

CASE STUDY

Health System Strategy to Safely Provide Surgical Care During the Covid-19 Pandemic

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During the initial onset of the Covid-19 pandemic, there was little information regarding how to deliver surgical care safely. Houston Methodist, an eight-hospital system with a flagship academic medical center (Texas Medical Center), adopted and implemented policies that were driven by science and expert opinion, including severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) polymerase chain reaction preoperative testing to decrease patient risk of Covid-19 diagnosis postintervention. In examining outcomes of the policies during the first 19 months of the pandemic, the authors discovered from a retrospective cohort study of 141,439 patients that the policies — especially SARS-CoV-2 preoperative testing — were effective in reducing postintervention Covid-19 disease, with an overall rate of 0.6%. Analysis of patients who had Covid-19 after intervention found that most had contracted the disease from community sources, which led to a nosocomial Covid-19 rate of 0.1%. Effective policy implementation was associated with successful delivery of safe surgical care during the pandemic.

KEY TAKEAWAYS

- » Overall, implementation of testing and universal precautions during the pandemic contributed to low rates of contracting Covid-19 after surgery or procedure in a large health care system.
 - » Our policy required patients to undergo preoperative or preprocedural severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) polymerase chain reaction testing and isolation after the test. Patients could proceed with the intervention if the SARS-CoV-2 test was negative. The
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emphasis on strict isolation before and after the surgery or procedure further decreased the risk of contracting the virus in the perioperative period.

- » Surgeries and procedures can be safely performed during a pandemic with the implementation of policies including preoperative SARS-CoV-2 surveillance testing to protect patients, staff, and physicians. These policies should be implemented to protect patients during future pandemics.

The Challenge

When Covid-19 was identified in the United States, the safety of performing surgeries and procedures was unclear. Houston Methodist, a hospital system that provides care for the Greater Houston metropolitan area, experienced its first Covid-19 case in March 2020 with an initial peak (mid-April 2020) followed by a second peak (July to August 2020) correlated with the phased reopening of businesses.¹ There have been a total of four epidemiologic peaks of Covid-19–positive patients treated at Houston Methodist during the 19-month study period (Figure 1).

Houston Methodist comprises eight hospitals, including one flagship academic hospital in the Texas Medical Center, six community-based hospitals, and one long-term acute care hospital (Figure 2).

The system has 2,541 licensed beds with more than 5,000 employed and affiliated independent physicians. In 2019, the system had 126,000 hospital admissions and 2.5 million outpatient and clinic visits. When infection rates of Covid-19 rose in the community, there was a community-wide moratorium on nonemergency clinical procedures to allow resources for hospitalized patients with Covid-19.² The governor of Texas implemented a stay-at-home order along with a limit on elective surgery on March 22, 2020.³ However, when infection rates decreased and the system had sufficient resources for both patients with Covid-19 and elective procedures, the moratorium was lifted. The phase 1 reopening with the resuming of elective surgeries occurred on May 1, 2020. Nevertheless, it was unclear how best to protect patients and providers from Covid-19. There were several society guidelines on how to provide care based on expert opinion,^{4,5} but there were no data on the efficacy of different policies. Moreover, poorly calibrated policies could mean significant infection-associated mortality in the perioperative period.^{6,7}

The Goal

We aimed to provide surgeries and procedures safely during the novel Covid-19 pandemic.

