Evaluating the Association Between Hospital Labor Costs and the Quality of Care

Beauvais, B. Kruse, C. S., Ramamonjiarivelo, Z., Sen, K., Pradhan, R., Fulton, L

School of Health Administration, College of Health Professions, Texas State University

Abstract

Throughout the history of healthcare delivery, patient care has been a personal issue. The competent healing touch of a caregiver is a critical component to the care patients receive. Thus, the more skilled the provider is, the higher the likelihood outcomes will be delivered in a safe and effective manner. However, it is costly to attract and retain high quality clinical staff leading many hospital leaders to continually adjust the staffing mix to minimize labor costs while also ensuring the quality of care is optimized. Unfortunately, in recent years, hospitals in the United States have faced immense financial pressures that are threatening their economic sustainability and patients' access to care in the future. Through the recent COVID-19 pandemic, the cost of delivering healthcare has continued to escalate, all while the demand for patient care has exceeded many hospitals' capacity. Most troubling is the impact that the pandemic has had on the healthcare workforce. Over the past two years, many healthcare workers have reached a point of exhaustion and burnout resulting in many leaving the industry. Others have lost their positions due to refusal to accept vaccination requirements. And some, unfortunately, have fallen victim to the disease. This has resulted in a depleted local market workforce and, in turn, has left many hospitals struggling to fill vacancies at ever increasing cost – all while under immense pressure to deliver quality patient care. What remains uncertain is whether the increase in labor costs have been matched with a commensurate rise in the quality of care or if quality has deteriorated as the labor force mix has changed to include more contract and temporary staff. Thus, in the enclosed study, we seek to determine what association, if any, there is between hospitals' cost of labor and the quality of care delivered.

Methods

We used descriptive statistics, correlation analysis, and multivariate regression analysis for all models in our analysis. All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), Version 28.

Results and Conclusions

Our results indicate a higher labor cost ratio is associated with lower quality care as measured by all three of our aggregate performance measures. One interpretation of our results indicates on average for each one-point increase in labor compensation ratio, the Total Performance Score decreases by 9.9 points ($p < .001$), the Hospital Compare overall rating declines by 2.1 points on a five-point scale ($p < .001$), and the HCAHPS summary star rating is reduced by 1.38 points on a five-point scale ($p < .001$).

Keywords

hospital; labor costs; quality

Objectives

The objective of this study is to assess in the relationship between hospital labor cost and quality of care.

The single most significant hospital expense is the cost of the health care workforce. Employee wages and benefits for acute care hospitals and clinical labor costs rose by almost 40% between 2019 and early 2022 alone. This phenomenon has been exacerbated over the past two years by the pressures of the COVID-19 pandemic. A recent analysis indicates hospital staffing shortages encumbered hospitals by an additional $24 billion in 2021 and are expected to rise to an added $86 billion by the end of 2022.

Although others have studied the association between health organization financial performance and quality of care, what is less well understood is the impact of increased labor costs and hospital quality outcomes. There are two potential logical outcomes. On one hand, a hospital paying for higher quality staff with more advanced skills and competencies relative to its competitors, might demonstrate a positive association with health care outcomes. On the other hand, if the added costs incurred by the hospital are primarily dedicated to short-term labor support as contract staff and short-term employees are asked to fill the gap to ensure continuity of patient care, the risk of errors, miscommunication, and erosion of highly reliable practices are all in question.

Methods

Data and Sample

Our dataset was extracted from Definitive Healthcare, which provides comprehensive data extracted from publicly available information, including from federal, state, and other regulatory agencies, in addition to licensed data from other companies, web research on publicly available information through technology as well as electronic and phone surveys conducted by their research team based in the United States. Our final dataset consists of 2,500 short term acute care hospitals in the United States, with some variation based on the dependent variables in question. In addition, Veterans Administration, Military Healthcare System, and Indian Health System hospitals were excluded from the analysis as the outcome measures used in this study are not fully available for these system hospitals.

