

Assessing Hospital Preparedness for COVID-19 by Affiliation Status

Jordan Shields, Andrew Blank, Alex Voss & Alexandra Normington



JUNIPER ADVISORY

Overview

System hospitals tend to have more ICU beds, higher case mix indices and are more likely to be a part of a Clinically Integrated Network (CIN) or Accountable Care Organization (ACO) comparable to standalone hospitals. These attributes are particularly important findings during the COVID-19 pandemic, where ICU beds are at a premium; experience managing complex cases is essential; and the ability to care for patients in appropriate settings is of utmost importance.

We reached these conclusions by analyzing CMS Medicare Cost Report data, the most comprehensive set of financial and clinical data available for comparisons of U.S. hospitals. [We used this data set to create regression models which can be found here.](#) These regressions allow us to assess the impact of independence on ICU beds, CMI and ACO/CIN membership. We performed this analysis on a subset of all hospitals, namely those with 80 or fewer ICU beds. Intuitively, facilities with more than 80 ICU beds tend to be 'hub' facilities and there are almost no independent hospitals with greater than 80 ICU beds. Further, by excluding these 'hub' facilities, we review a data set where both system and standalone hospitals are well distributed and lower the risk of confused results.

Key Takeaways

- **Facility Resources:**
System hospitals have more ICU beds than comparable standalone facilities
- **Clinical Depth:**
System hospitals treat higher acuity patients than similar standalones
- **Network strength:**
System hospitals are more likely to have accountable care or clinical integration structures in place than standalone facilities

ICU Beds

As it became clear that COVID-19 cases could overwhelm existing intensive care capacity, we wanted to better understand whether being part of a system impacted a facility's number of ICU beds. We generated a linear regression model and compared numerous control variables related to hospital size, profit, independence, payor mix, etc. We tested each generated coefficient for statistical significance. Our resulting model for ICU beds included hospital independence as a variable having a statistically significant (negative) relationship with the number of ICU beds, with the following additional statistically significant control variables:

- Case mix index – higher acuity patients need more ICU beds
- CMS hospital compare score – imperfect, but centralized and available, quality measure
- Discharges – a control for size of the hospital
- Average length of stay –longer stays can indicate intensive care utilization

Holding the above elements constant, we found that, for example, a 100-bed community hospital that is part of a system is likely to have 1.5 more ICU beds than a 100-bed standalone hospital.

Case Mix Index

Case mix index can be a proxy for clinical preparedness to care for complicated patients. Intuitively, a hospital that regularly treats higher acuity cases will be better prepared for the clinical demands of treating a novel virus than a similarly sized and situated facility that sees less complicated cases. Working with organizations that are considering partnerships, we regularly hear concern that if they join a larger system their facility will become a “band-aid station” sending complicated cases on to a system’s larger facilities. At the same time, we hear from past clients who tell us that post-transaction they have added specialized services and beds. These sentiments and anecdotes are contradictory, and we aimed to test the impact of independence on case mix index statistically, having the advantage of a large set of data.

We again generated a linear regression model with numerous variables related to hospital size, profit, independence, payor mix, etc. and tested each generated coefficient for statistical significance. Our resulting model for CMI included hospital independence as having a statistically significant (negative) relationship with CMI, with the following additional statistically significant control variables:

- ICU beds – patients assigned to ICU beds typically have higher acuity diagnoses
- Medicare payor mix – associated with comorbidities and higher acuity stays
- CMS hospital compare score – imperfect, but centralized and available, quality measure
- Adjusted patient days – a control for size, incorporating ambulatory reach
- Average length of stay – long stays can indicate complicated cases

A hospital that is part of a system will, on average, have a case mix index that is 0.05 higher than a similarly situated standalone hospital. For the typical hospital in the set with a CMI of 1.62, being in a system predicts a 3% increase. This indicates that systems work to grow their community hospitals by adding services and keeping patients close to home.

Accountable Care Organizations and Clinically Integrated Networks

If ICU beds are a proxy for a facility’s resource depth and CMI is a proxy for clinical depth, then ACO and CIN participation may be regarded as a proxy for network depth. We wanted to test whether standalone or system hospitals had the network depth to treat contagious patients in the most appropriate location as well as coordinate the care of non-COVID-19 patients. Relative to the other two questions, this is a bit more esoteric, and we had fewer variables from which to choose in the Medicare cost report data set. We selected ACO or CIN participation as a proxy for how acute care hospitals relate to their broader healthcare landscape.

To test the statistical significance of being standalone vs. part of a system on likelihood to participate in an ACO or CIN, we generated a logistic regression model. While we had used linear regressions when looking at the impact of ‘systemness’ on ICU beds and CMI, we used a logistic regression here given the yes/no nature of the predicted variable of ACO or CIN affiliation (yes, the hospital is in; or, no, the hospital is not in). With the model controlling for operating margin, Medicare payor mix and CMS hospital compare score, we found that being in a system has a statistically significant (positive) relationship with the odds of being a member of an ACO or CIN.

Conclusions

Contrary to the worries we hear from standalone hospitals, joining a system typically relates to greater local investment in facility infrastructure as measured by ICU bed capacity, clinical acumen as measured by CMI and care coordination as measured by participation in ACOs or CINs. These findings indicate that the highly fragmented nature of our healthcare delivery system hampers its ability to care for critically ill patients like those suffering from COVID-19.