Where Do We Find a Good Hospital?

A Dive into the Hospital Compare Data

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Executive Summary

- Hospitals in the Rocky West and Midwest regions tended to score consistently higher when compared to the nation.
- Hospital Ownership did not have a noticeable impact on the quality of care.
- Better patient experience correlates with affordability, rather than a higher price tag.
- Patients can't always tell the quality of the medical processes, but they can tell the quality of their experience, which Medicare encourages hospitals to improve.

Background

Data Source

We obtained our data from the Hospital Compare datasets page on the Centers for Medicare & Medicaid Services website.[1] Here is a description of Hospital Compare on the CMS website:[2]

> *Hospital Compare is a consumer-oriented website that provides information on how well hospitals provide recommended care to their patients. This information can help consumers make informed decisions about where to go for health care. Hospital Compare allows consumers to select multiple*

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[1] https://data.medicare.gov/data/hospital-compare. Last updated on Jul 30, 2019. Downloaded on Jul 30, 2019.

[2] https://www.cms.gov/medicare/quality-initiatives-patient-assessment-instruments/hospitalqualityinits/hospitalcompare.html

hospitals and directly compare performance measure information related to heart attack, heart failure, pneumonia, surgery and other conditions. These results are organized by:

- *General information*
- *Survey of patients' experiences*
- *Timely & effective care*
- *Complications*
- *Readmissions & deaths*
- *Use of medical imaging*
- *Payment & value of care*

Essentially, Hospital Compare makes the data related to the above characteristics publicly available to allow consumers to make informed decisions.

The data are collected for the Hospital Value-Based Purchasing program (HVBP), which is a Medicare initiative to link Medicare's payment system to quality.[3] Through the HVBP program, CMS pays hospitals based on the quality of care, measured on four domains[4] including the measures for Safety, Patient Experience of Care, Clinical Care Outcomes, Perinatal Outcomes, and Efficiency. The measures add up to the Total Performance Score (TPS).

Hospitals are no longer paid solely on the quantity of services provided. Under the Hospital VBP Program, Medicare makes incentive payments to hospitals based on how well they perform in those four domains. Below are the measures of the four domains for 2019.

Measures: Clinical care

Measure ID	Measure Description
MORT-30-AMI	Acute Myocardial Infarction (AMI) 30-Day Mortality Rate
MORT-30-HF	Heart Failure (HF) 30-Day Mortality Rate
MORT-30-PN	Pneumonia (PN) 30-Day Mortality Rate
THA/TKA	Total Hip Arthroplasty (THA) and/or Total Knee Arthroplasty (TKA)

Measures: Person and Community Engagement

Measured by the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) Survey. The aspects include:

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[3] DDB Data Dictionary_July 2019, which was included with the dataset from the CMS.

[4]

https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/Hospital_VBPurchasing_Fact_Sheet_ICN907664.pdf

* Communication with Nurses
* Communication with Doctors
* Responsiveness of Hospital Staff
* Communication about Medicines
* Hospital Cleanliness and Quietness
* Discharge Information
* 3-Item Care Transition
* Overall Rating of Hospital|

Measures: Safety

Measure ID	Measure Description
CAUTI	Catheter-Associated Urinary Tract Infection
CLABSI	Central Line-Associated Blood Stream Infection
CDI	*Clostridium difficile* Infection (*C. difficile*)
MRSA	Methicillin-Resistant *Staphylococcus aureus* Bacteremia
PC-01	Elective Delivery Prior to 39 Completed Weeks Gestation
SSI	Surgical Site Infection: Colon; Abdominal Hysterectomy

Measures: Efficiency and Cost reduction.

Measure ID	Measure Description
MSPB	Medicare Spending per Beneficiary (MSPB)

Hospital General Information

Description

The **Hospital General Information** dataset allows consumers to compare hospitals directly side-by-side to one another in terms of overall quality of services delivered. Hospitals across the nation were measured on seven primary categories:

- Mortality
- Safety of care
- Readmission
- Patient experience
- Effectiveness of care
- Timeliness of care
- Efficient use of medical imaging

These seven categories are themselves a summarization of over 60 separate measures of hospital quality of care as found throughout the other Hospital Compare datasets. This dataset contained 5,334 unique hospitals across the nation, with each row representing one hospital. Hospital identifying information was provided (including State and County), to include type of hospital (either Acute or Critical Care), type of ownership (government, non-profit, etc.), and finally the hospital score for each measure as noted above. Hospitals were scored based on national comparison and for each measure were rated as:

- Above National Average
- Same as National Average
- Below National Average

Methodology

Because each measure was rated as a categorical variable (i.e. "Above National Average") and not a numerical value, we decided, for ease of comparison, to create and map a simple point system to the categorical values as follows:

- Above National Average   =   1
- Same as National Average =   0
- Below National Average   = -1

Here's a snapshot of what the final results looked like:

	Hospital Name	City	State	Hospital Type	Hospital Ownership	Mortality national comparison	Safety of care national comparison	Readmission national comparison	Patient experience national comparison	Effectiveness of care national comparison	Timeliness of care national comparison	Efficient use of medical imaging national comparison
0	SOUTHEAST ALABAMA MEDICAL CENTER	DOTHAN	AL	Acute Care Hospitals	Government - Hospital District or Authority	-1.0	1.0	-1.0	-1.0	0.0	1.0	0.0
1	MARSHALL MEDICAL CENTER SOUTH	BOAZ	AL	Acute Care Hospitals	Government - Hospital District or Authority	-1.0	-1.0	-1.0	0.0	1.0	1.0	-1.0
2	NORTH ALABAMA MEDICAL CENTER	FLORENCE	AL	Acute Care Hospitals	Government - Hospital District or Authority	-1.0	1.0	1.0	-1.0	0.0	1.0	-1.0
3	MIZELL MEMORIAL HOSPITAL	OPP	AL	Acute Care Hospitals	Voluntary non-profit - Private	0.0	0.0	-1.0	-1.0	-1.0	1.0	NaN
4	CRENSHAW COMMUNITY HOSPITAL	LUVERNE	AL	Acute Care Hospitals	Proprietary	0.0	NaN	1.0	NaN	0.0	1.0	NaN

