

Financial Implications of the COVID-19 Epidemic for Hospitals: A Case Study

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Abstract

A concern about the COVID-19 pandemic is that U.S. hospitals may not have the capacity to serve all the patients seeking care. With all these new patients, could the pandemic be financially beneficial for hospitals? We suggest the answer is likely no for three reasons. First, many hospitals have experienced reductions in both surgical and clinic volumes resulting in substantial revenue losses. Second, there are reports of increases in the cost of supplies. Finally, the increase in intensive care services required to respond to the surge of COVID-19 patients will result in a shift of patient volume from acute to intensive care, and this shift will not likely improve profitability. To estimate the possible magnitude of each of these effects, we analyze 2019 financial data from a profitable, well-run hospital in Washington State. Our estimates suggest that the COVID-19 epidemic will cause dramatic financial losses for hospitals and that the bulk of those losses will result from lost revenue. We suggest that these losses will be sufficiently large to create major changes in the hospital industry including changes in ownership, changes in access to credit, changes in care delivery and changes in choices of community benefit provision.

Keywords: COVID-19, hospital, profit, cost

Introduction

COVID-19 and the virus that causes it (SARS-CoV-2) has dramatically increased the need for hospital services. Early estimates suggested that 20-60% of the U.S. population would eventually become infected with SARS-CoV-2 (Harvard T.H. Chan School of Public Health, 2020), with roughly 20% of infected persons requiring hospital care and 5% (an estimated 4.4 million people) requiring intensive care unit (ICU) care. At these rates, some estimated that even with social distancing measures in place, acute care hospitalizations would still fill 89% of current capacity while proper treatment of patients in ICUs would require 166% of current capacity (Tsai, Jacobson & Jha, 2020).

Because of the increase in demand for hospital services, one might hypothesize that, despite the massive human toll of the pandemic, it could be a financial boon to hospitals. This might not be the case. Instead, the COVID-19 epidemic is likely to reduce hospital revenues, increase the cost of supplies necessary to care for patients, and create losses as acute care volumes shift to intensive care. We outline the rationale and provide a model for each of these effects.

Elective procedures, like hip and knee replacements, make an important contribution to hospitals' profitability (Butcher, 2012). During the pandemic hospitals have reduced the provision of elective procedures or stopped them altogether. As early as March 18, 2020, the Center for Medicare and Medicaid Services (2020) issued guidance to postpone non-essential surgeries and other procedures. Over the next two weeks, governors from 27 states issued executive orders to cancel elective surgical procedures in their states (Ambulatory Surgery Center Association, 2020). Many hospitals suspended or reduced patient volumes in many of their clinics as well. We do not yet know the true extent of these measures' impact on revenues. There are initial reports that some hospitals may be cancelling between 25% and 50% of their surgical volume (Zhang, 2020), and estimates that roughly 37% of health plans' hospital spending is for non-emergent surgeries (Cox, et al., 2020). This is consistent with earlier research suggesting that nationwide, roughly half of surgeries are elective (Elixhauser & Andrews, 2010). Estimates for the reduction in clinic revenue are harder to find, though hospital administrators have reported reductions of 80% in specialty clinic revenue and 50% in primary care volume (Grimm, 2020).

COVID-19's effects on hospital finances will not be limited decreased revenues. One of the more disturbing aspects of the epidemic is the challenges that hospitals have faced in securing necessary supplies and personal protective equipment (PPE). There have been widespread reports of price gouging (Abrams, et al. 2020). RWJBarnabas Health, a large health system in New Jersey, has reported paying 50 times usual prices medical supplies (Harwell, 2020). Reports from group purchasing organizations suggest that these are not isolated incidents of price increases. Premier reports that prior to the pandemic N95 masks sold for roughly \$0.30 per mask, but recently prices have ranged from \$3-\$15 per mask (Whalen, et al., 2020). The prices for PPE and other supplies have increased and the focus on infection control has increased usage of these supplies. One survey of 1,500 hospitals found that between March 16 and 20th hospitals that had admitted COVID-19 patients were using between three and 17 times more PPE than usual (Premier Ind., 2020). In addition to increases in the prices of supplies and the volumes used, hospitals also incurred additional expenses resulting from a variety of efforts to expand capacity and service provision. These activities ranged from setting up drive-through clinics and testing facilities, remodeling rooms for negative pressure, and expanding ventilator capacity (either by renting ventilators, buying single-use emergency transport ventilators or converting existing anesthesia equipment for use as ventilators (Grimm, 2020).