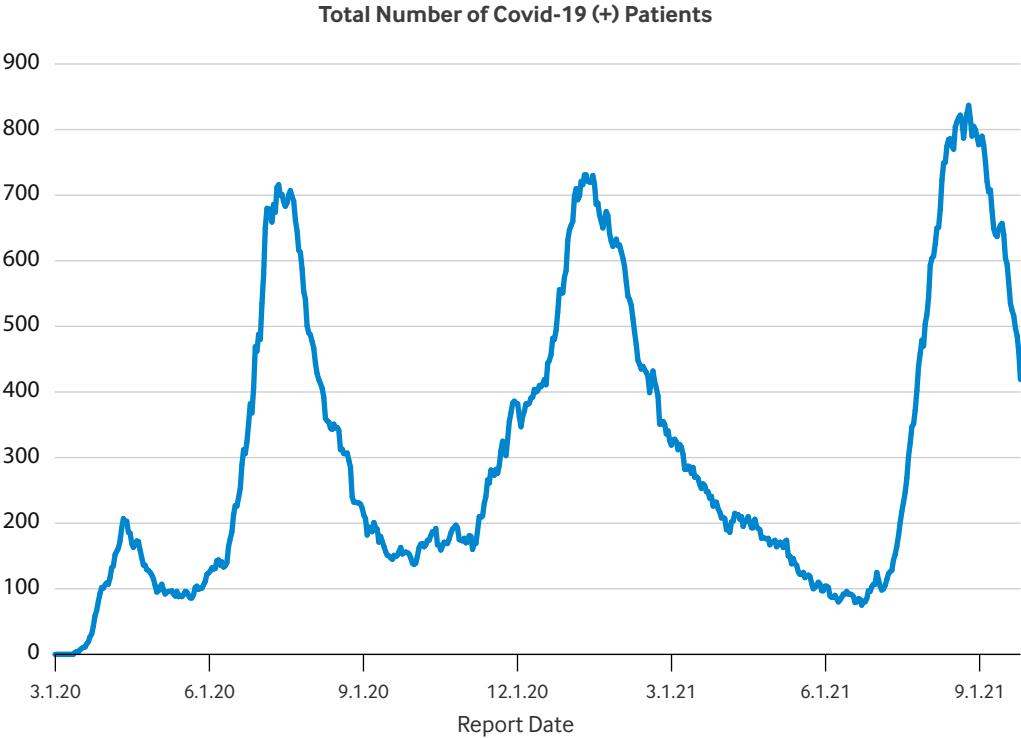
The Team

A team composed of hospital executives and physician leaders, including the CEO of the hospital system, CEO of the physician’s organization, head of infectious disease, head of medical staff, head of the ICU, head of pathology, and head of the research institute, developed a robust science- and guideline-based strategy to decrease the spread of Covid-19 in the hospitals.

FIGURE 1

Covid-19–Positive Patients Treated at Houston Methodist During Study Period

There were total of four epidemiologic peaks of Covid-19–positive patients who were admitted to the Houston Methodist system during the study period. The figure shows the prevalence of the Covid-19 in the Houston community.



Source: The authors
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“ Ultimately, investigation into and successful adoption of resterilization of the N95 masks allowed us to have enough PPE for the hospital system.”

The Execution

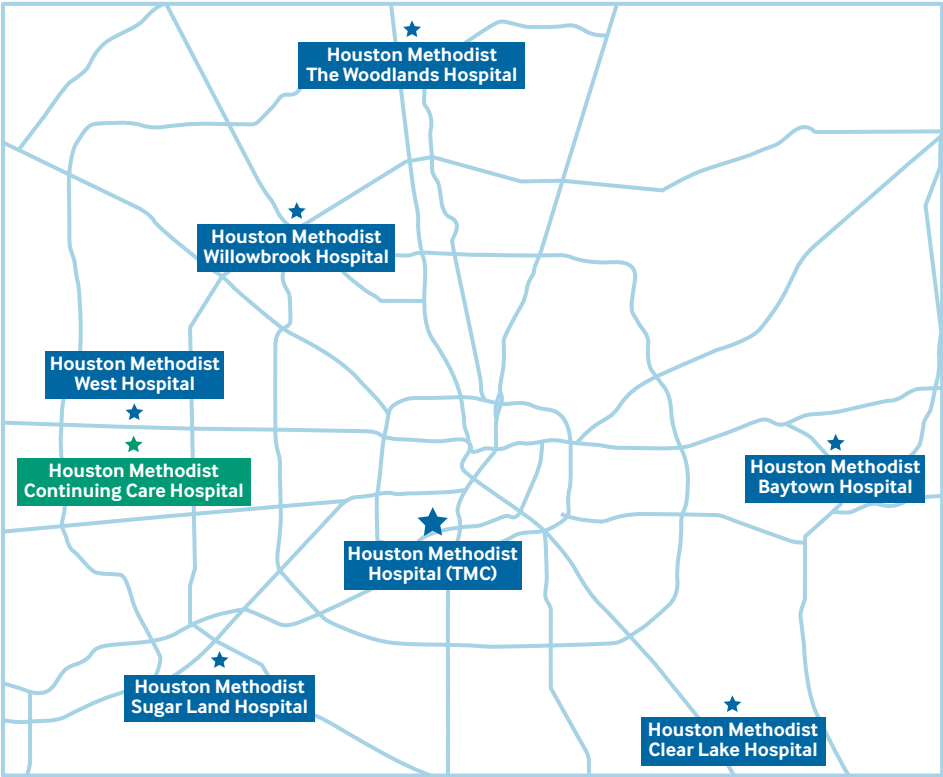
The policy included:

- Screening every physician, staff member, and incoming patient for Covid-19 symptoms through temperature checks and self-attestation regarding symptoms and travel;

FIGURE 2

Houston Methodist Facilities

The organization includes multiple facilities in the Greater Houston area, with about 60 miles between The Woodlands Hospital to the north and Clear Lake Hospital to the south.



Source: The authors
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- Mask mandates while in the hospitals and appropriate use of personal protective equipment (PPE);
- A strict visitor limitation policy⁸;
- Use of telemedicine visits⁹ (March 2020);
- Weekly townhall videoconferences to communicate policies with the physicians and staff to increase knowledge of Covid-19 and explain the policies (March 2020);
- Covid-19 surveillance for all staff and physicians through monthly polymerase chain reaction (PCR) testing (April 2020);
- Additional requirements implemented for patients to undergo preoperative SAR-CoV-2 PCR testing² before elective surgeries and procedures (May 2020);

- Administering available vaccines for employees, physicians, and the community (December 2020); and
- Vaccination mandate for hospital employees (April 2021).

Hurdles

There have been many difficulties during the pandemic, including three key challenges that had to be overcome to provide a safe surgical environment for patients: ensuring adequate PPE, efficient testing, and vaccine administration.

PPE

First, we had to secure enough PPE supplies, especially N95 masks. This hurdle was overcome with conservation and reesterilization procedures. The initial policy was to conserve the supply by wearing the masks all day and using the N95 mask supply selectively for only critical patients during intermittent or continuous aerosol-generating processes and procedures. In parallel, there were processes generated to acquire PPE from different suppliers in the country. Ultimately, investigation into and successful adoption of reesterilization of the N95 masks allowed us to have enough PPE for the hospital system.

Testing

The second challenge was testing for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). This hurdle was overcome by developing in-house SARS-CoV-2 PCR testing capabilities and investing in the tools and personnel necessary to provide results in an efficient manner. This testing capability allowed us to implement SARS-CoV-2 testing prior to intervention. Although the policy was in place in May 2020, the rate of patients with SARS-CoV-2 testing did not reach above 80% until 2 months after policy implementation. In addition, once the greater Houston community rate of Covid-19 decreased in June 2021, there was a change in policy to allow vaccinated patients not to undergo SARS-CoV-2 testing prior to surgery or procedure. The rationale at the time the policy was developed was that the patients who were vaccinated were less likely to contract Covid-19 with a low community rate of Covid-19. This policy was quickly reversed in July 2021 once there were data showing the infectivity of the Covid-19 delta variant even in vaccinated patients (Figure 3).