Final scores for each individual hospital were then summed across columns for each measure providing us with an overall final score for each hospital. The highest score that a hospital cold attain is a 7 while the lowest score possible is a -7. For the purposes of our study we chose to drop any hospital from the comparison which did not have a rating for at least four of the seven measures (thus leaving us with a final national sample of 3,427 hospitals).

Descriptive statistics and national score distribution as follows:

National Hospital Score Distribution

Distribution of Hospital Final Scores
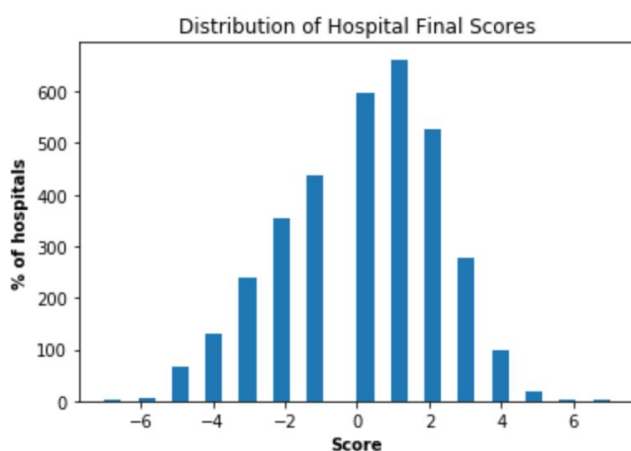
```
-7.0      1
-6.0      7
-5.0     67
-4.0    132
-3.0    241
-2.0    356
-1.0    438
 0.0    597
 1.0    662
 2.0    528
 3.0    276
 4.0    100
 5.0     18
 6.0      2
 7.0      2
Name: FinalScore, dtype: int64
```

Findings

The national hospital score distribution follows a normal distribution with a slight right skew. Of interest is that while only 22 hospitals scored a rating of 5 or higher and 75 hospitals scored a rating of -5 or lower, there were still 346 more hospitals with positive scores (n=1,588) than there were hospitals with negative scores (n=1,242). Mean of the distribution is 0.08 while median is 0.

Best Hospitals in the Nation

By filtering our sample to only include hospitals with final scores of six or higher we find four hospitals that meet this criterion. This prestigious accolade means that these hospitals ranked "Above the National Average" in at least six of the seven measures used for national comparison. **These hospitals are, given the choice, where we would recommend taking your mom for medical care.**

Hospital Name	City	State	Hospital Type	Hospital Ownership	FinalScore
ST JOSEPHS HOSPITAL	TAMPA	FL	Acute Care Hospitals	Voluntary non-profit - Church	7.0
MERCY HOSPITAL	IOWA CITY	IA	Acute Care Hospitals	Voluntary non-profit - Church	6.0
ST DAVID'S MEDICAL CENTER	AUSTIN	TX	Acute Care Hospitals	Voluntary non-profit - Other	7.0
SSM HEALTH ST MARY'S HOSPITAL - MADISON	MADISON	WI	Acute Care Hospitals	Voluntary non-profit - Private	6.0

By looking at the results above one might be inclined to think that "non-profit owned" hospitals tend to score higher when compared to other hospital ownership types. However, as we shall see later in our analysis, the type of hospital ownership does not seem to impact the quality of care at the national level.

Worst Hospitals in the Nation

By filtering our sample to only include hospitals with final scores of -6 or less we find that eight hospitals across the nation meet this criterion. This accolade of ignominy does not seem to follow a regional pattern (at least at this level), as the hospitals in question are scattered across the nation from Arizona, to NewJersey. **A negative patient experience can almost certainly be guaranteed by attending one of these hospitals for medical care.**

Hospital Name	City	State	Hospital Type	Hospital Ownership	FinalScore
CANYON VISTA MEDICAL CENTER	SIERRA VISTA	AZ	Acute Care Hospitals	Voluntary non-profit - Other	-6.0
EMORY DECATUR HOSPITAL	DECATUR	GA	Acute Care Hospitals	Voluntary non-profit - Private	-6.0
PIEDMONT HENRY HOSPITAL	STOCKBRIDGE	GA	Acute Care Hospitals	Government - Hospital District or Authority	-6.0
OCHSNER LSU HEALTH SHREVEPORT	SHREVEPORT	LA	Acute Care Hospitals	Voluntary non-profit - Private	-6.0
UNIVERSITY OF MISSISSIPPI MED CENTER	JACKSON	MS	Acute Care Hospitals	Government - State	-7.0
TRUMAN MEDICAL CENTER HOSPITAL HILL	KANSAS CITY	MO	Acute Care Hospitals	Voluntary non-profit - Private	-6.0
UNIVERSITY HOSPITAL	NEWARK	NJ	Acute Care Hospitals	Government - State	-6.0
POTTSTOWN HOSPITAL	POTTSTOWN	PA	Acute Care Hospitals	Voluntary non-profit - Private	-6.0

