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ARTICLE

A Guide for Surgical and Procedural Recovery After the First Surge of Covid-19

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The Covid-19 pandemic has forced health care systems to rapidly adapt to constantly changing circumstances to provide top care for employees and patients. Houston Methodist, an eight-hospital system in Texas, deployed an array of solutions to meet and overcome these challenges. We identified three areas of concern — operations, our medical staff, and our community — on which to concentrate our efforts. By integrating our established procedures with our Covid-19 patient care solutions, our goal remains to ramp up our services to provide unparalleled service in each area of concern. As we build up our services, we strive to attain pre-pandemic levels of patient care. Here, we share our solutions and lessons learned to deliver the best patient care within the new era of safety, with special attention on surgical and procedural care. We believe our tested approaches can benefit other health care systems around the world.

The 1918 H1N1 flu pandemic gave rise in 1919 to Houston Methodist (as The Methodist Hospital in Houston, Texas). Now in its second century of existence, Houston Methodist faces the Covid-19 pandemic. With a peak of the first wave on April 12, 2020, and with a modest uptick beginning in late May, as of June 16, 2020, we treated 2,378 unique Covid-19 patients, of whom 1,285 (54.0%) were hospitalized. Among the hospitalized patients, 108 (8.4%) died. Comprising an eight-hospital system with a flagship academic medical center (Texas Medical Center), six community-based hospitals, and one long-term acute care hospital, the system has 2,312 licensed beds with 792 employed physicians and more than 7,000 affiliated independent physicians.

Houston Methodist has 45 ACGME-accredited residency programs, and its primary academic affiliate is Weill Cornell Medical College in New York City. Houston Methodist is also an equal

partner in EnMed, an engineering medicine dual degree program with Texas A&M University. In 2019, Houston Methodist listed more than 126,000 hospital admissions, 1.2 million outpatient visits, and 1.3 million clinic visits. On average, we completed 1,700 surgeries per week, 1,800 procedures per week, 1,800 ambulatory imaging studies per day, and 1,355 physical and occupational therapy visits per day.

As Covid-19 inpatient volumes accelerated during the first 2 weeks of March, Houston Methodist faced a critical decision regarding system responses. Although we were seasoned in managing catastrophic weather events,[1] the Covid-19 pandemic posed novel challenges. Therefore, for the first time, we centralized incident command at the system level. In this structure, before making decisions, we first solicited input from our eight hospitals, our employed physician organization, and our medical executive committees that included independent physicians.

The chief executive officer of Houston Methodist Hospital, our flagship academic center, served as the overall operations incident commander, the system chief physician executive served as the physician incident commander, and the president of the Houston Methodist Academic Institute coordinated research and innovation efforts. This structure allowed the system CEO, a physician, the opportunity to spend time working with city, county, and state elected officials, business leaders, faith leaders, the national press, and others on education and policy initiatives. This public display of leadership was important as it helped instill confidence for the patients who had delayed getting treatment for their non–Covid-19 illnesses — which was important in our recovery. Because these were crisis conditions, operational decisions required management-level knowledge of hospital operations, and community advisory boards were not engaged. However, we did coordinate our efforts in an unprecedented fashion with the other major hospital systems in greater Houston, as well as city, county, and state officials.

Following a rapid turnaround collaboration with leaders in multiple medical, surgical, and procedural specialties throughout our system, system incident command significantly curtailed ancillary and diagnostic services and stopped all elective nonurgent procedures to preserve personal protective equipment (PPE) resources, beds, and personnel to care for a surge of Covid-19 patients. For all services we issued system-wide guidelines that were deliberately streamlined and eschewed overly complex and prescriptive policies. The basis of our guidance was reclassification of medical procedures, as well as diagnostic and ancillary services as elective nonurgent, elective urgent, and emergent (See Appendix.)

Later, on March 22, as Texas Governor Greg Abbott issued an executive order stopping all elective, nonurgent procedures, our Covid-19 volume was increasing. By the week of April 8 to 14, our weekly surgical volume fell by 78% to 455, procedural volume by 75% to 448, and imaging volume by 56% to 4,434. We saw significant decreases in ancillary services such as physical and occupational therapy, where visits dropped by nearly 80% to 287 per day. The reclassification of medical procedures, as well as diagnostic and ancillary services as elective nonurgent, elective urgent, and emergent, was readily adopted by physicians and surgeons, which led to successful operation in this restrictive environment. Importantly, this matrix empowered physicians to make critical medical decisions, which were clearly documented in the chart.

