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NEJM Catalyst Collection:

Covid-19: Managing the Surge

Exclusive content from NEJM Catalyst on the response to the Covid-19 pandemic

IN CASE OF EMERGENCY BREAK GLASS
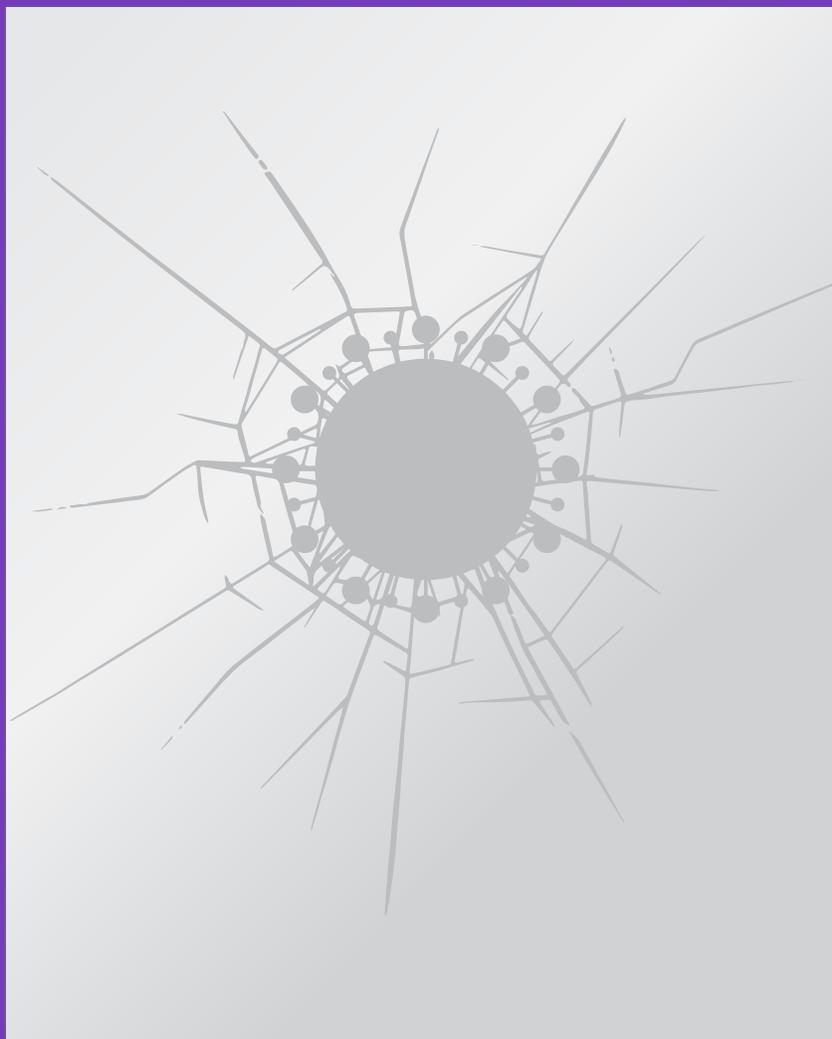
LETTER FROM THE EDITORS

Covid-19: Managing the Surge

As Covid-19 spreads around the world, health care leaders and clinicians currently dealing with rising case rates can learn much from those organizations hit with earlier surges of infection. NEJM Catalyst has featured articles, case studies, and conversations since the early days of the pandemic on the many different approaches and solutions to the problems posed by the SARS-CoV-2 virus.

This collection of previously published content from NEJM Catalyst contains first-person accounts of actionable solutions and insights from hospitals and health systems across the United States and extending to China.

After the initial outbreak in China was brought under control, a physician in Shanghai summarized the stringent measures and strict controls needed to avoid further surges. The early epicenter of Covid-19 in the United States was in New York City. In response to the enormous surge of illnesses, leaders at NewYork-Presbyterian redeployed physician teams to over 550 incremental ICU beds, structured around a supervised pyramid-staffing model. The Icahn School of Medicine at Mount Sinai set up a 24-hour palliative care help line to serve the sickest patients and their families.

Health care providers sought to keep patients out of hospitals when possible, both to avoid infection and make room for those who needed care the most. In Chicago, Northwestern Medicine developed a home monitoring program for the thousands of patients who could care for themselves safely. The Cambridge (Massachusetts) Health Alliance created an intensive community management strategy, incorporating outreach to high-risk patients, dedicated telephone triage, and a respiratory clinic.