Top Ten States

By aggregating hospital final scores by state and taking the mean we were able to identify the top and bottom ten states for hospital quality according to the previously described seven measures:
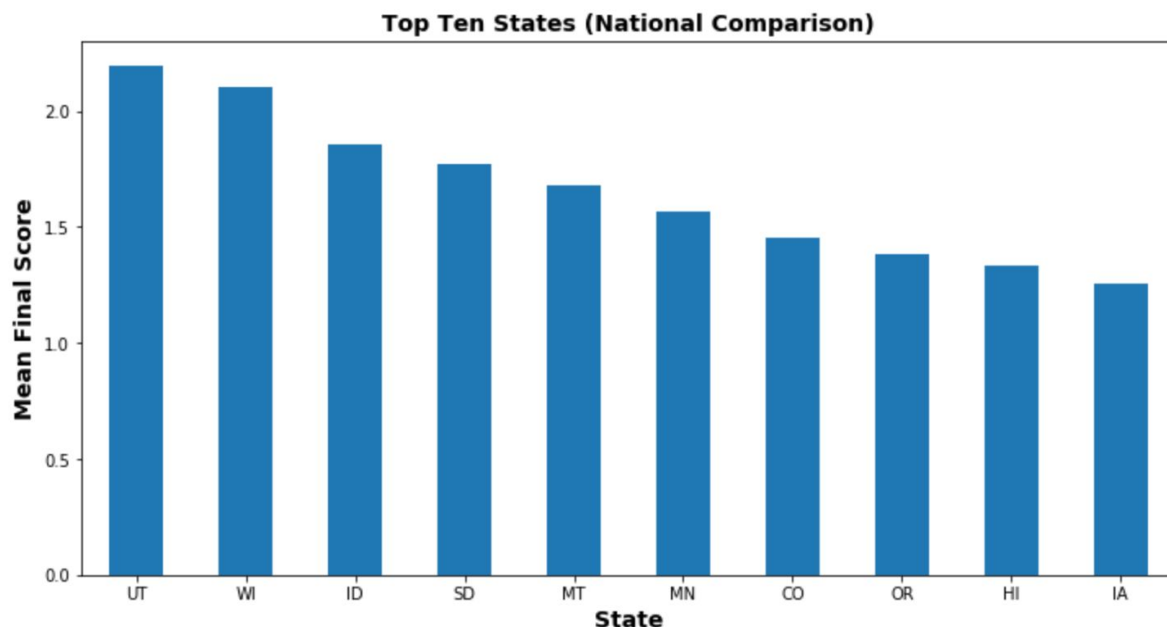
Of interest, we can start to see regional patterns emerging at this level of analysis. For instance the **Rocky Mountain West** region claims four out of the top seven national spots:

Utah: #1   Montana: #5
Idaho: #3   Colorado: #7

The **Midwest** region on the other hand claims seven of the top 16 national spots, with most states in the region represented except for the notable exceptions of Illinois and Michigan:

Wisconsin: #2   Iowa: #10   Kansas: #14
South Dakota: #4   Nebraska: #12   Ohio: #16
Minnesota: #6   Indiana: #13

Bottom Ten States
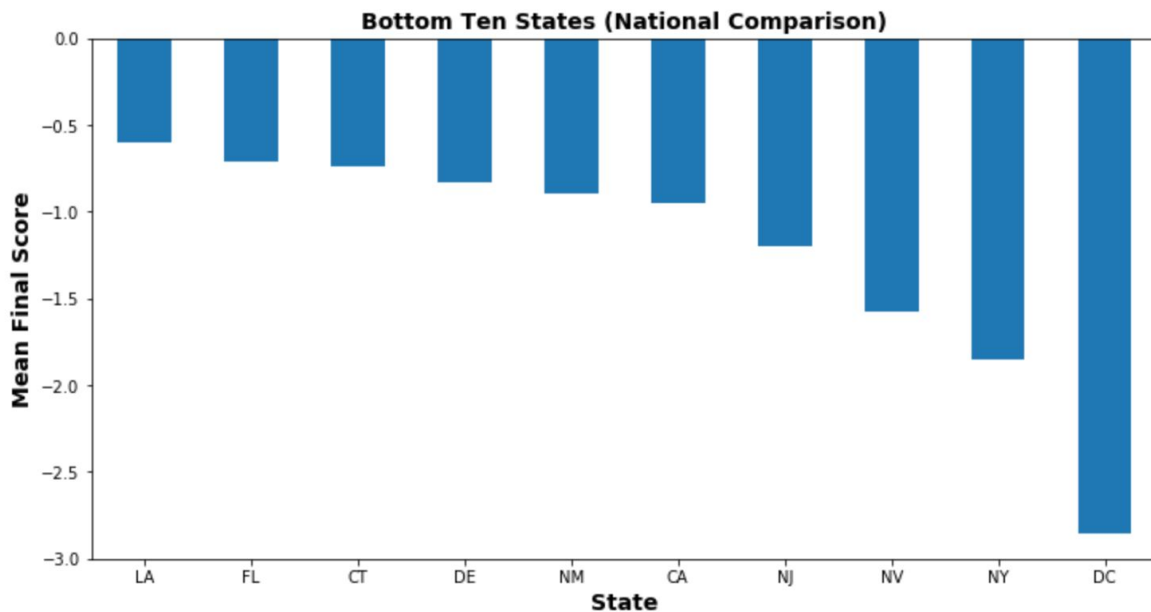
Unlike the top ten states there are no regional clusters of poor performance detected at this opposite end of the spectrum. Of note however, unlike the top ten states where there are marginal differences in scores amongst the states, the hospitals in the District of Columbia performed exceptionally worse than the others. In fact, the mean score for hospitals in the DC area is more than five times worse than the mean score for hospitals in Louisiana, which itself sits as the 10th worse score in the nation.