Time Line for Ramping Back Up

On April 17, 2020, another executive order by the governor slightly relaxed restrictions to allow a broader spectrum of surgeries and procedures but still placed burdens, initially through May 8 and then moved up to May 1, on physicians and facilities to ascertain medical necessity.

Building on our guidance to clinicians during the peak of Covid-19 cases (mid-April) and following the governor's previous directives, we framed the criteria for expanding case selection in a 2x2 matrix based on urgency and safety/resource utilization (Figure 1).

FIGURE 1

Criteria for Expanding Case Selection

Houston Methodist provided guidance during the period from April 24 through April 30 when attestation of medical necessity of surgery was required. This 2x2 matrix was helpful in identifying planned case selection and expansion of services based on urgency of the intervention and associated risk. Risk considers risk to staff, PPE supply, required resources, blood product usage, potential for ICU post-op, and compliance with government orders. Urgency was based on clinical factors.

	Lower Urgency	**Higher Urgency**
Lower Risk	Do: • Outpatient non-invasive imaging (CT/MRI) • Radiology studies requiring only masks for PPE	Do: • IR Procedures such as biopsies • Ambulatory surgeries
Higher Risk	Proceed with Sustainable PPE: • Screening colonoscopy	Do: • Cancer operations • Cardiovascular operations • Neurosurgery • All others that fit the definition of medical necessity

Source: The authors

This matrix provided scaffolding for physicians and surgeons to prioritize their case selection. Critically, we could treat more patients while operating within the confines of the state and Texas

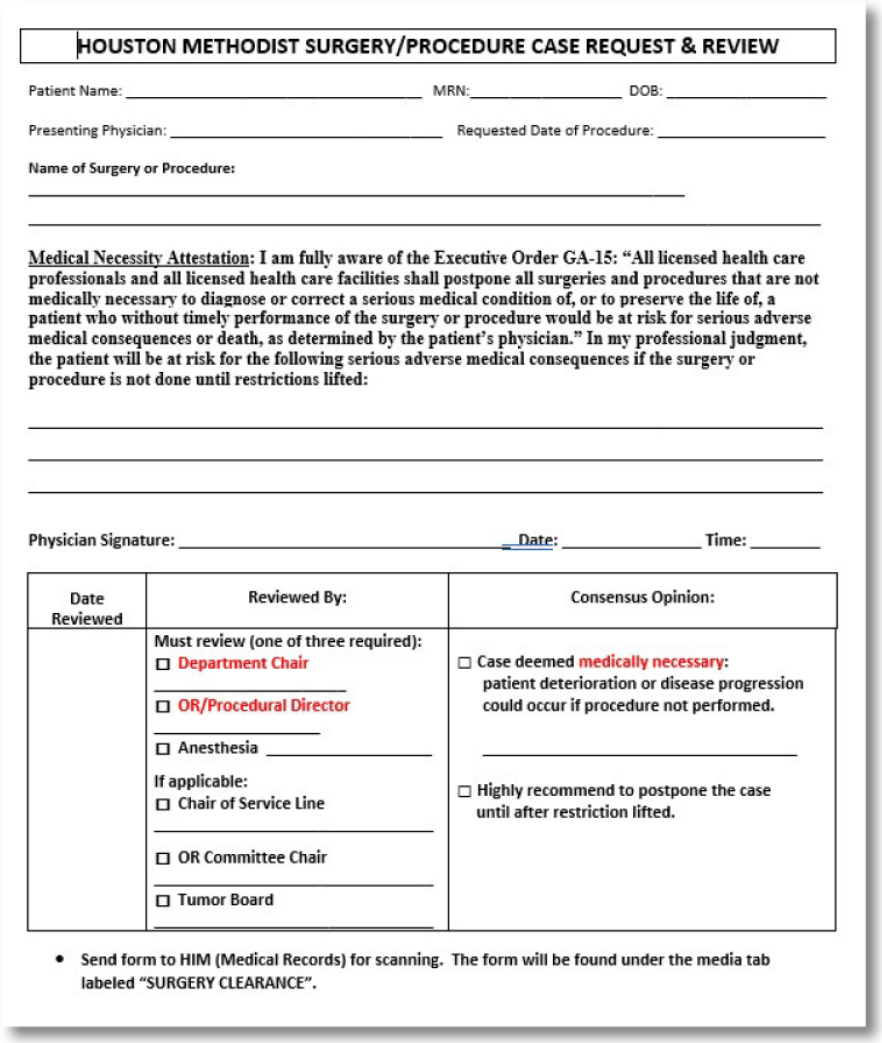
Medical Board regulations. The leadership of Houston Methodist began to carefully execute the plan to expand our scope of services further using our 2x2 grid. We presented our approach at a system-wide physician virtual town hall on April 23. We framed this expansion of our services to our staff and clinicians to treat patients who had non–Covid-19 medical issues that needed to be addressed. We realized that operations, procedures, diagnostic imaging, and ancillary services — which had been postponed during the time of greatest uncertainty — could not be delayed indefinitely without significant adverse consequences to patients. We created clear and deliberate messages that we would expand services thoughtfully, informed by the urgency of the intervention as well as the risk to staff, PPE levels on hand, resources required, blood product usage, the potential for ICU post-op, etc. Throughout the process, we maintained compliance with the governor's order.