Dependent Variables

Given the variety of perspectives and robust number of quality measurement measures available, three aggregate dependent variables were used for this study.

- Value Based Purchasing (VBP) Total Performance Score (TPS). Value-based purchasing is a CMS program that adjusts a hospital's payments based on its performance in four quality measurement domains to comprise its Total Performance Score (TPS). Weighting, domains, and the measures vary from year to year. For this study, the year 2021 was used, which indicates the four equally weighted domains included were (1) clinical outcomes, (2) person and community engagement, (3) safety, and (4) efficiency and cost reduction.
- Hospital Compare overall rating. For this study, the year 2021 was used and we treated the Hospital Compare rating (1 – 5 scale) as a continuous variable in alignment with prior research that indicates ordinal variables with five or more categories can be used as continuous data without any harm to the analysis.
- HCAHPS (Hospital Consumer Assessment of Healthcare Providers and Systems) summary star rating. The patient survey (HCAHPS) summary star rating is the average of all the Star Ratings of the HCAHPS measures. For this study, the year 2021 was used and we also treated the HCAHPS summary star rating (1 – 5 scale) as a continuous variable.

Independent Variable

- Labor compensation ratio (LCR) or the percent of net patient revenue consumed by labor expense. The potential for reverse causality prompted us to utilize older (2019) labor compensation ratio data to allow for the impact of hiring practices to be fully realized within the quality outcomes and score reports. The practice of replacing an explanatory variable with its lagged value to counteract endogeneity is prevalent across a wide variety of disciplines in economics and finance. We operationalized this variable by extracting measures from the Medicare Cost Report (MCR) as shown below:

$$\text{Labor Cost Ratio} = \frac{\text{(Total Salaries + Total Contractor Labor + Total Fringe Benefits)}}{\text{Net Patient Revenue}}$$

Control Variables

- Bed utilization rate
- For-profit ownership status (dichotomous)
- Government operated (dichotomous)
- Average length of stay
- Market concentration index
- Rural / urban (dichotomous)
- Medicare days
- Medicaid days
- Case mix index
- Complications or major complications (CC & MCC) rate
- AHA geographic region (1- 9)

Results

Table 1 reflects the complete list of variables and descriptive statistics. Our sample had a comparable proportion of for-profit ownership, rural, and government run facilities but had a slightly lower overall case mix index and complications rate than the entire population of short-term acute care hospitals in the United States. The measures of our dependent variables were found to be moderately correlated, but none of the relationships exceeded 0.6 ($r < 0.6$, $p < .001$). Among the dependent variables of interest, the average Total Performance Score in the sample was 33.61 on a 100-point scale (SD = 11.28). The average Hospital Compare overall rating was 3.20 on a five-point scale (SD = 1.14) and the average HCAHPS summary star rating was 3.02 on a five-point scale (SD = 0.84). The primary independent variable of interest, labor compensation ratio, was found to have a mean of .44, inferring the average hospital expends 44% (SD = .14) of its net patient revenue to cover its labor costs.

Table 1. Descriptive Statistics

Variable	Min	Max	Mean	Std Dev
Total Performance Score	6	93	33.61	11.29
Hospital Compare Overall Rating	1	5	3.21	1.14
HCAHPS Summary Star Rating	1	5	3.02	.839
Labor Compensation Ratio	.01	.98	.44	.14
Bed Utilization	0	.99	.49	.20
For Profit	0	1	.24	.43
Government Operated	0	1	.14	.34
Average Length of Stay	1.00	6932.00	8.56	160.31
Market Concentration Index	.03	1.00	.35	.33
Rural Facility	0	1	.10	.31
Medicare Days	1.00	163808	13392.95	9223.37
Medicaid Days	1.00	104745	4723.93	8693.51
Case Mix Index	.82	5.27	1.65	.37
Complications/ Major Complications Rate	.00	.75	.02	.03
Region 1 (CT, ME, MA, NH, RI, VT)	0	1	.04	.21
Region 2 (NJ, NY, PA)	0	1	.13	.33
Region 3 (DE, KY, MD, NC, VA, WV, DC)	0	1	.09	.28
Region 4 (AL, FL, GA, MS, SC, TN)	0	1	.17	.37
Region 5 (IL, MI, IN, OH, WI)	0	1	.16	.37
Region 6 (IA, KS, MN, MO, NE, ND, SD)	0	1	.08	.28
Region 7 (AR, LA, OK, TX	0	1	.15	.35
Region 8 (AZ, CO, ID, MT, NM, UT, WY)	0	1	.07	.26
Region 9 (AK,CA, HI, NV, OR, WA)	0	1	.11	.32