Reductions in revenue and increases in supply and operating costs are unequivocally bad for hospital finances. The added phenomena of shifting from acute care to critical care has implications that are less straightforward. As hospitals defer elective admissions and try to maintain open capacity for COVID-19 patients, provision of acute-care services drops. Resources are shifted to the ICU where demand is supposed to be greatest. As a result, a portion of the financial implications of COVID-19 for hospitals will depend on the extent to which increases in profits from ICU services compensate for reductions in the provision of acute care services.

Despite the availability of some early information on the extent of revenue losses, increases in supply costs, and shifts from acute to intensive care, it is difficult to gauge the magnitude or relative importance of each of these factors on hospital finances. National level estimates of these effects are difficult to construct because detailed financial data for hospitals are not available at a national level. The data that do exist are not in a format that is easy to aggregate and manipulate. Instead, we have chosen a single hospital in Washington State to present as a case study to illustrate the potential impact of the epidemic on hospital finances. We chose this hospital because rich, recent financial data are available at the service line level. We think this hospital is a useful example because it appears well managed and was relatively profitable in 2019. As such, our results highlight the detrimental effects of the pandemic, rather than the effects of mismanagement or challenging market dynamics.

Methods

Case Study Hospital

The basis of our case study is a 300+-bed community hospital located in Washington State. (Note: we leave the hospital unnamed and have modified some of the data to disguise the hospital. Managers of the hospital would not likely be embarrassed by being viewed as well managed and relatively profitable. Still, we have not attempted to contact the managers, and we use these data to model possible effects of the epidemic. Moreover, our results cannot be interpreted as describing a particular hospital's response to COVID-19 since all data were collected prior to the virus' arrival in the U.S.). This facility enjoyed an inpatient occupancy rate over 90% with 30% of clinical revenues (by charges) coming from the surgical service line, 10% from acute care, and less than 5% each from clinics and intensive care. The total margin for this facility was approximately 1% in 2019, lower than the 2018 average of 6%, but higher than the roughly 25% of hospitals with negative margins (American Hospital Association, 2018). We chose a hospital in Washington State because hospitals in the state of Washington are required to publicly report in-depth financial information at the clinical department level, and this type of detailed information was required for our analyses. Data come from 2019, before the first case of COVID-19 in Washington State.

Reductions in Revenue from Clinics and Surgery

The first assessment involves the financial consequences of reductions in the provision of surgical and clinic services. We estimated that between 25% and 50% of surgeries were elective, and that elective surgeries would be cancelled for three months. We assumed these reductions would translate directly into reductions in surgical revenue. There is little data available to inform our projections about how much clinic revenue will be lost. Some clinics have found ways to maintain operations through telemedicine, though the extent to which these services have been adopted and the degree to which professionals are able to adopt them is unknown. As baseline values, we assumed reductions in clinic revenue of 10%, 15% and 20% for three months. These are far lower than the 50%-80% reductions reported anecdotally (Grimm 2020). We assume similar reductions in supply expenses for each clinic, but not staffing cost or depreciation, rental or lease expenses. We are effectively assuming that the majority of facility costs are fixed, and that hospitals will

choose not to furlough workers in these areas or, equivalently, that reductions in labor expense in other departments offset labor expenses in surgical and clinic services. Estimates do not include any costs associated with developing telemedicine capabilities.

Increasing Supply Costs

We examined the effects of increases in supply costs for the ICU and emergency departments. We do not assume any changes in volume for these departments since we anticipate that, if anything, volume is likely to increase for these departments and we capture some of that effect (for the ICU) in a substitution model. We have not modeled changes in supply costs for acute care or surgical service lines (though per-unit supply costs for these service lines are likely to increase) since we assume that patient volume, and hence supply use, for both service lines will fall as hospitals shift care to cover more COVID-19 cases. We capture the effects of this decline in supply use in our projections of the impact of lost revenue.