We developed an attestation form using a rapid-response surgical task force to meet the new requirements of the state (Figure 2) and built the Epic order within 24 hours (Figure 3).

FIGURE 2

Case Request and Review Process

An attestation form was required for each case in advance of surgery and was designed to protect the physician and the health care system. This form must document medical necessity and be reviewed and approved by either department chair, anesthesia, or operating room director.



HOUSTON METHODIST SURGERY/PROCEDURE CASE REQUEST & REVIEW

Patient Name: _____ MRN:_____ DOB: _____

Presenting Physician: _____ Requested Date of Procedure: _____

Name of Surgery or Procedure:

_____

_____

Medical Necessity Attestation: I am fully aware of the Executive Order GA-15: "All licensed health care professionals and all licensed health care facilities shall postpone all surgeries and procedures that are not medically necessary to diagnose or correct a serious medical condition of, or to preserve the life of, a patient who without timely performance of the surgery or procedure would be at risk for serious adverse medical consequences or death, as determined by the patient's physician." In my professional judgment, the patient will be at risk for the following serious adverse medical consequences if the surgery or procedure is not done until restrictions lifted:

_____

_____

_____

Physician Signature: _____ **Date:** _____ **Time:** _____

Date Reviewed	Reviewed By:	Consensus Opinion:
	Must review (one of three required): ☐ Department Chair _____ ☐ OR/Procedural Director _____ ☐ Anesthesia _____ If applicable: ☐ Chair of Service Line _____ ☐ OR Committee Chair _____ ☐ Tumor Board _____	☐ Case deemed medically necessary: patient deterioration or disease progression could occur if procedure not performed. _____ ☐ Highly recommend to postpone the case until after restriction lifted.