Covid-19 overshadowed all other health care for a time. NYC Health + Hospitals investigated the dramatic drop in non-Covid-19 patients in its ICU, leading to the conclusion that many illnesses were hidden and many treatments deferred. Thomas H. Lee, MD, MSc, Editor-in-Chief of *NEJM Catalyst Innovations in Care Delivery*, reflected on "the invisible patients" – those without Covid-19 but whose health needs were no less real.

Equitable access, always a concern in care delivery, was highlighted by the rapid shift to telemedicine that occurred everywhere. Researchers at the University of California, San Francisco explored means of mitigating inequitable access and ensuring that telemedicine does not exacerbate health disparities. The pandemic has taken a toll on health care providers as well. Rush University Medical Center in Chicago created a wellness consult and service to protect the well-being of frontline workers.

As early lessons to combat Covid-19 crystallized, a group of health care leaders from across the United States, including the Department of Veterans Affairs, created a systematic guide and action plan for health systems to prepare for future waves. Finally, leaders from Geisinger and Humana called for health care organizations to recognize and preserve valuable innovations developed during the crisis.

As Covid-19 cases continue to spread, look to this guide for hard-won lessons from your peers, as well as NEJM Catalyst's Covid-19 resource page. There you will find more inspiration for how health care leaders and clinicians can respond with the immediacy and agility required by this devastating virus.

—The Editors

ARTICLE

A Flower Blooms in the Bitter Soil of the Covid-19 Crisis

Jaewon Ryu, MD, JD, Kristin Russell, MD, MBA, William Shrank, MD, MSHS

Covid-19 has forced us all to innovate at every level. We would be wise to take the time to recognize and preserve those innovations — especially as they relate to value-based care.

The rate of innovation in health care during the Covid-19 crisis has been extraordinary. The percentage of physicians using telehealth has soared from less than 20% 2 years ago to almost 50%[1] today and an estimated 1 billion visits will occur virtually this year.[2] When the need arose, clinicians quickly learned how to sterilize personal protective equipment and the U.S. Food and Drug Administration rushed to approve the technique. Ventilators have been rigged so they can be shared while research studies are completed — from ideation to publication — within weeks. And we are caring for patients where they are — in their homes — with remote monitoring, triaging health bots, and in-home hospital care.

Examples abound, and the remarkable pace of progress has been a bright spot amidst the tragedy. In addition to celebrating this, we should think proactively about whether there are lessons that we can apply to other health care challenges. Although the need to decrease costs and waste in the health care system lacks the drama and immediacy of the current crisis, it is more essential than ever that we do this, and that we do it quickly. Solving these issues has been a formidable challenge that will require the type of rapid and robust innovation we have seen during this crisis, and understanding the conditions that created such fertile ground may help us cultivate these similar conditions post-crisis.

What Has Enabled This Rapid, Highly Impactful Innovation?

Alignment and Urgency

The primary driver of innovation during this crisis has been the urgency and common enemy that mobilized and united us. At the outset, reputable models projected millions of deaths would occur if we did not intervene. There was an urgent need to act and we responded by implementing

unprecedented public health measures that resulted in 95% of Americans being subject to stay-at-home orders.

Similarly, there have been crises in the past that have mobilized the world to innovate in surprising ways. The desire to beat the USSR during the space race in the 1960s mobilized the country to achieve something that would have seemed impossible, and the Internet was invented as a contingency plan if phone lines were destroyed by the USSR during the Cold War. Urgency with shared purpose are indeed powerful forces.

Flexibility

The massive infusion of flexibility into the traditionally rigid health care industry removed barriers to innovation. The policy changes that were made by the federal government had immediate and cascading impact. Some of the most transformative included the sweeping Centers for Medicare and Medicaid (CMS) waivers that expanded access to telehealth, provided flexibility for member cost-sharing, facilitated advanced payments to providers, and loosened regulatory requirements for skilled nursing facility coverage. Similarly, state governments added additional flexibility with actions like modifying licensure requirements to allow providers to cross state lines to meet surging capacity demands quickly. Providers themselves raced to offer flexible care options, many moving to telehealth-only practices within days and some offering "porch visits" as a halfway step between in-office and in-home visits to decrease transmission and need for personal protective equipment.