For the ICU and emergency service lines that are the focus of our analysis, we assume supply cost increases of 10%, 20%, 30%, 40% and 50%. These are significant increases, though these are far below the 100-500% increases some hospital administrators have reported for PPE and do not include any of the costs of rearranging facilities to increase capacity.

Substitution of Acute Care for Critical Care

To estimate the financial effects of substituting acute care for ICU care, we estimate the contribution margin from each service line. Contribution margins were defined as the revenue received by a service line (net of contractual allowances) less that service line's variable costs. Unfortunately, the data only included service line level information on billed charges, before contractual allowances. However, because our data also included an organization-level income statement, we were able to estimate a contractual discount percentage by looking at reported net patient revenues as a percentage of total clinical gross revenue. This resulted in an estimated contractual discount of 74% of gross charges, which we applied to the reported gross revenue for each service line to estimate net revenue. Next, we estimated service line level variable costs as the sum of salary, benefits and supply expense (omitting other operating expenses like rentals and depreciation).

Again, to examine the financial effects of shifting patient load from acute care to the ICU, we used the contribution margins for the acute and intensive care service lines to calculate per-diem contribution margins. We then estimate the financial effects of substitution as the difference between the additional contribution margins earned from the provision of more ICU care less the contribution margin foregone from the provision of acute care services. We assume that the provision of one additional patient day of acute care must result in the loss of ten patient days of acute care as hospitals shift staff and resources from the more intensive ICU setting from the less intensive acute care setting (Lippincott Nursing Education, 2016). This estimate also reflects the fact that the COVID-19 patients requiring intensive care or intubation are likely to have longer lengths of stay than the average acute care patient. The degree to which patient care will be shifted from acute care to the ICU will depend on the severity of the COVID-19 outbreak in a given area as well as the capacity available in the ICU. We provide estimates ranging from a 1% increase in

ICU volume to a 20% increase (at which point the ICU would be fully occupied). Our initial estimates are made on a three-month basis.

Results

Reductions in Revenue from Clinics and Surgery

The first panel of Table 1 shows our results for reductions in surgical volumes of 25-50% lasting three months. Net of reductions in supply expense, we estimate that these reductions will result in the loss of between \$12.46 and \$24.9 million. The second panel of Table 1 shows our estimates of the financial impact of reductions in clinic volume of 10-20%. Losses in clinic volume have a more modest impact than losses in surgical volume, resulting in a loss of between \$0.64 and \$1.29 million. For both clinical and surgical services, our estimates of financial losses increase linearly with the duration of time of reduced volumes. A 50% reduction in surgical volume that persists for a year would result in a financial loss four times larger than the one presented in Table 1 (i.e. a \$99.6 million loss as opposed to the \$24.9 million loss).

Table 1: Estimated financial losses (\$) associated with a three month reduction in clinical and surgical volume.

Department	Reduction in volume	Revenue lost	Supply cost avoided	Net financial impact
Surgery	25%	(15,500,636)	3,038,828	(12,461,807)
	37%	(22,940,941)	4,497,466	(18,443,475)
	50%	(31,001,271)	6,077,656	(24,923,615)
Clinics	10%	(798,011)	154,167	(643,844)
	15%	(1,197,017)	231,251	(965,766)
	20%	(1,596,023)	308,335	(1,287,688)

Source: Data from a Washington State Hospital.

Increasing Supply Costs

Table 2 shows our estimated financial impact resulting from increased supply expenses that persist for three months. Our low estimate of a 10% increase is associated with a \$66,834 increase in ICU supply costs and an increase of \$40,205 in emergency room supply costs for a combined increase of \$107,040 in supply costs. For our high estimate of a 50% increase in supply costs, the combined effect for the ICU and emergency departments is \$535,198. A 50% increase in the price of supplies persisting for a year would result in a \$2.14 million increase in the cost of supplies for the ICU and emergency service lines combined. These estimates only reflect increases in the costs of supplies. They do not reflect increase in staffing costs, for instance, increased rates paid for overtime for increased rates paid to agency staff. Similarly, these increases do not reflect costs

associated with the purchase of additional ICU equipment or with efforts to establish ICU or emergency care in non-traditional locations like tents or convention centers.

