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Medicaid beneficiaries undergoing complex surgery at quality care centers: insights into the Affordable Care Act

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Abstract

BACKGROUND—Medicaid beneficiaries do not have equal access to high-volume centers for complex surgical procedures. We hypothesize there is a large Medicaid Gap between those receiving emergency general vs complex surgery at the same hospital.

METHODS—Using the Nationwide Inpatient Sample, 1998 to 2010, we identified high-volume pancreatotomy hospitals. We then compared the percentage of Medicaid patients receiving appendectomies vs pancreatectomies at these hospitals. Hospital characteristics associated with increased Medicaid Gap were evaluated using generalized estimating equation models.

RESULTS—A total of 602 hospital-years of data from 289 high-volume pancreatotomy hospitals were included. Median percentages of Medicaid appendectomies and pancreatectomies were 12.1% (interquartile range: 5.8% to 19.8%) and 6.7% (interquartile range: 0% to 15.4%), respectively. Hospitals that performed greater than or equal to 40 pancreatic resections per year had higher odds of having significant Medicaid Gap (odds ratio 2.3, 95% confidence interval 1.1 to 5.0).

CONCLUSIONS—Gaps exist between the percentages of Medicaid patients receiving emergency general surgery vs more complex surgical care at the same hospital and may be exaggerated in hospitals with very high volume of complex elective surgeries.

Keywords

Medicaid access; Disparities in high quality care; High volume; Surgical disparities

Expansion of Medicaid eligibility is one of the keystones of the Patient Protection and Affordable Care Act.¹ Medicaid expansion is designed to improve access to high-quality healthcare for the poorest of Americans, and is estimated to bring over 16 million new

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enrollees to Medicaid.² Increasing Medicaid coverage, however, may not increase access to high quality health care. The mechanisms for decreased access to high quality health care among Medicaid enrollees are not completely characterized.

Questions of Medicaid access and patterns of care are particularly important to the surgical field. Although 81% of general surgeons are willing to accept new Medicaid patients, in some surgical specialties only 50% are willing to accept new Medicaid patients.³ Across a number of surgical interventions, and in particular those complex interventions requiring specialized care, having Medicaid is associated with worse outcomes.^{4–12} At least some of these differences in outcome have been attributed to decreased access to high-volume centers.^{13–17} There is an assumption that access to emergency surgery is not an issue and that it is selective access to high volume, high-quality centers for elective, specialized services which drives this outcome disparity.

The differences between Medicaid access to emergency surgery and specialized surgery are further highlighted when looking at the geographic distributions of Medicaid enrollees and specialized surgical care. Most Medicaid enrollees tend to be in urban centers,¹⁸ where also most of the highly specialized, high-volume hospitals tend to be.¹⁹ It has been demonstrated that a disproportionately low number of Medicaid enrollees receive complex procedures at high-volume centers when compared with the number of Medicaid enrollees in the catchment area for these hospitals.^{20–22} This would imply that there is selective access to specialized services within these hospitals.

To explore selective access within high-volume hospitals, we used the nationally representative data available in the Nationwide Inpatient Sample (NIS). We developed a metric called Medicaid Gap that directly compares the percentage of Medicaid primary patients in different surgical populations within high-volume hospitals. We chose pancreatic resections for our index complex surgical procedure. We chose appendectomies for our index emergency surgical procedure. A larger Medicaid Gap implies more selective access for Medicaid patients within each hospital. We explored the distribution of Medicaid Gap at high-volume hospitals across the country and identified those hospital characteristics associated with a large Medicaid Gap. Ultimately, we hope to provide another means to quantify and track selective access for Medicaid patients. To increase access to high quality care for even the most vulnerable Americans, metrics for equity and quality will have to be developed and rewarded.

Methods

We used the 1998 to 2010 NIS, part of the Healthcare Cost and Utilization Project from Agency for Healthcare Research and Quality. NIS is composed of all discharge records from a representative yearly 20% sample of all United States community hospitals.²³ NIS is the largest all-payer database that is publicly available in the United States. It includes a representative sample of short term, general, and specialty hospitals and is stratified and weighted with regard to hospital ownership, bed size, teaching status, urban and/or rural location, and the US region. We obtained information on inpatient procedure, patient primary insurance and hospital characteristics from NIS. One hospital may be included in

the 1998 to 2010 cycles of NIS for multiple years. In such scenarios, each year's data from the same hospital was treated as separate but correlated data points.

Discharge records of pancreatic resection and appendectomy were identified using International Classification of Diseases-9 procedure codes (pancreatic resection: 52.51 to 52.57, 52.6, 52.7; appendectomy: 47.0 to 47.19). A hospital was defined as a high-volume hospital if it performed over 10 pancreatic resections in a given year. Very high pancreatic volume was defined as a hospital performing over 40 pancreatic resections within that year.