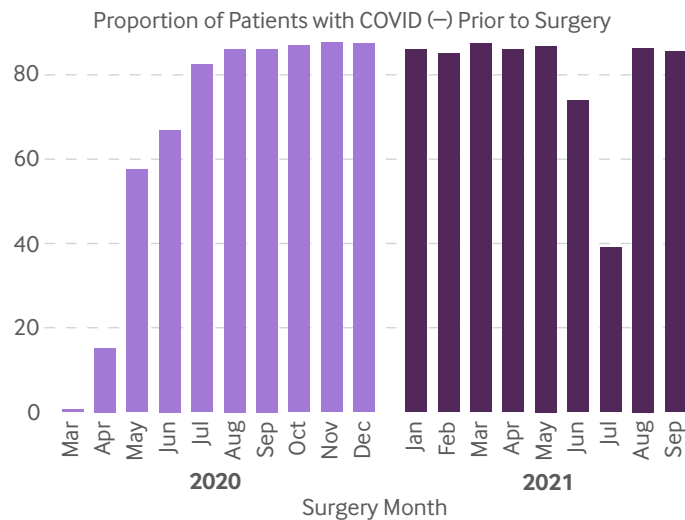
Vaccines

The third challenge was administering vaccines for the hospital employees, physicians, and the community. This hurdle was overcome by creating a vaccination scheduling system through the Employee Health Portal and prioritizing the highest-risk employees and physicians. Houston Methodist Hospital was designated by the state to serve as one of the vaccine hubs in the Greater Houston region to administer vaccines to the community. To further protect patients from getting Covid-19 in the hospital, on March 31, 2021, Houston Methodist was the first hospital system to

FIGURE 3

Proportion of Patients Who Tested Negative for Covid-19 Prior to Surgery

In May 2021, Houston Methodist set a policy mandating a negative Covid-19 test for elective intervention; patients in need of urgent or emergent surgery or procedures did not need testing. Lower rates in June and July 2021 occurred during a brief time when vaccinated patients did not require a test prior to surgery. This was reversed when the Covid-19 delta variant was found to lead to breakthrough infection in vaccinated patients, precipitating a fourth surge in the community.



Source: The authors

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mandate vaccination for all employees.¹⁰ A lawsuit by 117 employees challenging the mandate was dismissed by a federal judge, who upheld the hospital’s right to require the Covid-19 vaccine for all of their employees.¹¹ By June 2021, 100% of the employees without religious or medical exemption were vaccinated against Covid-19.

“Patients with negative SARS-CoV-2 tests prior to surgery or procedure had a SARS-CoV-2-positive rate of 0.5%, which was significantly lower compared to the rate of 1% in patients with an unknown SARS-CoV-2 status.”

Metrics

From March 1, 2020, to September 30, 2021, 161,315 patients underwent 230,872 procedures or surgeries at Houston Methodist. We excluded surgeries or procedures performed after the first intervention as well as those patients who had a SARS-CoV-2 test performed more than 7 days

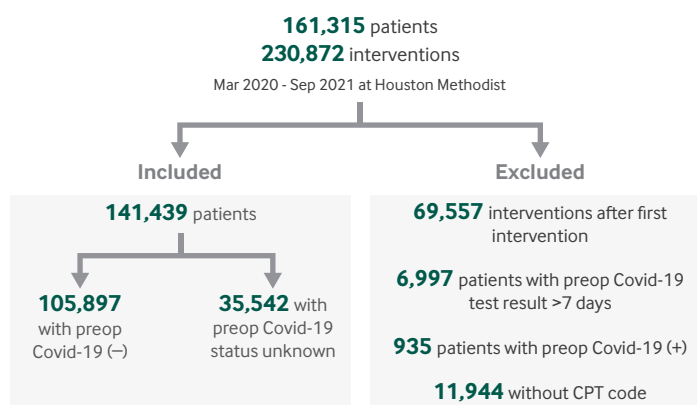
prior to intervention, those with a preoperative SARS-CoV-2-positive test, and those who did not have a Current Procedural Terminology code associated with a surgery or procedure. Patients who had a SARS-CoV-2-positive test prior to elective intervention had their surgeries and procedures postponed and were directed to either contact their primary care physician or contact virtual urgent care. The cohort included in the analysis consisted of 141,439 patients, of whom 105,897 patients had a negative preoperative SARS-CoV-2 test and 35,542 patients had an unknown Covid-19 test status (Figure 4). The patients had unknown Covid-19 test status if they did not undergo Covid-19 testing prior to surgery. This occurred for patients who were undergoing either urgent or emergent care. Also, this occurred prior to fully implementing the protocol in May/June 2021 and when the policy was briefly lifted for vaccinated patients in June/July 2022.