Table 2: Estimated financial losses (\$) associated with a three month increase in supply expenses.

Increase in supply expense	ICU	Emergency	Combined
10%	(66,834)	(40,205)	(107,040)
20%	(133,669)	(80,410)	(214,079)
30%	(200,503)	(120,615)	(321,119)
40%	(267,338)	(160,821)	(428,158)
50%	(334,172)	(201,026)	(535,198)

Source: Data from a Washington State Hospital.

Substitution of Acute Care for Critical Care

While surgical and clinic revenue are almost certain to decline without compensating increases in other general services, COVID-19 is expected to shift utilization from acute care to intensive care. Table 3 shows estimates of the net changes in contribution margin associated with these shifts. Estimates are presented for a range of 1% increase in ICU patient days to a 20% increase, at which the ICU of the hospital examined would be near 100% occupancy. We assume each 1-percentage point increase in ICU usage will correspond to a 10-percentage point decline in acute care patient days because of the need to shift resources to the more intensive site of care. We also assume that the shift in care lasts only three months. Under these assumptions, we estimate the financial impact on the hospital to range from a loss of \$124,480 (1% increase in ICU days) to a loss of \$2.49 million (20% increase in ICU days). If the duration of the shift were longer than three months, the financial losses at any level of ICU for acute care substitution increase. Assuming a one-year duration, estimated losses increase linearly. A 1% increase in ICU volume lasting one year would result in \$497,921 in losses while a larger 20% increase in ICU volume would result in a total of \$9.96 million in losses.

Combined Effects of Revenue Reduction, Supply Costs and Substitution

Combining our estimates of the individual effects of reductions in clinic and surgical revenue, increasing supply costs, and the substitution of acute care for critical care, result in conservative estimates of the total financial impact of COVID-19 on the hospital examined. We say that these estimates are conservative because these three effects could certainly interact in ways that generate greater financial losses for the hospitals, but we have omitted these interactive effects from our models. For example, an increase in the volume of ICU patients could exacerbate increases in supply costs. However, we have chosen to model the effects of increases in ICU costs assuming no change in supply costs, and increases in supply costs assuming no change in ICU volumes.

Table 3: Estimated financial losses (\$) associated with a three month shift to intensive care from acute care

Shift to ICU from Acute	ICU Patient days	Additional ICU contribution	Forgone Acute contribution	Net substitution effect
1%	63	10,448	(134,929)	(124,480)
5%	316	52,242	(674,644)	(622,402)
10%	631	104,484	(1,349,287)	(1,244,804)
15%	947	156,726	(2,023,931)	(1,867,205)
20%	1,262	208,968	(2,698,575)	(2,489,607)

Source: Data from a Washington State Hospital.

Using out best-case assumptions for each of the three effects (i.e. the lowest reductions in revenue, a 1% volume shift from acute care to the ICU and the lowest assumed increase in supply costs) we estimate a negative financial impact totaling over \$13 million. In the worst-case scenario (i.e. a 50% reduction in surgical revenue, a 20% reduction in clinical revenue, a 20% shift from acute to ICU care and a 50% increase in the cost of supplies for the ICU and emergency departments all of which persist for a year) the financial losses are much greater. Under this scenario the hospital would realize an almost \$117 million loss for the year.

These estimates are conservative in most respects. They do not include additional expenses required for staffing, or to establish alternative care and testing sites, and they do not include the costs to expand ventilator capacity through additional purchases, rentals or repurposing existing equipment. Our estimates of reductions in surgical and clinical revenue do not include corresponding reductions in acute care revenue. However, one respect in which the estimates are not conservative is that we have assumed hospitals will not take action to reduce their labor expenses, like furloughing staff or imposing salary reductions. Similarly, we have not attempted to incorporate estimates of the effects of federal subsidy funds from the CARES act.