> *Entrepreneurs encourage principles like 'test and learn' and 'fail fast' to spur creativity and speed, yet we rarely see these principles evoked on such a large scale and with such high stakes as we have seen with the Covid-19 crisis."*

Finally, health plans made far-reaching changes like waiving utilization management and covering all costs related to Covid-19 testing and treatment. At Humana, an interesting benefit of this action was the ability to retrain nurses who had been doing utilization management to make proactive outreach calls to members to address their crisis-related needs. Likewise, at Geisinger, nurses who had been doing preventive screening outreach calls were able to shift gears to also perform outreach check-in calls to those patients who tested positive for Covid-19 and were recovering at home, and by monitoring disease symptoms and advising if in-person evaluation appeared necessary.

By necessity, we have also seen another type of flexibility during the crisis: an increased tolerance for creative solutions that are imperfect or untested. Entrepreneurs encourage principles like "test and learn" and "fail fast" to spur creativity and speed, yet we rarely see these principles evoked on such a large scale and with such high stakes as we have seen with the Covid-19 crisis. It has been remarkable to witness the numerous examples of makeshift and unorthodox solutions that have been applied to truly complex problems — from creating a hospital in New York's Central Park to repurposing empty hotels to house the homeless. Innovations have led to important learnings;

for instance, when CMS began allowing audio-only telehealth interactions, we learned that many seniors much preferred this option as it avoided the embarrassment they felt at the idea of providers seeing inside their homes.

Collaboration

While the absence of systems-based thinking among stakeholders in the industry has stalled progress in the past, this crisis has highlighted the critical importance of collaborating and has spurred surprising new partnerships that should give us hope. The entire Covid-19 genome was sequenced in a day and published online through a large-scale international collaboration, and the "Accelerating Covid-19 Therapeutic Interventions and Vaccines" partnership between National Institutes of Health and multiple pharmaceutical companies has provided a compelling example of the public-private partnerships that have been a prominent theme of this crisis.

We are also seeing remarkable examples of competitors who are now collaborating, such as Apple and Google combining forces to develop a contact tracing platform. Another striking example arose when New York essentially merged all 200 hospitals in the state into a single operating body to enable supplies and capacity to be rationally and nimbly allocated.

Public Health Lens

Covid-19 is the quintessential example of the way that public health interventions can extend the reach and efficiency of our existing health care system. Months ago, it would have been hard to imagine a situation that could have mobilized millions of Americans to pay avid attention to key epidemiological principles. Yet, phrases like "flatten the curve" and "slow the spread," are now part of our everyday vocabulary and our children are playing "social distancing" with their dolls. Millions tuned in every night to watch the White House task force (including the infectious disease expert turned cult-hero Anthony Fauci) use slides and pointers to explain the intricacies of hospital capacity, testing algorithms, and risk stratification. Laser-like focus on the allocation of scarce resources has required us to think about the needs of the whole population more than ever before.

> " *We have been forced think about the needs of the whole population more than ever before and that has drawn attention to these issues and helped us develop the vocabulary to discuss them. It is this population-level lens that will be required to truly transform our health care system."*

We are seeing this public health influence throughout the system, from sophisticated models that predict the impact of prevention measures to a sharper focus on allocation of scarce resources like personal protective equipment and ICU beds using robust, new risk stratification and triage processes. We have been forced think about the needs of the whole population more than ever before and that has drawn attention to these issues and helped us develop the vocabulary to discuss them. It is this population-level lens that will be required to truly transform our health care system.

Table 1. Innovation Catalysts in Covid-19 and Value-Based Care Models

Catalyst	Covid-19 Crisis	VBC Models
Alignment	Common enemy increased collaboration	Shared risk aligns stakeholders
Flexibility	Regulatory relaxation had cascading impact	Incentives and predictable income encourage innovation
Population-Level Lens	Laser focus on prevention, risk stratification, scarce resources	Reimbursement based on health of whole population

Source: The authors.

Value-Based Care Models Cultivate These Conditions

Alignment, flexibility, collaboration, and a public health lens have enabled rapid progress (Table 1). As important as this progress has been, many more changes are still needed, and we must be deliberate about how to achieve them. It is notable that the conditions that allowed for this rapid change to occur overlap substantially with the conditions created by value-based payment models. In fact, in many ways, these models are specifically designed to create these dynamics.

Alignment Is Inherent

In addition to the urgency, part of what made the Covid-19 crisis such fertile ground for innovation was the shared mission. One of the issues with the legacy fee-for-service model is that it fails to align stakeholders. Fee-for-service providers are reimbursed based on the volume of care they provide.