Three populations were defined at each high-volume pancreatic center: those patients receiving pancreatic resections, those patients receiving appendectomies, and the general hospital population. All the three populations were limited to patients under 65 years old to decrease confounding from Medicare coverage. The percentage of patients with Medicaid as their primary insurance was calculated for each population.

Medicaid Gap was then defined as the percentage of Medicaid primary patients in the appendectomy population minus the percentage of Medicaid primary patients in the pancreatic resection population for each high-volume hospital. As a comparison, the Medicaid Gap between the appendectomy population and the general hospital population was also calculated. High Medicaid Gap was defined as those hospitals in the top decile for Medicaid Gap.

$$\begin{aligned} \text{Pancreatic resection Medicaid Gap} = \\ \% \text{Medicaid primary appendectomies} - \\ \% \text{Medicaid primary pancreatic resections} \end{aligned}$$

$$\begin{aligned} \text{General population Medicaid Gap} = \\ \% \text{Medicaid primary appendectomies} - \\ \% \text{Medicaid primary in adult hospital population under 65} \end{aligned}$$

To evaluate how Medicaid Gap varied by type of hospital, we built a multivariable logistic model with high Medicaid Gap status as the outcome. Given that multiple data points from the same hospital may be correlated, we adopted the generalized estimating equation (GEE) method to estimate regression coefficients. GEE is a type of population average model commonly used to analyze correlated data with binary outcome. We chose GEE over other correlated data methods because we were interested in estimating population-average differences between hospitals of different types. GEE also has the advantage of having no underlying assumption on data distribution and being robust to model specification. Because of the lack of diversity of the high-volume pancreatic resection hospitals, our regression model included only pancreatic resection volume and geographical area as predictors.

All analyses were performed using SAS 9.4 (Cary, NC). A sensitivity analysis was performed by combining multiple years' data from the same hospital to generate only one data point per hospital.

Results

There were 289 high-volume pancreatic resection hospitals identified for a total of 602 hospital-year data points. There were 134 (22.3%) very high-volume hospitals. The vast majority of high-volume centers were urban (98.0%) teaching hospitals (87.8%). Table 1 exhibits the distribution of hospital characteristics including pancreatic resection volume status, hospital location, teaching status, and region by level of Medicaid Gap. High Medicaid Gap hospitals were more likely than other high-volume hospitals to be very high volume (36.7% vs 20.8%, $P=.005$) and teaching (98.3% vs 86.6%, $P=.01$). These distributions were all similar between the reported analysis and the sensitivity analysis.

The median percentage of patients with Medicaid primary insurance receiving appendectomies was 12.1% (interquartile range [IQR] 5.8% to 19.8%). The median percentage of patients with Medicaid primary insurance receiving pancreatic resection was 6.7% (IQR 0% to 15.4%). Of 602 hospital-years, 238 (39.5%) had no patients with Medicaid primary receive pancreatic resections; 422 (70.1%) had a positive Medicaid Gap (higher percentage of Medicaid primary patients in that hospital's appendectomy population compared with that hospital's pancreatic resection population). The median Medicaid Gap for pancreatic resections was 4.6 percentage points (IQR -1.5 to 11.3; Fig. 1). The cutoff point for the high Medicaid Gap hospitals (90th percentile) was an 18.1 percentage point Medicaid Gap. The median Medicaid Gap for the general hospital population (percentage of Medicaid primary patients in that hospital's appendectomy population minus that hospital's general adult population under 65 years old) was -8.0 percentage points (IQR -13.4 to 4.0; Fig. 2). The previously mentioned reported numbers were again close to those from the sensitivity analysis.

Our regression results showed that very high-volume centers were associated with increased odds for being a high Medicaid Gap center (odds ratio 2.3, 95% confidence interval 1.1 to 5.0, $P=.03$), after controlling for region of the hospital. The sensitivity analysis showed an association of similar magnitude to the same direction.

Comments

A new metric was developed in order to capture differences in populations of patients within the same hospital. We interpret a larger Medicaid Gap to be a reflection of inequality in the hospital system. That is, the larger the difference is between the percentage of Medicaid primary patients in the natural hospital catchment area (represented by appendectomies), and the percentage of Medicaid primary patients in the highly specialized services offered by the same hospital (represented by pancreatic resections), the more selective access is implied. Most high-volume centers in the country were found to have a Medicaid Gap. Very high-volume centers may be associated with the most pronounced Medicaid Gap.