Discussion

We present the results of a case study in which we estimate the financial impact of COVID-19 using recent financial information from a relatively large, well-run and profitable hospital. Based on a series of assumptions, we estimate a range of possible financial losses spanning from \$13 million to \$117 million. To put these figures in context, in 2019 the hospital had net income of just over \$5 million and held cash and investment reserves of over \$70 million (prior to recent declines in investment markets). Even a best-case scenario changes this hospital's financial picture from a 1% profit margin to a 1% loss. These results suggest that COVID-19 could have a profound impact on hospitals and that further study is required to understand the effects of the pandemic. Several questions are of particular importance. First, how will hospitals that struggled financially prior to the pandemic cope with the financial challenges the pandemic imposes? This is a particular concern for rural hospitals and safety net facilities. Although the average profit margin for a hospital was 6% in 2018, 25% of hospitals incurred a negative margin. Without the operational

acumen and contracting advantage to operate profitably in stable economic times, will these facilities be able to remain solvent? If not, what strategies will financially insolvent hospitals pursue to cope, and what effects will these changes have on the health system? A number of scenarios are possible, depending on a particular hospital's characteristics, the financial capital available to support it, and leadership's ability to execute plans.

Implications for Hospitals that Struggle to Remain Solvent

Consider a scenario where capital is available from large multihospital systems, private equity firms or even local governments. If this is the case, then hospitals with desirable operating characteristics like growing markets and market power over payers may be attractive acquisition targets for multihospital systems. This scenario could also increase the relatively low degree of exposure the hospital sector has to private equity ownership as private equity investors pursue operationally strong hospitals selling out because of depleted cash reserves. Even hospitals with less operational strength may be able to continue operations if local governments determine they are critically important and are willing and able to provide increased funding. However, even under this relatively optimistic scenario, hospitals with less desirable underlying characteristics may close. Of particular concern are rural and safety net hospitals, since many of these facilities struggle financially under normal circumstances. Unfortunately, both of these categories of hospitals are critical to providing access to care in the communities in which they operate.

This scenario assumes capital will be available from either private equity, hospital systems, or local governments. However, it is quite possible that each of these entities will struggle to secure capital themselves. For private equity holders, this would mean that private equity continues playing the relatively minor role that it currently does in hospital management. The implications for multihospital systems could be more interesting. It is possible that, if systems face serious financial losses, they may divest or close hospitals in less profitable markets to preserve the cash needed to support their more financially stable members. Under this scenario, hospital systems do not take on a role as the saviors of financially struggling facilities but, rather, actually increase the challenges hospitals hoping for acquisition face by adding to the supply of hospitals seeking scarce buyers. Similarly, it is possible that local governments, despite having a strong desire to support local hospitals, simply do not have the tax revenue to do so. This scenario implies that many of the same access to care issues as the previous scenario.

Implications for Hospitals' Ability to Raise Credit

It seems likely that hospitals may become increasingly willing to declare bankruptcy, using the protection that it provides to reduce debt loads and continue operations. If this is the case, it will be interesting to see whether and how hospital operations change as bankruptcy trustees play a larger role in management. Similarly, it will be important to understand how credit markets view bankruptcy declarations among hospitals following the pandemic. Will hospitals have difficulty in attracting credit in the future? Will lenders view the financial losses from the pandemic, and any associated bankruptcies, as a one-time shock unlikely to recur? Even if credit markets do not penalize hospitals for low margins, the notable reductions in cash on hand and the value of investment holdings may result in bond downgrades and limited access to credit for many hospitals.

Implications for Hospital Operations in the Period Immediately Following the Pandemic