The SARS-CoV-2 positivity rate after the surgery or clinical procedure during the Covid-19 pandemic was 0.6% for all patients. Multivariable analysis showed that patients who were Hispanic or Latino; of younger age; or had a comorbidity of peripheral vascular disease, moderate or severe liver disease, diabetes, and renal disease were at higher risk of having a positive SARS-CoV-2 assay after surgery or procedure. In addition, multivariable analysis showed an increase in the risk of a SARS-CoV-2-positive result after urgent or emergent cases and after June 2020, when the community rate of Covid-19 increased. Moreover, the patients who had negative SARS-CoV-2 tests prior to surgery or procedure were protected from getting a positive SARS-CoV-2 test compared to patients with unknown SARS-CoV-2 status. Patients with

FIGURE 4

Review of 161,315 Patients Who Underwent Surgery or Procedure from March 1, 2020, to September 30, 2021

There were 141,439 patients were analyzed for this study. Of that group, 105,897 patients tested negative for Covid-19 before surgery and 35,542 patients had unknown Covid-19 status prior to surgery. CPT = Current Procedural Terminology.



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negative SARS-CoV-2 tests prior to surgery or procedure had a SARS-CoV-2-positive rate of 0.5%, which was significantly lower compared to the rate of 1% in patients with an unknown SARS-CoV-2 status (Figure 5).

Next, we defined the source of the Covid-19 based on the lag time between exposure and testing positive for Covid-19. Since it is estimated to take about 2 to 14 days after exposure for the patient to test positive for SARS-CoV-2, we defined a community source as any patient testing positive for SARS-CoV-2 either the day of or up to 2 days after admission date and 14 days after discharge from the hospital (if no known exposure). Hospital source was defined as any patient who did not have a community source of Covid-19 who tested positive for SARS-CoV-2 in the hospital up to 2 days after discharge. Finally, patients who did not fit either criterion were defined as having an unknown source of Covid-19.

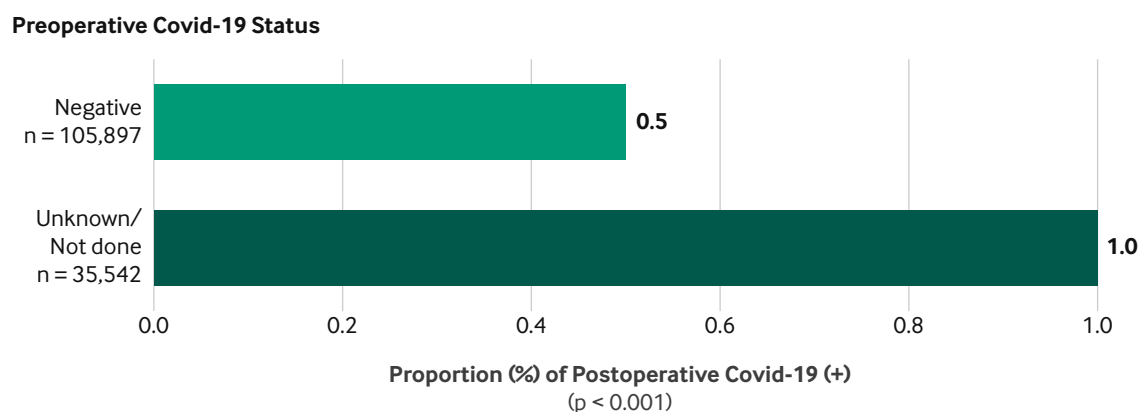
“ We discovered that most of the patients had Covid-19 exposure in the community (n = 518; 60%), whereas a minority of patients had a Covid-19 diagnosis from a hospital source (n = 154; 18%) or a status that could not be determined from the records (unknown n = 189; 22%).”