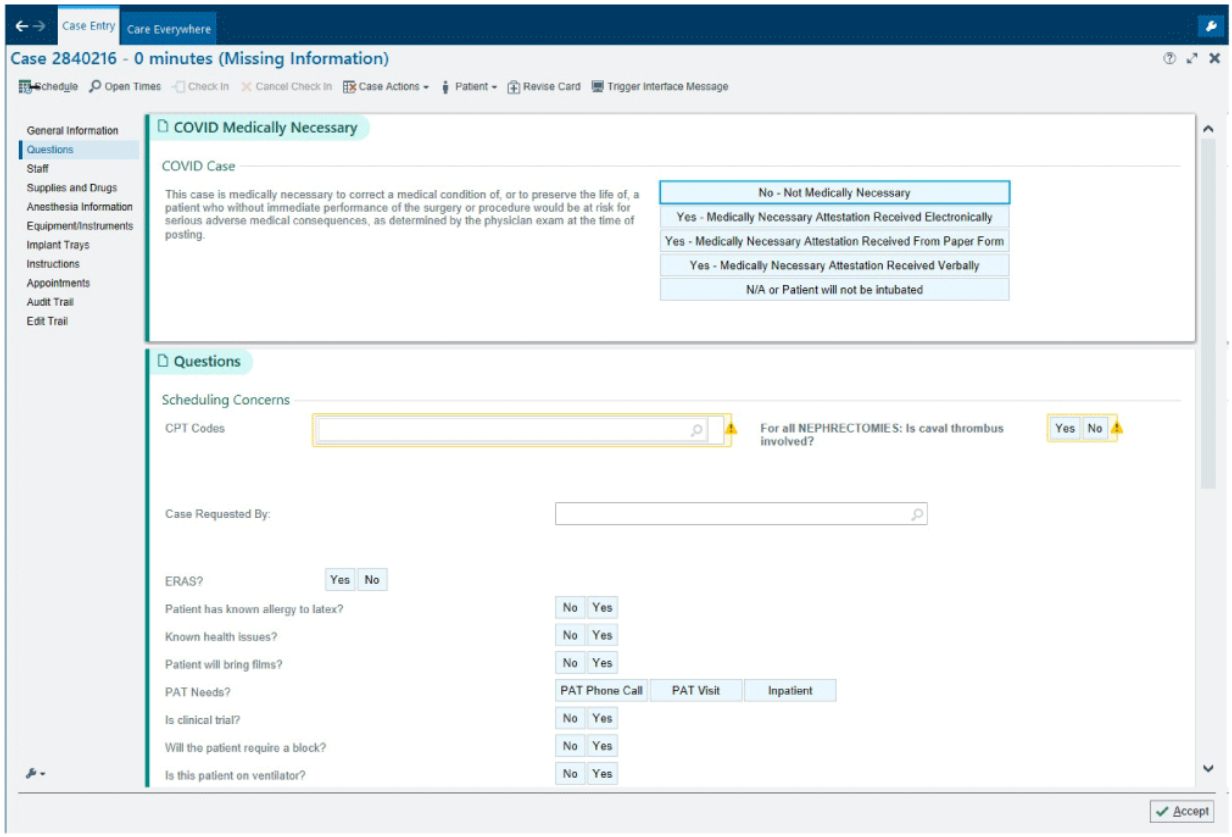
- Send form to HIM (Medical Records) for scanning. The form will be found under the media tab labeled "SURGERY CLEARANCE".

Source: The authors

FIGURE 3

Electronic Health Record Process

This is a screenshot of an Epic order that we built as an alternate version of the attestation form required from April 24 to April 30 for each case in advance of surgery. The button labeled "Not Medically Necessary" placed the case in queue to be worked as a backlog after restrictions on surgery were lifted. The button "Yes, Medically Necessary, Attestation Received Verbally" was only used when a case was being entered for immediate life-threatening emergencies, such as a ruptured aortic aneurysm.



Source: The authors

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During the period from April 24 through April 30, in order to follow the governor's order, we required the request form for each case in advance of surgery to document the medical necessity, which was reviewed and approved by either the department chair, anesthesia, or operating room director. Compliance with the process, which was 100%, was facilitated by several mechanisms. We actively engaged surgical and OR director leadership, who supported this process at each hospital, and we disseminated the information at virtual physician and staff town halls, as well as through emails. No surgeon or proceduralist ignored or resisted the attestation requirement. Six hundred and sixty-two surgical attestation forms were approved, and the surgeries performed. Less than 5% of submitted attestation forms failed to meet criteria and the surgery was postponed.

> *"We have now achieved a 1-day turnaround for testing, which requires minimal quarantine and greater flexibility in scheduling."*