Hospital Ownership

We additionally explored hospital ownership types to see if there were any noticeable differences in scores between the various ownership types. The table below shows that hospitals are generally owned by three primary entities: Government (local, state and federal), Voluntary (non-profit), and Proprietary, with two very small groups owned by Physicians or Tribal entities. A full 65% of the hospitals in our analysis were owned by non-profit entities.

National Hospital Ownership Count - by entity

```
Government - Federal                            13
Government - Hospital District or Authority    304
Government - Local                             233
Government - State                              39
Physician                                       22
Proprietary                                    588
Tribal                                           2
Voluntary non-profit - Church                  282
Voluntary non-profit - Other                   333
Voluntary non-profit - Private                1608
```

A review of differences in scores between the various ownership types did not reveal any striking differences. Non-profit organizations performed slightly better than their other ownership counterparts, but not enough to make a noticeable difference at the national level of aggregation.

National Hospital Score Distributions - by Ownership Type
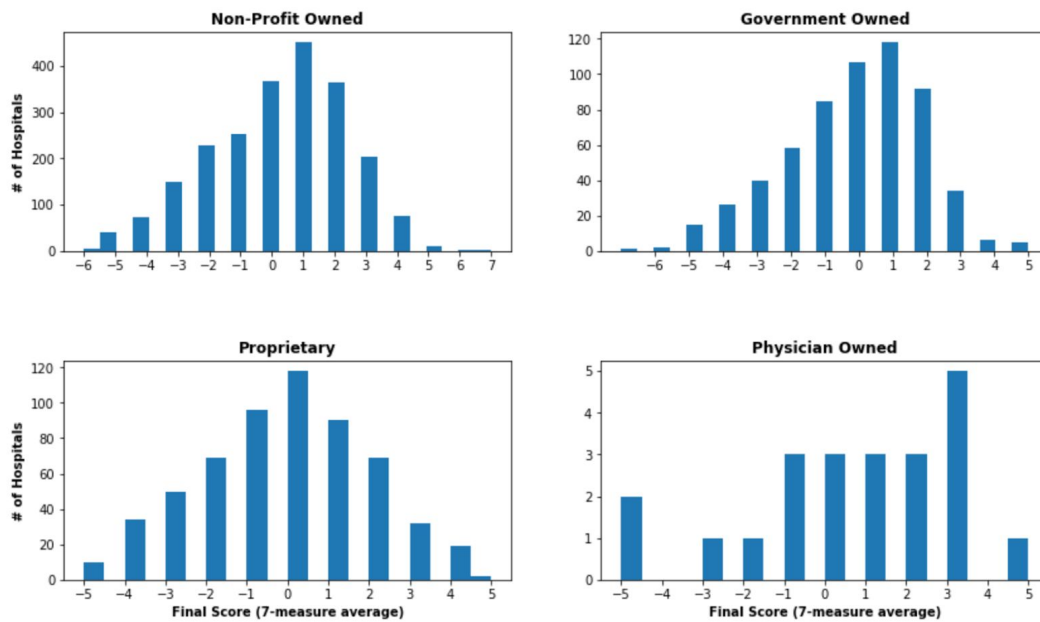
Takeaways

1. This dataset allows consumers to make quick decisions for choosing which hospitals to attend in the event that they need medical care. The scoring measures provide a decent roundup for comparison between the different hospitals, however, consumers who want to know the specific outcomes on which the measures were based, will have to look at other datasets for that information.

2. Regional differences are noted in our analysis. Combined with population size data and spending per patient data could provide some insight as to why some regions of the U.S. tend to provide better medical care than others. The key takeaway here is that if having access to quality medical care is an important decision in choosing where you live, then taking note of this analysis would perhaps be of interest. Utah for instance has 15 hospitals within the state which scored 3 or higher while only having one hospital which performed worse than the national average. While it's true that there are pockets of excellence, even in the worst performing states (New York for instance ranked 49th but has two hospitals in the state whose final score was a 4), one is more likely to access quality medical care by moving to a top performing state like Utah or Wisconsin. States whose hospitals did not perform well could perhaps glean best practices by visiting with officials from those areas which tended to score higher than the national averages.

3. In sum, there are striking differences in the quality of care rendered between the different hospitals. However, as the distribution plots show from above, the hospital ownership type does not seem to affect the quality of care rendered, so we do not recommend choosing one hospital over another based solely on ownership type.

Timely and Effective Care

Descriptive

The **Timely and Effective Care** dataset allows consumers to compare hospitals directly side-by-side to one another to see which hospitals are most effective in processing patients efficiently and moving them along to the next level of care if necessary. Measures included are found in the following table:

```
Emergency Department                      33306
Heart Attack or Chest Pain                14274
Colonoscopy care                          9516
Preventive Care                           9516
Cataract surgery outcome                  4758
Sepsis Care                               4758
Cancer care                               4758
Pregnancy and Delivery Care               4758
Blood Clot Prevention and Treatment       4758
```

For the purposes of our study we limited our analysis to timely and effective measures related to the Emergency Department (ED) and Heart Attack categories. Subset measures of the ED and category included:

- Average (median) time patients spent in the emergency department before leaving from the visit
- Percentage of patients who left before being seen

Subset measures of the Heart Attack category included:
- Median Time to Transfer to Another Facility for Acute Coronary Intervention
- Median Time to ECG

Findings

Emergency Room visit length

Generally speaking people seeking care at an Emergency Room want to be seen quickly, treated effectively, and released to go home promptly. Sitting for long periods of time in an Emergency Room waiting room or, once having been seen, sitting on an ER bed waiting for discharge instructions can have a seriously negative impact on the patient experience. For this reason we decided to compare how long the average ER visit is on a national scale.