Providers benefit by increasing volume and, as a consequence, payers (whether employers, health plans, or the government) lose. Despite the best of intentions, this design inadvertently thwarts innovations that decrease waste by impacting volume. In contrast, providers in value-based care arrangements share risk with payers, and both benefit when high-quality care can be provided for a lower cost.

Flexibility to Innovate

Value-based payment models provide stability and predictability in income, offering providers far more flexibility than the traditional fee-for-service models. Because providers in value-based payment environments are not constrained by the need to maximize the volume of care, they have the freedom to experiment with novel ways to reduce costs and improve outcomes. For the most part, providers can choose how to do this, which encourages creativity and allows for a "test and learn" mentality that is necessary for innovation. The money saved can increase take-home compensation and can also be invested into the practice in ways that can further increase efficiency, creating a virtuous cycle that further fuels innovation

Collaboration Is Necessary

Participants in value-based payment relationships must collaborate to be successful. For example, payers can help providers identify which patients have social challenges like food insecurity and loneliness and connect them with resources that help close these gaps. In this elegant arrangement, both payer and provider benefit when patient outcomes improve.

Population Health Lens

To enable true transformation of our health care system, we must shift to thinking about whole-person health on a population level. By design, this thinking is required in value-based payment relationships where providers are financially responsible for the health of their entire panel, or "population," of patients. As such, providers must think about how to engage patients who are coming for care, and also those who may not be. Because social determinants like food insecurity have such an impact on health outcomes, providers are more attuned to the "whole patient" in these models.

Specific Recommendations

Motivate

We must accelerate our efforts to reduce costs while improving care, and value-based payment models are best positioned to do this. Models that provide predictable payment may be particularly appealing to providers struggling in the current environment. There is both urgency and opportunity right now, and it is critical that we seize this opportunity and act quickly to prioritize policies that encourage and enable value-based care relationships.

Modify

As we have seen with telehealth policy, tactics that increase flexibility can rapidly accelerate positive change. Now is the time to consider which changes (e.g., telehealth waivers, state licensing modifications, etc.) should become permanent and to think proactively about adding new flexibilities that might drive change, particularly in areas like social determinants of health and behavioral health where there are immediate, pressing needs. Other high-priority policy areas include figuring out how to reimburse for remote monitoring, considering the idea of adding social risk scores to risk adjustment methodologies for payment and quality measurement purposes, allowing STARS performance measures to be attained virtually, and removing outdated anticompetitive barriers like state certificate-of-need laws.

Measure

The trends that emerge from this crisis will define health care for many years, and our ability to anticipate and shape these trends is essential. To do that effectively, we need to be avidly collecting, analyzing, and sharing data now. For instance, by measuring the shifts in utilization during this crisis (e.g., telehealth utilization by patient demographics and provider type), we can better understand the impact of type and site of care more generally. Correlating utilization with health outcomes is also critical; for instance, many providers were reluctant to adopt telehealth before the crisis because of fear of decreased quality of care, and understanding telehealth-related outcomes can help address this.

The Covid-19 crisis has caused morbidity, mortality, and worldwide economic and social disruption that will impact us for generations. Even before this, with costs soaring, waste rampant, and

the increasing prevalence of chronic conditions, the health care industry was in dire need of transformation. Pre-crisis, the animosity and sense of futility amongst stakeholders in the health care system created real barriers to change. The urgency of the current crisis has mobilized the United States to align and cooperate in new and flexible ways that leverage public health principles. The collaboration and ingenuity we have seen during this crisis should give us hope that we can make progress on issues that have seemed intractable, and transitioning to value-based payment models will help to create the conditions and alignment we will need to act.

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Disclosures: Kristin Russell is employed by Humana. Jaewon Ryu is employed by Geisinger. William Shrank is employed by Humana and is a board member for GetWellNetwork.

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Rapid Implementation of an Outpatient Covid-19 Monitoring Program

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As the Covid-19 pandemic accelerated in the US, Northwestern Medicine recognized a need to support the numerous patients who would care for themselves at home. We wanted to assess patients daily, provide advice, and facilitate additional care for those with concerning, worsening, or severe symptoms.