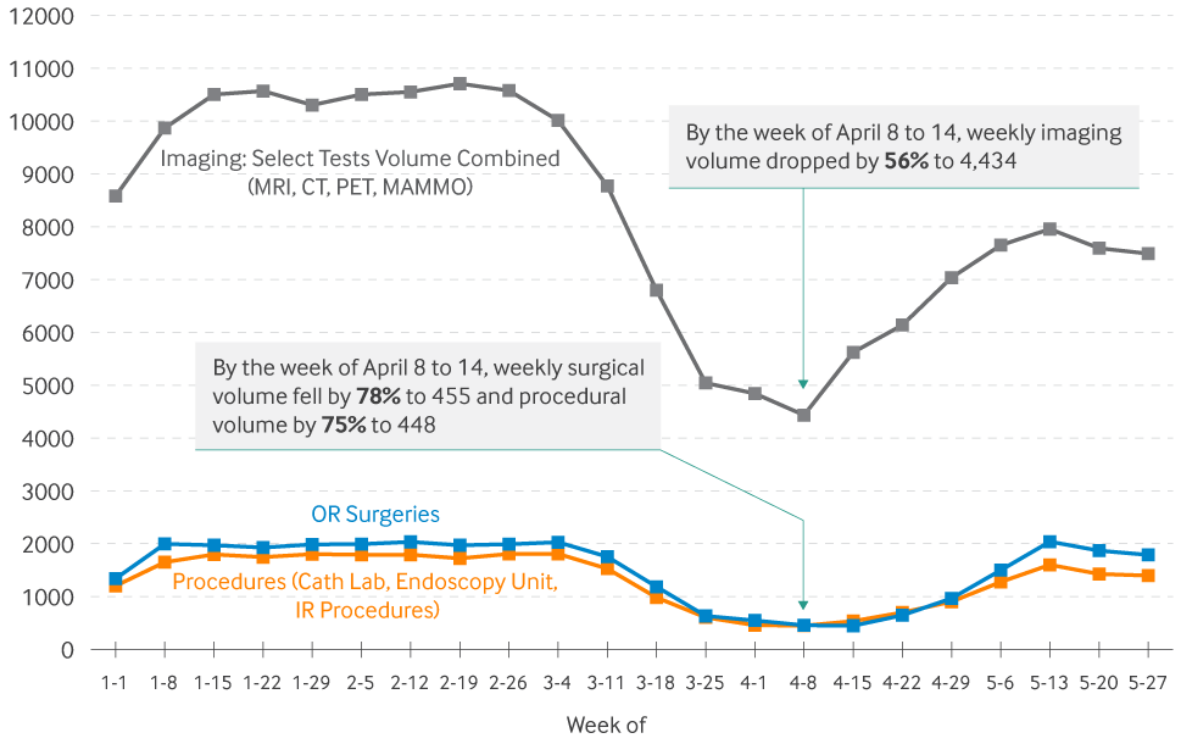
For procedures that did not require general anesthesia, we advised that those conducted clearly in a procedural area — such as a catheterization laboratory, endoscopy suite, interventional radiology room, or dermatology procedural area — were open for scheduling without an attestation. We utilized proper PPE, which included N95 masks, surgical face masks, face shields, and appropriate gowns and gloves. We asked physicians to use good judgment in scheduling patients to ensure that any hospitalization for long periods after the procedure was then accompanied by a completed attestation form, so the case was treated like a surgery.

On May 1, the governor lifted restrictions on elective, nonurgent cases, allowing us to remove the attestation requirement. While eliminating restrictions on surgeries and procedures, the governor's executive order required hospitals to maintain 15% of beds for Covid-19 patients. This requirement exists to this day, as of June 17. As we then began to ramp up surgeries, we set expectations to achieve surgical volumes in the first week of up to 50% of our pre–Covid-19 baseline. This baseline represented the volume we were at in early March, 2 weeks before the governor's directive in mid-March (Figure 4).

FIGURE 4

Houston Methodist Weekly Volume Trends for Operating Room Surgeries, Inpatient Procedures, and Imaging Tests; January 1 – June 2, 2020

This rapid recovery of volume highlights the need in the community for full surgical, procedural, and imaging services that were not related to Covid-19, and that we were unable to provide during the first surge.



Note: Inpatient procedures include catheterization laboratory, endoscopy, and interventional radiology (IR) procedures. Imaging tests include magnetic resonance imaging (MRI), computed tomography (CT), positron emission tomography (PET), and mammograms (MAMMO).

Source: The authors

This 50% goal, which was a consensus decision of surgical and administrative leadership, was determined by several factors, including the need to first ramp up diagnostic imaging services, clinical offices visits, and additional OR turnaround time needed to address expanded disinfection processes between cases. We safely achieved this goal, and by the week of May 6–12, while meeting the requirement to maintain 15% of beds for Covid-19 patients, our surgical volume rose to 74% of baseline, our procedural volume was 71% of baseline, and imaging rose to 77% of baseline. By the week of May 27 to June 2, our volumes were 88%, 77%, and 75%, respectively.