One of the largest financial effects we identified was the loss of clinical and surgical revenues. The degree to which these losses affect hospitals will depend somewhat on hospitals' ability to recoup these revenues after pandemic restrictions are lifted. One question is, how much of the demand for elective surgeries will remain after the pandemic? It seems likely that much of this demand will remain after restrictions are lifted; however, it is not certain. Some medical conditions may have resolved on their own, reducing demand for procedures. Similarly, some patients may have lost jobs or insurance during the pandemic and may continue to delay care for financial reasons. During the Great Recession, many hospitals saw declines in the volume of elective procedures for these reasons. Assuming that significant pent up demand does still exist after restrictions are lifted, it will be important to understand how patient access is affected and to understand the operational changes hospitals make to meet this demand and to address possible access issues. Many resources required for care provision are limited to fixed quantities in the short term. For example, operating room capacity is relatively fixed. Future research should examine whether hospitals develop new processes, for instance, expanding operating room hours, to meet pent up demand, and the extent to which these processes become permanent. Similarly, pandemic restrictions have caused many hospitals to experiment with telehealth to a degree that they had not previously. If hospitals engage in these sorts of operational changes, it will be important to understand the impact these changes have on hospital finances and patient access to care.

Implications for Hospitals' Provision of Community Benefit

Finally, recent years have seen increasing calls for not for profit hospitals to provide sufficient community benefit to justify their tax-exempt status. This effort has included IRS mandates increasing the reporting requirements for these hospitals. However, the serious financial consequences hospitals face are likely to reduce the financial resources available to hospitals to support community benefit programs. It will be important to understand how hospitals adjust their community benefit provision in light of COVID-19 losses, and the impact that any reductions have on the health of hospitals' local communities. This is especially important in light of the fact that rising unemployment and the uneven impact of COVID-19 are likely to increase the need for hospital provision of community benefit within their markets. Similarly, hospitals will face challenges implementing existing charity care policies, and may weigh the need for new policies as the demand for uncompensated care rises in step with hospitals' difficulties sustaining operations.

For their part, regulatory agencies responsible for monitoring community benefit requirements will need to determine whether, and to what extent, they will consider the financial hardships hospitals face. Will hospitals be held to the same standards they were previously or will new standards be enacted? If the acceptable levels of community benefit provision decline, how long will this reduced standard be in force?

Limitations

Our analyses are subject to a number of limitations. Most important, our estimates are based on the financial characteristics of a single hospital. Despite this, we suggest that these estimates will be representative of the financial results many hospitals are likely to experience. A key limitation is the difficulty in forecasting the duration of time over which hospital operations will be affected by the pandemic. Our estimates are based on research aimed at informing social distancing policy. However, it is possible that elective surgeries will be allowed to resume before overall restrictions are lifted, or that supply chain disruptions last longer than social distancing requirements. Either of these conditions would affect the financial impact of the epidemic on hospitals. Similarly, if “waves” of social isolation followed by reductions in restrictions, it is uncertain how hospitals would respond and how this policy would affect hospitals financially.

Among the major limitations of our analyses is that our estimates of the impact of reductions in revenue from surgical and clinic revenue assume that only supply costs, not labor costs, are variable. This is equivalent to assuming that hospitals will choose not to reduce clinical staffing levels in responses to reductions in clinic and surgical volume. We made this decision for several reasons. First, there are some reports that hospitals are re-training staff for new roles caring for COVID patients (Grimm 2020). Second, we suspect that many hospitals will be unwilling to lay off clinical staff given the current nursing shortage (Owens 2019), and the challenges that doing so would pose for restarting normal operations and to community perception. Nonetheless, staff retention is not a universal strategy and some hospitals are choosing to lay off or furlough staff.

Another limitation of our methods is that we do not directly observe revenue earned from acute care or ICU departments, and our estimates assume that all services are reimbursed at the same discount relative to billed charges. It is possible that hospitals are able to secure more favorable reimbursement for ICU services than for other services. However, we have found no evidence in the academic literature or the trade press that ICU services are more paid more favorably than other inpatient services. In fact, we suspect that ICU services may be less profitable than some other services. Our application of a single contractual discount rate to both service lines results in a conservative estimate of financial losses stemming from the shift in service provision.

Conclusions

Our results suggest that the financial implications for hospitals of the coronavirus epidemic are likely to be negative and substantial. The magnitude of these consequences depends in large part on the duration of time that hospitals have to adjust their operations and the steps they are able to take to recoup lost revenue once restrictions are lifted. As the situation develops, it will be important to understand the consequences these financial losses have on hospital ownership, hospitals’ access to credit, hospital operations and hospitals’ decisions regarding community benefit.

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