We developed a monitoring program that delivers a daily electronic symptom and coping questionnaire, uses text message reminders, and relies on telephone-based care. Within 10 days, we organized 193 nurses, 70 advanced practice professionals, 152 medical students, and 115 physician attendings to care for about 1000 patients per day using an electronic health record registry. As of May 21, 6,853 individuals had been through the monitoring program. We have averaged sending nine patients per day to emergency departments. Challenges include standardizing workflows, reaching patients, and balancing workforce with patient volume. In the accelerating pandemic, proactive monitoring of Covid-19 patients has helped our health system, employees, and patients. Future directions include developing sustainability and better integration with primary care.

Most patients with Covid-19 have a benign course, do not require hospital level care, and can self-isolate and treat themselves at home.[1,2] Patients with a severe course generally worsen after many days of home-managed mild to moderate illness.[3] Early in the pandemic, a high proportion of patients with presumed Covid-19 could not or did not require testing.[4] Many institutions recognized the need to develop processes and capacity to accommodate the anticipated surge of emergency department (ED), inpatient, and intensive care unit patients. At Northwestern Medicine – an integrated academic health system with 10 hospitals and over 200 sites throughout Chicagoland – we also recognized a need for an initiative to implement systematic monitoring and support of patients at home.

We developed and implemented a dynamic registry of adult ambulatory patients with pending or positive SARS-CoV-2 testing or presumed Covid-19 based on clinical criteria. Our goals were to: provide patients with home-based monitoring, clinical care, and support; off-load burden from primary care practices; develop a platform that could support outpatient observational or interventional research

Development and Initial Implementation

Covid-19 was first reported by the Illinois State Department of Public Health on January 24 in a person who had traveled from China, and then in her husband.[5] This discovery was followed by several isolated travel-related or family-linked cases in February. Between March 8 and March 10, a series of cases was identified without clear linkage to travel, signaling the arrival of the pandemic in Illinois.[6]

> *We also engaged faculty from the Department of Medical Social Sciences who have expertise in symptom assessment and patient-reported outcomes and quickly developed a short, easily understandable questionnaire that captured the main domains of patients' symptoms and experience with Covid-19 at the time."*

We first discussed an intensive patient outreach and follow-up program on March 17, and the work of several groups quickly came together. We obtained the support of our chief quality officer, chief medical officers, Northwestern Medical Group president, and vice dean for education. Information technology staff began building a registry and questionnaire based on our Epic electronic health record. We also engaged faculty from the Department of Medical Social Sciences who have expertise in symptom assessment and patient-reported outcomes and quickly developed a short, easily understandable questionnaire that captured the main domains of patients' symptoms and experience with Covid-19 at the time.[7,8] (Note: Though the Covid-19 symptom picture has evolved over time, we elected to keep our questionnaire consistent for data consistency and ease of use.)

Initially, educational faculty put us in touch with about 60 fourth-year medical students whose clerkships were on hold and who were eager to contribute. Other fourth-year students finishing clerkships and third year students subsequently joined the program. To supervise the medical students, we recruited primary care physicians, specialists, and other physicians who were quarantining after Covid-19 exposure, could not do face-to-face work based on personal risk, or were recently retired.

We went live on March 24. On March 27, we engaged furloughed nurses and advanced practice professionals (APPs -- physician assistants and nurse practitioners).

TABLE 1.

Variable	Total (N = 6006)*
Age, mean (SD)	**47 (17)**
Age, n (%)	
0 – 18	130 (2)
19 – 29	905 (15)
30 – 39	1175 (20)
40 – 49	1206 (20)
50 – 59	1196 (20)
60 – 69	867 (14)
70 – 79	386 (6)
80 – 89	114 (2)
90 +	27 (0.5)
Female, n (%)	3554 (59)
Race, n (%)	
Asian	231 (4)
Black	989 (17)
White	3662 (61)
Other/Unknown	1124 (19)
Ethnicity, n (%)	
Hispanic	1700 (28)
Non-Hispanic	4027 (67)
Unknown/Missing	279 (5)

* N is 6006 based on the patients who completed at least one survey. Source: Northwestern Medicine and the authors.