The Ramp-Up: Challenges, Solutions, Lessons Learned

We made a strategic decision to cohort the Covid-19 and non–Covid-19 populations to create an environment of safety for our physicians, our staff, our patients, and our visitors. Health care leaders are creating *ad hoc* policies subject to revision to address circumstances of a fluid and uncertain era. Each day, new knowledge requires adapting to new lessons. Indeed, we have learned many critical lessons during the past 4 months. We want to share our knowledge from both our success and lessons learned to help others. We strive to help others as they return to pre–Covid-19 states of operation.

Environment of Care and Logistical Concerns

Testing availability is critical for restarting services.

Because we do not have a vaccine or a cure, prevention of infection transmission from asymptomatic carriers was critical for restarting services. Over the past month, our testing capabilities have significantly improved. In April, when our testing was limited by logistics, we found 5-day-in-advance turnaround time between the test and procedure was unacceptable for surgeons and patients, who gave feedback that this created scheduling difficulties and a burdensome period of quarantine. However, as testing capabilities improved, a 3-day-in-advance turnaround was acceptable for physicians to manage their schedule and for patients to quarantine voluntarily. We have now achieved a 1-day turnaround for testing, which requires minimal quarantine and greater flexibility in scheduling.

PPE challenges remain.

Supply of new PPE as well as provider concerns regarding adequacy of protection remains a challenge. To maintain our ability to care for Covid-19 and non–Covid-19 patients, we must reuse equipment, as there is insufficient disposable equipment to use for every case. Initial concerns from physicians and staff about using reprocessed equipment and N95 masks has dissipated as safety of this process has been demonstrated. However, some physicians still do not feel safe even with the appropriate PPE. To mitigate these concerns, we employed direct conversations with medical staff leadership, email, Web-based town halls, and tip sheets about appropriate PPE with a focus on safety.

Regular testing of asymptomatic patients and staff is operationally and economically challenging.

In mid-June we developed the capability to perform Covid-19 testing on every asymptomatic patient admitted to our hospitals. At the peak of the first wave, Houston Methodist developed and implemented a weekly surveillance program designed to test 5% of the employee population to identify asymptomatic Covid-19–positive employees and potential outbreaks through contact tracing if needed. We used nasopharyngeal sampling with testing for SARS-CoV-2 by a reverse transcriptase polymerase chain reaction (RT-PCR) assay that is 75% sensitive and at least 99% specific. We found a 5% positive rate in the Covid-19 units and 1% in other clinical areas of the hospital. Asymptomatic Covid-19 employees were removed from the workplace for 10 days. We were fortunate that removal of these employees did not lead to staffing disruptions.

> *"To maintain our ability to care for Covid-19 and non–Covid-19 patients, we must reuse equipment, as there is insufficient disposable equipment to use for every case."*

Since early May there has been less than a 1% positive rate in this random testing of employees, including those in Covid-19 units. Our tracing efforts to date suggest that the positive asymptomatic employees have community-acquired infection. Testing all employees on a weekly or even biweekly basis is logistically challenging and expensive. At this point, with the low prevalence of Covid-19 in our employees, we are not convinced of the benefit and will continue our weekly surveillance of 5% of the employee population. For mass daily screening, on a daily basis we continue with attestation of visitors and daily temperature screening of visitors and our employees.

Social distancing was never planned in hospital or ambulatory care design.

In general, hospital facilities were not designed to accommodate social distancing. The *no visitor* limitation at the peak of the first wave has been relaxed. Barring exceptional circumstances, one designated visitor per patient per hospital stay is now allowed, but this is still unpopular with patients and families. There are now longer times allotted for procedures and ambulatory appointments due to social distancing and more extensive cleaning.

We have instituted multiple modalities to accommodate our patients under these constraints. Our most expeditious and first response was to expand ambulatory clinic hours to include early morning, evenings, and weekends. We have also implemented two technological and operational innovations. The first is the creation of a *virtual waiting room*. Leveraging our secure patient communication texting platform, patients are able to text us upon arrival and we can text them back when it's time for them to enter the clinic. This minimizes the time a patient spends in a physical waiting room, allows patients to get escorted directly to exam rooms, and reduces traffic flow within the clinic. In the past month, this technology was used for nearly 10,000 appointments across more than 30 clinics.