Three separate multivariate regression analyses were performed. Results of these analyses are presented in Table 2 below. Based on our analysis examining the association between the labor compensation ratio, on average, our results indicate a higher labor cost ratio is associated with lower quality care as measured by all three of our aggregate performance measures. One interpretation of our results indicates on average for each one-point increase in labor compensation ratio, the Total Performance Score decreases by 9.9 points ($p < .001$), the Hospital Compare overall rating declines by 2.1 points on a five-point scale ($p < .001$), and the HCAHPS summary star rating is reduced by 1.38 points on a five-point scale ($p < .001$).

In all three regression analyses, no variable had a Variation Inflation Factor (VIF) in excess of 4.4 indicating multicollinearity is within tolerable limits. The Durbin-Watson statistics in our study ranged from a low of 1.962 (HCAHPS Summary Star Rating) to a high of 2.009 (Hospital Compare Overall Rating) which is within the acceptable range (1.5 to 2.5), and it can be stated that the residuals have relative independence and there is no serial correlation between them.

Table 2. Multiple Regression of Labor Compensation Ratio on Quality Scores

Variable	Total Performance Score			Hospital Compare Overall Rating			HCAHPS Summary Star Rating		
	n = 2324 Adj R^2 = 24.0%			n = 2421 Adj R^2 = 24.5%			n = 2429 Adj R^2 = 45.4%		
	β	S.E.	Sig	β	S.E.	Sig	β	S.E.	Sig
Constant	49.87	2.05	***	4.99	0.20	***	3.72	0.13	***
Labor Comp Ratio	-9.98	1.86	***	-2.15	0.18	***	-1.38	0.11	***
Bed Utilization	-5.55	1.37	***	-0.64	0.14	***	-1.03	0.09	***
For Profit	-3.58	0.55	***	-0.68	0.05	***	-0.53	0.03	***
Number of Staffed Beds	0.00	0.00	-	0.00	0.00	-	0.00	0.00	**
Case Mix Index	-2.73	0.75	***	0.08	0.07	-	0.57	0.05	***
CC / MCC Rate	56.05	7.36	***	7.26	0.72	***	8.37	0.45	***
Payor Mix Medicare Days	0.00	0.00	***	0.00	0.00	-	0.00	0.00	**
Payor Mix Medicaid Days	0.00	0.00	***	0.00	0.00	***	0.00	0.00	**
Rural	3.34	0.72	***	0.26	0.07	***	0.44	0.04	***
Government Operated	-2.71	0.66	***	-0.14	0.65	*	0.07	0.04	-
Mkt Concentration Index	1.15	0.68	-	0.02	0.06	-	0.28	0.00	***
Average Length of Stay	-0.02	0.01	***	-0.01	0.00	***	-0.01	0.00	***
Region 2 (NJ, NY, PA)	-3.75	1.16	***	-0.57	0.11	***	-0.52	0.07	***
Region 3 (DE, KY, MD, NC, VA, WV, DC)	-4.05	1.25	***	-0.78	0.12	***	-0.77	0.08	***
Region 4 (AL, FL, GA, MS, SC, TN)	-5.78	1.15	***	-0.88	0.11	***	-0.80	0.07	***
Region 5 (IL, MI, IN, OH, WI)	-4.44	1.15	***	-0.64	0.11	***	-0.63	0.07	***
Region 6 (IA, KS, MN, MO, NE, ND, SD)	-1.34	1.26	-	-0.50	0.12	***	-0.58	0.08	***
Region 7 (AR, LA, OK, TX)	-6.16	1.19	***	-0.77	0.11	***	-0.66	0.07	***
Region 8 (AZ, CO, ID, MT, NM, UT, WY)	-4.22	1.32	***	-0.70	0.13	***	-0.97	0.08	***
Region 9 (AK,CA, HI, NV, OR, WA)	-0.21	1.19	-	-0.49	0.12	***	-0.74	0.07	***