National Distribution of Median Length of ER Visit (Hours)
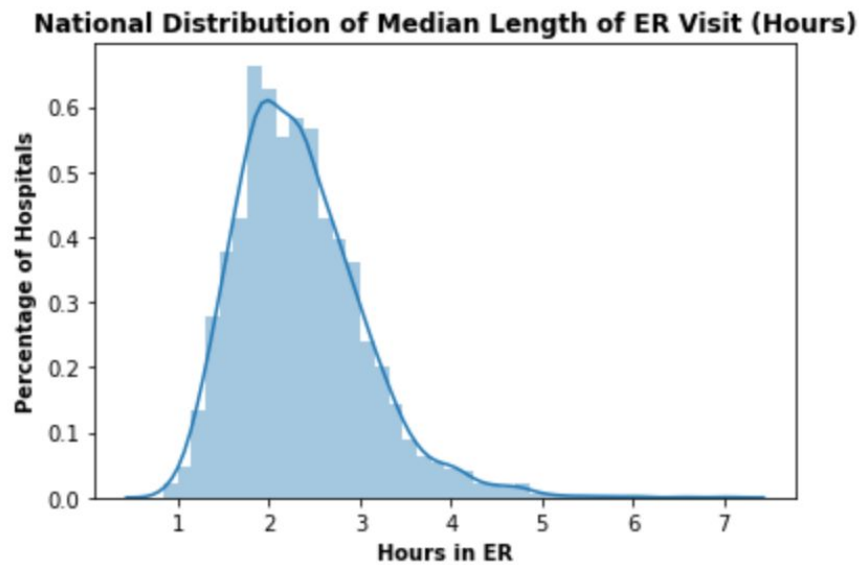
According to these results the mean length of an ER visit is approximately 2 hours and 20 minutes with the median length being roughly the same length of time. For those who enjoy sitting in an Emergency Room we decided to provide data on those hospitals whose visits were almost triple the national average:

	Provider ID	Hospital Name	Address	City	State	County Name	Score
3387	31309	SAGE MEMORIAL HOSPITAL	STATE ROUTE 264 SOUTH 191	GANADO	AZ	APACHE	6.583333
18207	110079	GRADY MEMORIAL HOSPITAL	80 JESSE HILL, JR DRIVE SE	ATLANTA	GA	FULTON	6.100000
76043	450289	HARRIS HEALTH SYSTEM	2525 HOLLY HALL	HOUSTON	TX	HARRIS	6.016667

Percentage of Patients Leaving

It's unclear from the dataset why patients leave the ER before being seen, however, we suspected that there might be a correlation between hospitals that take a long time to see and treat patients and the percentage of patients who leave before being seen. After comparing the two measures against one another at the state level, we found that the two measures are positively correlated $r=0.672$. At the national level, hospital ERs can expect the percentage of patients who leave without being seen to be around 2%. However, as one would expect there are some outliers that are far above the national average:

```
count    51.000000
mean      1.476188
std       0.699651
min       0.333333
25%       0.960526
50%       1.362637
75%       1.922393
max       3.000000
Name: % Left Before Seen,
```

Hospitals with Highest Percentage of Patients Who Leave Before Being Seen

Hospital Name	City	County Name	State	Score
REPUBLIC COUNTY HOSPITAL	BELLEVILLE	REPUBLIC	KS	20
SOUTHERN REGIONAL MEDICAL CENTER	RIVERDALE	CLAYTON	GA	18
ZUNI COMPREHENSIVE COMMUNITY HEALTH CENTER	ZUNI	MCKINLEY	NM	16
BAKERSFIELD HEART HOSPITAL	BAKERSFIELD	KERN	CA	14
OROVILLE HOSPITAL	OROVILLE	BUTTE	CA	13
CENTINELA HOSPITAL MEDICAL CENTER	INGLEWOOD	LOS ANGELES	CA	11