Our second innovation was to adjust templates to stagger virtual appointments with in-person visits. This allows a fraction of the providers within the same clinic to see face-to-face patients while the other providers in that clinic see telemedicine visits at that same time. This helps to control traffic into our clinics, without reducing access. Our anecdotal evidence to date is that patients are appreciative of the extended hours and the innovations that at the same time maintain access and mitigate the safety-influenced slower throughput.

Longer operating room total procedural times, longer OR turnaround times, and decreased efficiency.

During the first surge of the Covid-19 crisis, the anesthesia service created intubation teams that used advanced PPE (PAPRs) for all operating room and procedural area intubations and extubations; the use of such equipment requires more time. As we expanded volume, anesthesiologists transitioned to N95 masks and face shields for PPE as a way to save time. We have added 3 minutes after intubation and 3 minutes after extubation to allow for air exchange after these aerosolizing procedures. New cleaning protocols have added an additional 8 to 10 minutes

between cases. This has significantly impacted high-throughput, short-duration, ambulatory surgery cases. As a result, surgeons have requested longer OR days with increased afternoon/evening and weekend schedules to account for these longer turnover times and to address case backlogs. Fortunately, we have been able to adequately staff our backlogged and new cases without fatiguing surgeons and staff on long days.

Medical Staff Concerns

Physician hesitation to trust the Texas Medical Board's interpretation of the governor's Executive Order.

During the initial restriction period on nonurgent elective surgery, anyone could file a complaint with the Texas Medical Board (TMB) alleging a violation of the order. To address this potentiality, we relied on our expert legal team to fully interpret and explain to our physicians the executive order and the subsequent TMB press release. We reopened surgery and procedures in close alignment with the TMB rules. We communicated updated information regarding this specific issue at every physician town hall. An anonymous complaint was filed with the Texas Medical Board regarding care provided by one employed physician. We are confident in the prudency of this physician's care and decision-making that aligns with the governor's executive order and the Texas Medical Board's interpretation.

Virtual town halls ease the challenges for frequent communication to alert medical staff to procedural changes during the Covid-19 crisis evolution.

Most physicians received information through Houston Methodist, local hospital entities, specialty-specific channels, other hospital systems, and from their national professional organizations. In some cases, professional organization information conflicted with Centers for Disease Control and Prevention guidance. To address possible inconsistencies and to deliver timely information, from March 26 through May 28, we conducted a weekly 90-minute physician-only WebEx town hall led by the chief physician executive. The panel included the system CEO, the system CMIO, and leaders in infectious disease, emergency medicine, critical care, laboratory medicine, primary care, infection control, human resources, employee health, and supply chain. Physicians were able to ask questions and raise concerns with this panel in real time.

> *"Judging by the weekly attendance of nearly 1,000 physicians and their positive feedback to leadership, the town halls were a successful platform for communicating all updates."*

Judging by the weekly attendance of nearly 1,000 physicians and their positive feedback to leadership, the town halls were a successful platform for communicating all the updates to protocols, personal protective equipment, plans of care, testing availability, and numbers of known infected patients within the Houston Methodist system. Physicians frequently told us that these town halls provided their most trusted source of information for Covid-19 related treatment, safety, and operational updates. All information presented at town halls was subsequently sent as emails

to all physicians for full transparency and reinforcement. In addition, email was used as an effective communication vehicle for our physicians.

The need for more robust support for telemedicine visits involving non-surgeon members of the care team.

During the development of the pandemic in the U.S., consumers and physicians dove into the "deep end of the pool" of virtual medicine. Across primary care and 36 specialties, at Houston Methodist we quickly migrated nearly half of our pre–Covid-19 employed ambulatory volume to telemedicine. Because these virtual visits used our electronic health record platform, physicians and surgeons were typically able to make referrals, order laboratory tests and imaging, and schedule surgeries and procedures. This rapid switch to virtual visits facilitated identification of urgent and emergent surgical situations, and the ability to develop an easily accessible backlog of elective, nonurgent surgeries and procedures to perform during our eventual ramp-up.

However, inefficiencies did occur in this new workflow because the previous in-clinic hand-off to surgical schedulers or medical assistants was disrupted as our providers were predominantly working from home and support staff had been deployed to other Covid-19–related activities. While practices merge traditional office and virtual care, a more robust pathway is necessary to capture all patients who have a virtual visit and then need further evaluation prior to a surgery or procedure. To accomplish this, we are building a "warm" virtual hand-off from the provider to schedulers and medical assistants.