Note: *p<.05; **p<.01; ***p<.001; Region 1 (CT, ME, MA, NH, RI, VT) is the referent geographic region

Limitations

Several limitations are present in our study. First, is the fact our data are drawn from one of the most difficult periods of US hospital performance – in the middle of the COVID-19 pandemic - when hospitals were struggling to meet patient demand and retain nursing staff. We do not view this as a detraction from our study, but we are curious if this same persistent phenomenon will still occur in future years or if the same association would be present in a historical longitudinal study. The current study is drawn from a single year lagged cross-section of data, so a longitudinal study may also provide increased insight in increase / decline of the tested relationship.

Second, the current Labor Cost Ratio (LCR) accounts for all sources of labor cost in one variable. Further study might be worthwhile to directly determine if the level of contract staff versus long-term employees is more strongly or weakly associated with the variation, we observed in our dependent quality outcome measures. This additional research would provide insight to hospital leaders regarding the quality-centric risks, or lack thereof, when agency staff are utilized to fill the gaps in times of workforce shortages. Or, if a strong negative relationship is discovered, it may indicate healthcare leaders must take additional steps to ensure temporary staff are fully immersed in the organization's operating procedures, protocols, and work culture. Further study is warranted to assess what areas of the workforce have the greatest association with quality of outcomes and focus attention on those which might impose the most risk on patient outcomes.

A final limitation centers on the fact that all our chosen quality dependent variables are weighted aggregates. Although this provides consistency across our studied population, additional insight might be gained by examining our study relationship on more granular aspects of each of the current dependent variables. As an example, in further research, we could evaluate each of the component parts of the value-based purchasing Total Performance Score. This would provide clarity regarding where labor costs have the greatest association as far as quality is concerned - clinical outcomes, person and community engagement, safety, or efficiency and cost reduction. Similar efforts could be applied to the measures supporting the Hospital Compare overall rating or the HCAHPS summary star rating.

Conclusions & Practice Implications

We believe the negative labor cost – quality association is an issue that highlights the undue risk that hospital staffing and workforce management issues may be introducing into the hospital environment. Consideration should be undertaken to assess the cost-quality-access issue. Should hospitals use financial incentives to improve quality of care? Should a service line remain open if poorly staffed or staffed with a sub-optimal workforce? Is offering services irrespective of the quality of care one might receive in patients' best interest? We suggest it is at least worth considering on a case-by-case basis. The political implications of closing a facility for workforce concerns in the middle of a national emergency is serious. However, if this issue persists beyond the end of the pandemic, we suggest there are systemic workforce management issues that must be addressed. The deployment of human resources in any organization needs to be aligned with the desired outcomes and the role of the care recipient needs to be incorporated in the organizational structure and the daily care process. We recognize that reversing the negative labor cost – quality association is far from simple, and this, too, has been a chronic concern.

Following the extreme measures hospital leaders were forced to take during the recent pandemic, the political and institutional will is present to adopt new staffing methods to simultaneously improve continuity of care, decrease cost, and enhance quality. Among these are efforts to reduce staff turnover and mitigate wage inflation by moving agency staffing 'in house', increasing opportunities for remote or hybrid work schedules, restructuring work schedules to reduce commute times, and altering shift differentials to alleviate off-hours and weekend coverage challenges. It remains to be seen if the emerging cost reduction and workforce stabilization strategies will prove effective and if patients will receive the quality of care they expect – or not.

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