,



Soryn Lurding
CEO Soaring Analytics