Time to Care for Heart Attack Patients

Patients who come to the hospital with potential heart attack symptoms expect to be treated promptly to avoid any life threatening complications. Hospital protocols are in place to ensure that patients who present with a specific set of symptoms are triaged and promptly cared for according to generally accepted standards of care. One of these measures is ensuring a patient receives an Electrocardiogram (ECG) promptly to detect damage or abnormalities to the heart muscle. Another measure is ensuring that patients whose symptoms warrant further care are promptly transferred to the next level of care in an expeditious manner to prevent further complications. The chart below shows the national median times for both of these measures:
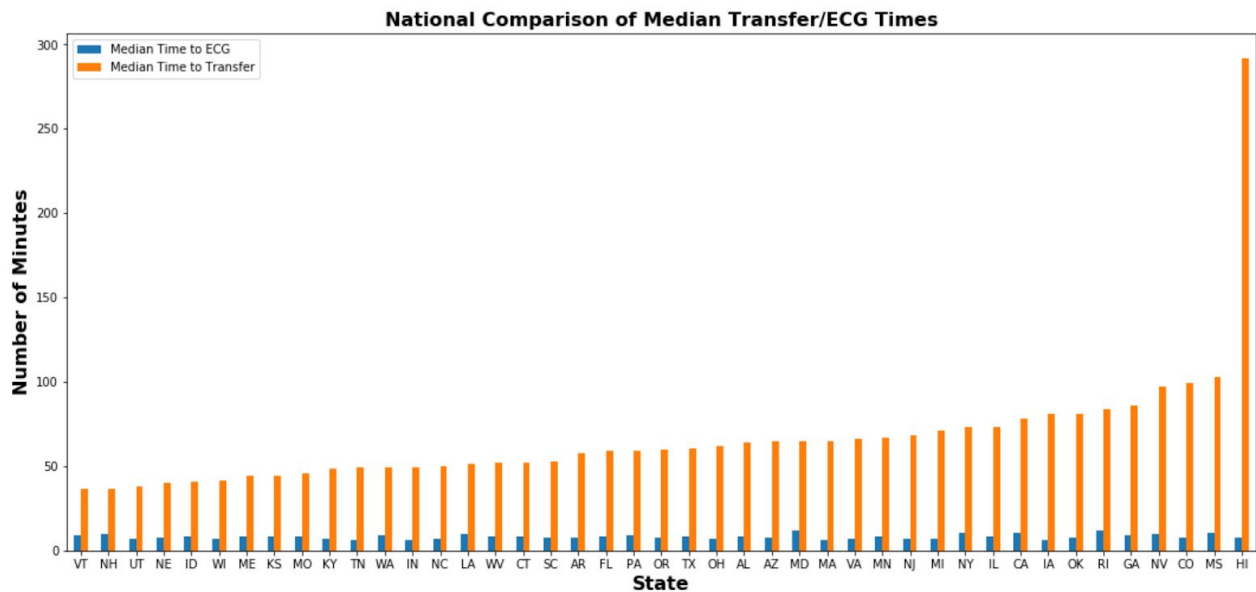
Takeaways

Generally speaking you can expect to spend between 2-3 hours at an ER, though if you live in Houston which is a large metropolitan area with several hospitals to choose from, we would

recommend staying away from Harris Health System for any condition less than life-threatening (if you don't have six hours to spare).

Hospitals across the nation appear to be adhering to basic standards of care when it comes to prompt treatment of heart attacks, with minor fluctuations. Nevada, Colorado, and Mississippi all appear to have room for improvement, with Hawaii representing a notable outlier (which likely warrants further analysis to ensure there are no errors in data reporting).

Cost of Care and Patient Experience

Description

The "Payment and Value of Care" dataset contains the "hospital-level results for payment measures and value of care displays associated with 30-day mortality measures." This dataset merges both payment measures (Medicare Spending Per Beneficiary, or MSPB-1) and quality measures (various mortality measures). The data dictionary has the following definition for the MSPB-1:

> The Medicare Spending Per Beneficiary (MSPB-1) Measure assesses Medicare Part A and Part B payments for services provided to a Medicare beneficiary during a spending-per-beneficiary episode that spans from three days prior to an inpatient hospital admission through 30 days after discharge. The payments included in this measure are price-standardized and risk-adjusted.

> The payment measures for heart attack, heart failure, pneumonia, and hip/knee replacement include the payments made for Medicare beneficiaries who are 65 years and older. The measures add up payments made for care and supplies starting the day the patient enters the hospital and for the next 30 days or 90 days for hip/knee replacement. The measures are meant to reflect differences in the services and supplies provided to patients.

> Hospital results are provided in the downloadable databases for the heart attack, heart failure, pneumonia, and hip/knee replacement payment measures. You can see whether the payments made for patients treated at a particular hospital is less than, no different than, or greater than the national average payment. For some hospitals, the number of cases is too small to reliably compare their results to the national average payment.

Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) Patient Survey (a.k.a. The CAHPS Hospital Survey or Hospital CAHPS), measures patients' perceptions of their hospital experience. According to the CMS, the survey is "administered for a random sample of adult inpatients after discharge."

Here is an excerpt from the medicare website.[5]

> *Using data from the 10 HCAHPS measures publicly reported on Hospital Compare, CMS created 10 HCAHPS star ratings. Star ratings for composite topics (listed below) combine multiple questions from the HCAHPS Survey. For instance, the nurse communication star rating combines data from 3 questions from the HCAHPS Survey. Star ratings for individual and global topics represent individual questions on the HCAHPS Survey.*
>
> *Composite topics*
> - *Nurse communication (questions 1, 2, 3)*
> - *Doctor communication (questions 5, 6, 7)*
> - *Responsiveness of hospital staff (questions 4, 11)*
> - *Communication about medicines (questions 16, 17)*
> - *Discharge information (questions 19, 20)*
> - *Care transition (questions 23, 24, 25)*
>
> *Individual topics*
> - *Cleanliness of hospital environment (question 8)*
> - *Quietness of hospital environment (question 9)*
>
> *Global topics*
> - *Hospital rating (question 21)*
> - *Willingness to recommend hospital (question 22)*

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[5] https://www.medicare.gov/hospitalcompare/Data/HCAHPS-Star-Ratings.html

Methodology & Findings

Cost of Care

We analyzed the Payment and Value of Care dataset, in which each row represents the payment category for the type of care (for heart attack, heart failure, pneumonia, or hip/knee replacement) for each hospital. The Payment Category field indicates whether the payment is greater than, less than, or no different from the national average payment.

Excluding those hospitals with unavailable or too few cases, we calculated the percentage of payment categories that were greater than, less than, or no different from the national average payment, aggregated at the state level.