Physician reluctance to return to practice for concern of safety.

Although most surgeons and proceduralists were prepared to resume operations, there remained a very small minority (less than 5%) of employed physicians who felt less comfortable returning to the operating room or procedural suites. We were confident in our PPE, cleaning, and screening strategies and the safety of the work environment. These physicians were encouraged to return to a safe environment and avoid further disconnection from patients who required their services, as well as potential salary reduction because of reduced productivity. By late May, these strategies were successful in returning virtually all employed surgeons to the operative suites.

Community Concerns

Consumer concerns about exposure.

Consumers have spent months hearing that Covid-19 is dangerous and to stay home. In addition, consumers have been told that they need to "save the heroes in the health care system to treat Covid-19." So, consumers withdrew from seeking health care services and preferred to wait until "after Covid-19" to get services. As part of the ramp-up effort, we surveyed the community to understand their concerns. As a result, we crafted targeted and ongoing safety messages and marketing focused on the community's concerns.

Impact of unemployment, underemployment, and decreased insurance coverage.

Further complicating return to baseline health care delivery is the impact of the Covid-19–induced recession, which has left individuals without the disposable income to manage high-deductible plans and large co-payments. While some consumers may want to resume services, we

acknowledge that it may be financially challenging for them to undergo even urgent operations. We facilitate mitigation of these concerns by offering non–interest-bearing payment plans to spread out the burden of their out-of-pocket costs over time.

> *"Further complicating return to baseline health care delivery is the impact of the Covid-19–induced recession, which has left individuals without the disposable income to manage high-deductible plans and large co-payments."*

In addition, many consumers feel that they do not have the necessary information to engage the health care system safely. Most consumers desire a more *normal* experience when they undergo medical procedures, including a less-restrictive visitor policy. To help address these concerns, we have launched a comprehensive marketing campaign — including television, Web, print, billboard, and mail — to emphasize the safety measures that have been initiated in all patient care areas. We created talking points and FAQ tip sheets for physicians and employees to reassure patients about the safety of the hospital.

Looking Forward and Leadership Lessons

Although we have successfully ramped up our services, with our system incident command structure and close collaboration with physicians and administrators, we believe we are also well positioned to adapt to any changes that arise as the Covid-19 pandemic evolves. Since late May we have been experiencing a second surge of hospitalized Covid-19 patients; this surge is accelerating as of late June. Fortunately, we are simultaneously managing to care for these patients and continue all other services. If we do need to scale back our caseload, our decisions will be informed by our previous experiences and the proven guidelines detailed in this report: our lessons learned.

We believe that with knowledge gained regarding PPE and infection prevention and control that we will not shift to such a great degree in the ambulatory setting from in-person to virtual care. In all aspects of our care we will continue to revise and optimize our responses guided by our experiences. True to the Houston Methodist tradition as a learning health care system, we will continue to learn and adapt to serve the needs of our patients and community.

We have learned many leadership lessons from guiding our physicians and surgeons through both the restrictive period of surgery and procedures, as well as the resumption of all services. In all communications and interactions we aimed to be transparent, strived to be pragmatic, and projected optimism. To ensure ease of communication and compliance with restriction of services, we deliberately streamlined our guidance, eschewing overly complex and prescriptive instructions. The weekly virtual town halls attended by more than 1,000 physicians provided an interactive forum where physicians could receive timely updates on Covid-19 from system leadership and medical subject matter experts and ask them questions and raise concerns in real time. In addition, we published a daily email from the system chief physician executive, to all employees and physicians, to relay pertinent important information ranging from personal protective equipment

to showcasing our Covid-19-related innovations. These communications built confidence and unity during the surge and paved the way for a successful recovery effort.

Our multiyear initiative to develop physician executive leaders throughout the organization bore fruit during this crisis. Working with executive administrative leaders, these physicians created new dyads to address emerging Covid-19–related issues. This close interaction allowed for rapid operational decisions and enhanced engagement and alignment across the medical staffs. We are confident that these newly cemented relationships, forged in crisis, will augment our resilience and agility to manage Covid-19 and future challenges.

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Appendixes 1 and 2.

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