We discovered that most of the patients had Covid-19 exposure in the community (n = 518; 60%), whereas a minority of patients had a Covid-19 diagnosis from a hospital source (n = 154; 18%).

FIGURE 5

Postprocedure Covid-19 Positivity Rate for Patients

Patients who had a negative Covid-19 test result before surgery had significantly less chance of being found to have Covid-19 after surgery (0.5%) compared to patients who had unknown status of Covid-19 (1%; $P < .001$).



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18%) or a status that could not be determined from the records (unknown; n = 189; 22%). Thus, the SARS-CoV-2 positivity rate with a hospital-acquired source after a surgery or procedure during the Covid-19 pandemic was 0.1% (Figure 6).

Where to Start

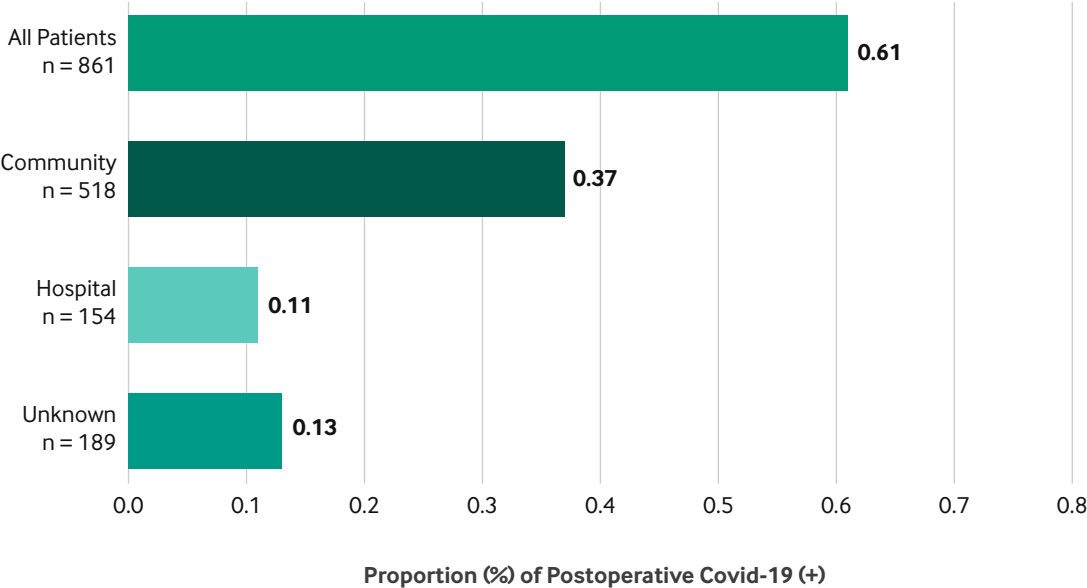
We attributed the success of our policies to — and, likewise, recommend the adoption of — the following key steps when crafting safe surgical and procedural polices during a pandemic:

1. Develop a team of key stakeholders with knowledge within the area to develop the plan.
2. Obtain resources to support the plan.
3. Constantly evaluate implementation, including the establishment of data tracking and dashboard capabilities to facilitate such an evaluation.¹²
4. Communicate with the community at large. Implement constant communication to explain the key decisions made during the pandemic.

FIGURE 6

Postoperative Covid-19–Positive Patients by Source of Infection

Most of the patients who were found to have Covid-19 after intervention acquired it in the community. Definitive hospital-acquired rate of Covid-19 was 0.1%.



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One of the most important parts of these policies was the weekly town hall meetings conducted by system leadership to disclose and discuss the emerging science and data behind the policies to protect staff, physicians, and patients. This communication stream helped the medical community understand the current status of the unfolding Covid-19 pandemic in real time and the rationale for the policies.¹³

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