States with the Most Affordable or Expensive Care
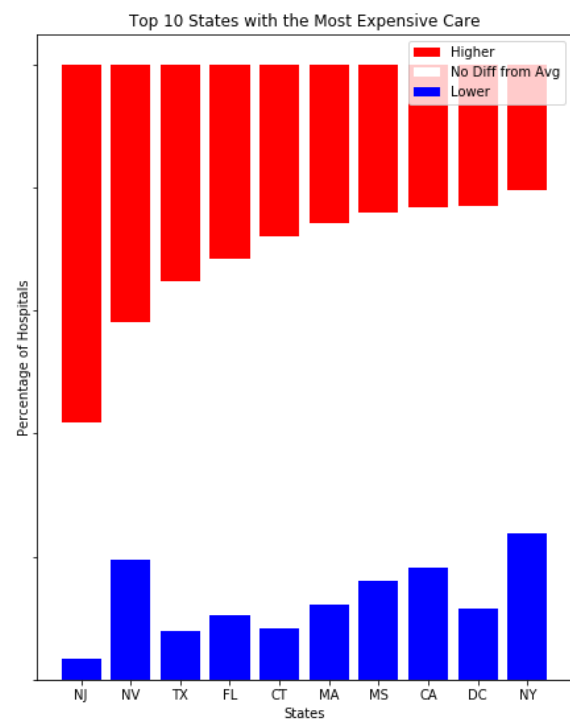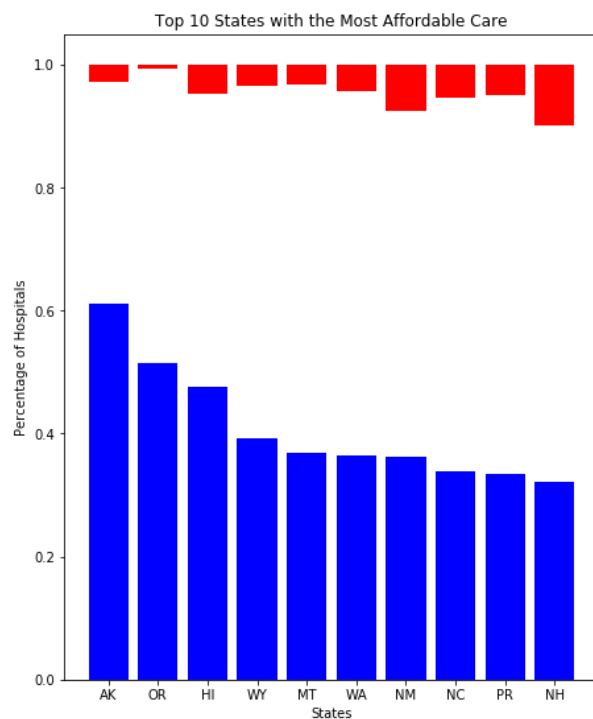
Patient Experience and Satisfaction

We also analyzed patient perception of hospital experience in the HCAHPS data. The dataset includes the HCAHPS summary star rating, which is the average of the star ratings of the topic-specific HCAHPS measures. We use the summary star rating to compare the hospitals.

Overall, the patients surveys' summary star ratings average at 3 stars (mean of 3.22 and median of 3). Using 3 stars at the national average, we regarded hospitals receiving 4 or 5 as "above national average" and those receiving 1 or 2 as "below national average".

Summary Star Ratings on the HCAHPS Survey
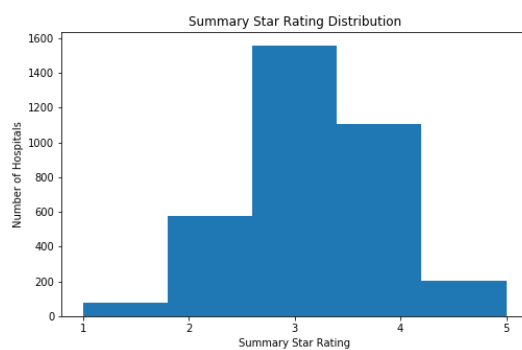
The national mean of the HCAHPS summary star ratings was 3.22 stars and the median was 3. Based on this information, we calculated what percentage of hospitals in each state received above (4 or 5 stars), below (1 or 2 stars), or the same (3 stars) as national average summary star ratings from the HCAHPS patient surveys. Here are the rankings by state:

States with the Best or Worst Patient Experience (According to HCAHPS Survey)