It has been documented that Medicaid primary patients have worse surgical outcomes across a range of complex surgical care when compared to private insurance primary patients.^{24–27} One source of this disparity is the difference in access to high quality surgical care.^{28–31} At the same time, however, there are higher proportions of Medicaid primary patients

geographically clustered around traditionally high quality care hospitals including high volume, urban, teaching hospitals. There is literature to suggest that Medicaid primary patients may not be benefiting from the outcomes associated with these high-volume centers and that they are at higher odds for receiving specialized care in low-volume or low quality centers.^{16,17,20,31–36} Even when receiving care at high-volume teaching centers, high Medicaid burden hospitals are associated with a higher odds of failure to rescue.³⁷

Our new metric, Medicaid Gap, sought to capture and quantify this selective access within high quality centers. This is a novel and unvalidated tool, however using it, we found differences in the proportion of Medicaid primary patients receiving representative emergency general surgery and elective complex surgery in most of the high-volume centers identified in the United States. There was some evidence in our data that very high-volume centers were associated with the highest levels of Medicaid Gap. This would imply that selective access might be a particular challenge at the institutions that provide the highest quality of care.

The pressures that might create an environment for selective access are multiple. Reasons for this selective access are patient, surgeon, and hospital based. Patients with Medicaid primary have been shown to present at later stages of disease, they may be inoperable at higher proportions than non-Medicaid primary patients.³⁸ Medicaid reimbursement rates are lower than other insurance reimbursements, this may lead surgeons with otherwise burgeoning clinical practices to decrease the number of Medicaid primary patients served.^{38–40} On a hospital level, in the era of pay for performance, populations with known worse outcomes, higher costly complication rates, and longer average hospital stays may be encouraged to seek care elsewhere.^{41,42}

Medicaid Gap is a new and unvalidated metric. To our knowledge, there has been no previous use or description in the literature. We have demonstrated its usefulness in quantifying selective access across high-volume centers in a representative complex surgical procedure. It is not clear if our findings would hold across other complex surgical procedures. Further work includes calculating this measure for other complex surgical procedures. There are a number of intrinsic limitations with the data available in NIS. It is also not granular enough to determine when and how selective access is occurring in these high-volume centers. Another weakness of NIS data is lack of longitudinal outcomes. We are unable to determine directly from this database the outcomes of the included patients. NIS is also a nationally representative sample. It could be that the sample of particular hospitals over the 12 years included in this study had individual hospitals that were overrepresented. We chose methods and completed sensitivity analysis that took into account this possibility, but it still exists.

We found that the hospitals with the highest volume of complex procedures were more likely to also have a high Medicaid Gap. It could be that instead of Medicaid patients being selectively weeded out at these institutions, the population receiving highly specialized surgical care is disproportionately enriched with private insurance primary patients traveling from outside the natural catchment area for these hospitals. High Medicaid Gap could be attributable to referral and patient travel patterns. Therefore, more work needs to be done in

identifying the mechanisms for creating a high Medicaid Gap hospital, the implications for equity of a “zero gap” hospital, and limits of an “acceptable gap.”

It is the goal of the Patient Protection and Affordable Care Act to increase access to the high-quality health care already available for some in the United States. We have demonstrated using a simple tool that merely expanding Medicaid coverage may not actually expand access to high-volume centers for complex surgical care and the outcome benefits associated with them. In fact, it is possible the very incentives set up to encourage high quality care at all hospitals may be a driving factor in curtailing access to Medicaid primary patients at the best hospitals. After further development and validation, Medicaid Gap may serve as a dashboard metric for access equality within large hospital systems. It is only after these metrics for equity as well as quality are developed and rewarded that hospital systems will have the incentives to provide the very best care to all Americans.⁴³

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Figure 1.

Pancreatic resection Medicaid Gap in high-volume hospitals. Pancreatic Medicaid Gap = % of Medicaid primary patients receiving appendectomies – % of Medicaid primary patients receiving pancreatic resections. High-volume hospital = 10 or more pancreatic resections per year. High gap = in the top decile for Medicaid Gap. Medicaid Gap displayed in percentage points.

Figure 2.

General population Medicaid Gap in high-volume hospitals. General population Medicaid Gap = % of Medicaid primary patients receiving appendectomies – % of Medicaid primary patients in adult hospital admissions under 65 years old. High-volume hospital = 10 or more pancreatic resections per year. Medicaid Gap displayed in percentage points.

Table 1

Hospital characteristics by high Medicaid Gap status among high-volume pancreatic resection hospitals
(Nationwide Inpatient Sample, 1998 to 2010)

Hospital Characteristic	Low Medicaid Gap; n = 542	High Medicaid Gap [*] ; n = 60	P value
Very high volume [†]	20.8	36.7	.005
Urban location	98.0	98.3	.84
Teaching hospital	86.6	98.3	.01
Hospital region			
Northeast	19.9	23.3	.88
Midwest	22.5	21.7	
South	35.8	36.7	
West	21.9	18.3	

^{*} High Medicaid Gap = in the top decile for Medicaid Gap; Medicaid Gap = % of Medicaid primary patients receiving appendectomies – % of Medicaid primary patients receiving pancreatic resections.

[†] Very high volume = performed at least 40 pancreatic resections in the given year.