Top 10 States with the Best Patient Experience

Top 10 States with the Worst Patient Experience
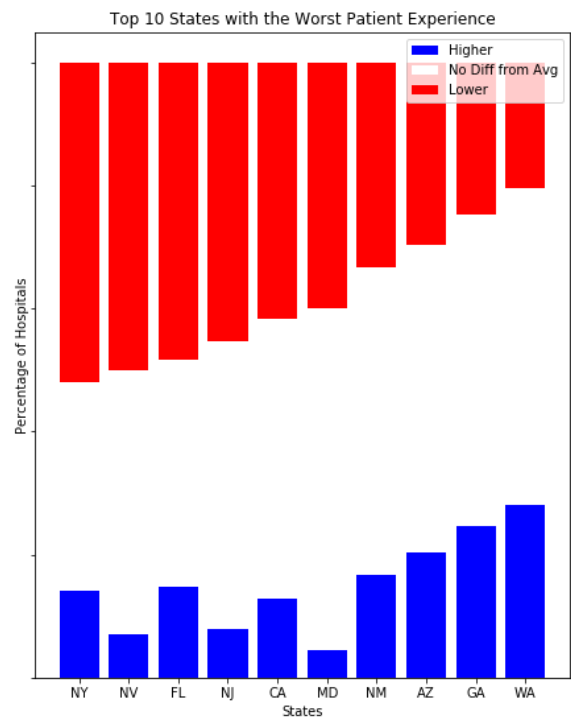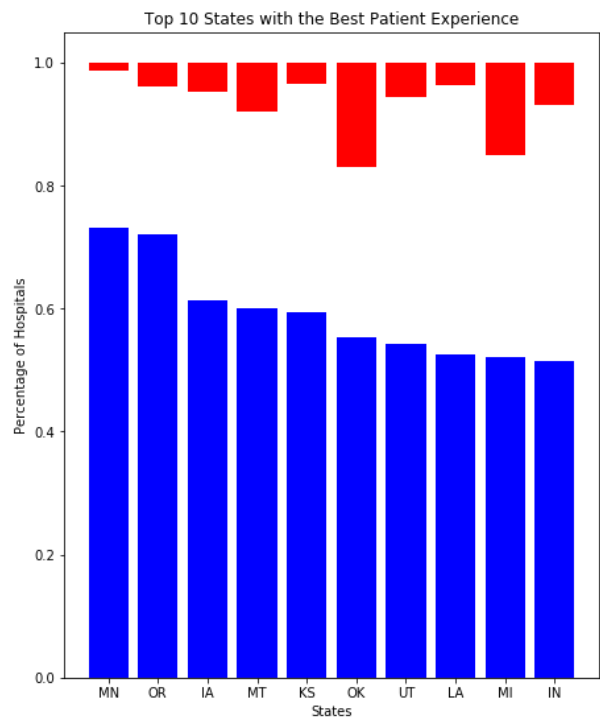
Next, we looked at the relationship between the two variables - cost of care and patient experience. We calculated the scores of these two attributes as follows.

Affordability Score	(% of cost measures that are **lower-than-average**, per state) - (% of cost measures that are **higher-than-average**, per state) The higher the score, the more affordable the care is each state.
Patient Experience Score	(% of hospitals with **higher-than-average** summary star rating, per state) - (% of hospitals with **lower-than-average** summary star rating, per state) The higher the score, the better the patient experience is in each state.

Relationship Between Affordability and Patient Experience
Higher affordability score indicates more affordable care available in each state.

Affordability vs. Patient Experience - by State
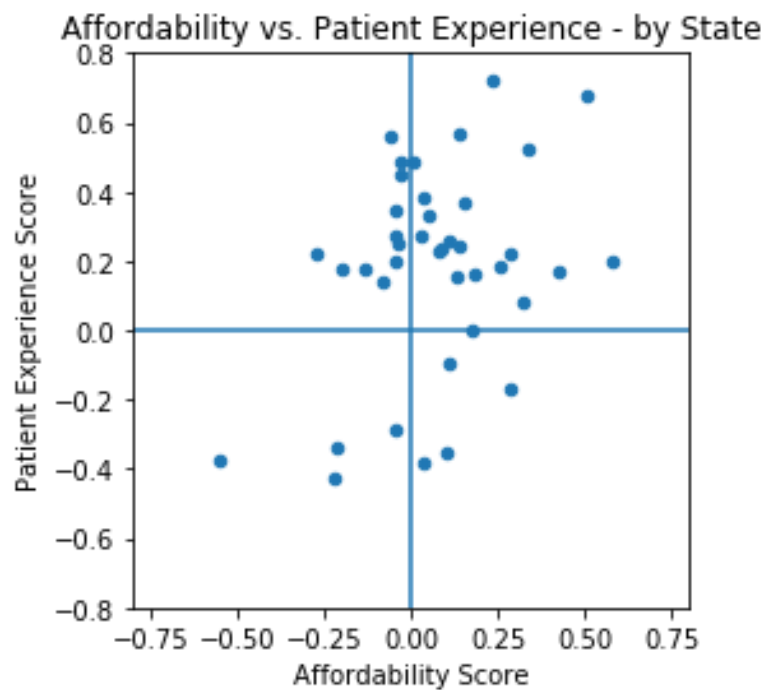
We did not do a statistical analysis, but at a glance, there seems to be a positive correlation between the patient experience and affordability.

Affordability & Patient Experience - Best and Worst States

Top 5 States	Bottom 5 States
1. OR 2. MN 3. MT 4. AK 5. IA	1. NJ 2. NV 3. FL 4. NY 5. CA

Takeaways

The general trend shows that the more affordable hospitals tend to receive higher star ratings for patient experience surveys. We initially thought that more expensive hospitals may be charging higher prices for a higher quality customer service, so this is surprising. Given that the patient experience surveys do not ask about the value of care, the lost cost of care is unlikely to impact patients' perceived quality of care.

Conclusion

There are striking differences in the quality of care rendered between the different hospitals. However, the hospital ownership type does not seem to affect the quality of care rendered, so we do not recommend choosing one hospital over another based solely on ownership type.

When measuring the hospitals based on the seven measures of care discussed previously, hospitals in the Rocky West and Midwest regions tended to score consistently higher when compared to other hospitals across the nation.

Surprisingly, higher cost of care did not necessarily lead to a better patient experience. In fact, better patient experience correlates with affordability.

As demonstrated by the example of Utah, where the hospitals tend to be top notch, yet patient experience is somewhat low, we find that patients often cannot tell if the hospital is really following the best practices due to the lack of medical knowledge. However, they experience the quality of care through the quality of their experience, including the healthcare provider's communication skills, responsiveness, hospital maintenance. The fact that Medicare provides incentives for hospitals to improve patient experience seems to be a positive sign.