Patients and Questionnaire

To limit the number of patients in the registry and to ensure consistent adherence to the entry criteria, our clinical criteria and processes were intentionally specific. Patients were included in the registry if they had a pending Covid-19 test, a positive or indeterminate Covid-19 test, or presumed presence of Covid-19 based on clinical criteria. The clinical criteria included fever > 100.4°F (38.0°C), a new respiratory symptom or diarrhea, lack of an alternate diagnosis, and a high-risk feature (age ≥ 65 years old or a chronic medical condition). We excluded inpatients. Only nurses from our Covid-19 triage phone line, ED staff, and hospital medicine staff were able to add patients to the registry. (Table 1)

At 6 a.m. each day, enrolled patients with an EHR portal account receive a questionnaire invitation. The initial questionnaire asks about the date symptoms began, the presence or absence of 10 symptoms, information about the household, and an alternate contact person. On the initial questionnaire and each day subsequently, patients are asked to evaluate 10 symptoms rated on a zero to 4 scale (from "not at all" to "very much") how they feel the infection is affecting them, how many analgesic/antipyretic tablets they are taking, and a measured temperature **(Figure 1).**

FIGURE 1

Daily Outpatient COVID-19 Monitoring Questionnaire

Below is a list of statements that other people with your illness have said are important. Please circle or mark one number per line to indicate your response as it applies to the past 24 hours.

	Not at all 0	A little bit 1	Some what 2	Quite a bit 3	Very much 4
I have been coughing					
I have been short of breath					
I have a sore throat					
I have muscle aches					
I have trouble sleeping at night					
I have a lack of energy					
I feel ill					
I have had fevers					
I have diarrhea					
I have pain in my stomach area					
I feel overwhelmed by my condition					
I worry that the infection will get worse					
I worry about spreading my infection					

How many pain or fever-reducing pills (like Tylenol or Ibuprofen) have you taken in the last 24 hours: [enter whole number]

What is the highest your temperature has been in the past 24 hours? [enter temperature]

Since you have been monitored, has anyone else in your household developed fever AND a new respiratory symptom?: Y/N

Source: Northwestern Medicine and the authors
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We use responses from the daily symptom questionnaire to stratify patients into those with mild symptoms (0, 1, or 2 responses to most questions) and those with concerning symptoms (mostly 3 and 4 responses to some questions). Nurses, APPs, and medical students call patients who report concerning symptoms, those who do not fill out the questionnaire because they are not enrolled in the patient portal, and those who have not responded by about 11 a.m.

Our initial plan was to follow patients until a) they had symptoms for seven days and minimal symptoms for three days (indicating that their overall illness would likely be mild), b) they were hospitalized, or c) we could not reach them for seven days. We found that the seven-day monitoring was unnecessary for patients who had mild symptoms, and also that if we couldn't reach patients after three days, they were effectively unreachable. Subsequently we revised our "graduation criteria" to include patients who had minimal symptoms for three days or could not be reached for three days, to reduce the time spent chasing after patients who could not be reached or monitoring those who were not severely ill enough to benefit from our intervention.

Patient Assessment and Assistance

During the calls, medical students, nurses, and APPs evaluate patients for the presence of severe symptoms, answer questions, provide information, determine whether contacting other clinicians might be helpful (e.g., a primary care physician or specialist), reinforce the need for self-isolation, and identify non-clinical issues that might be routed to a social worker. Primary care and specialty attending physicians answer questions from the students and nurses and evaluate more complicated patients. Patients with severe symptoms – shortness of breath, confusion, signs of hypoxia, or persistent chest pain or pressure – are referred to the ED. If they need emergent transport, we call 911.

Workforce

The program operates from 8 a.m. to 8 p.m. seven days a week. An average of 90 different nurses, APPs, and medical students work four-, eight-, or 12-hour shifts for an average of roughly 500 staffed person-hours per day. Three attending physicians, working four-hour shifts, provide clinical supervision, for a total of nine attendings per day. Each team member receives training before their first shift, which includes orienting to the program and its goals, setting up EHR tools, and modeling the telephone call workflow. Nurses and APPs, whose usual clinic sites are closed or have reduced staffing because of the pandemic, are paid their usual hourly rate.

By April 3rd, we had three leads supervising and coordinating the work. To communicate, we grouped the calls based on the first letter of patients' last names and used Microsoft Teams to coordinate during the day. The medical students initially communicated with each other and their attending physicians using email or Zoom, but gradually transitioned to Microsoft Teams (the preferred health system communication platform) as well.

Metrics

We went live mid-day on March 24 with 50 patients. Within 8 days, we were following roughly 1000 people per day **(Figure 2)** and, as of May 21 we had reached 6,853 unique individuals.

FIGURE 2

Patients in the Northwestern Outpatient COVID-19 Monitoring Program over Time
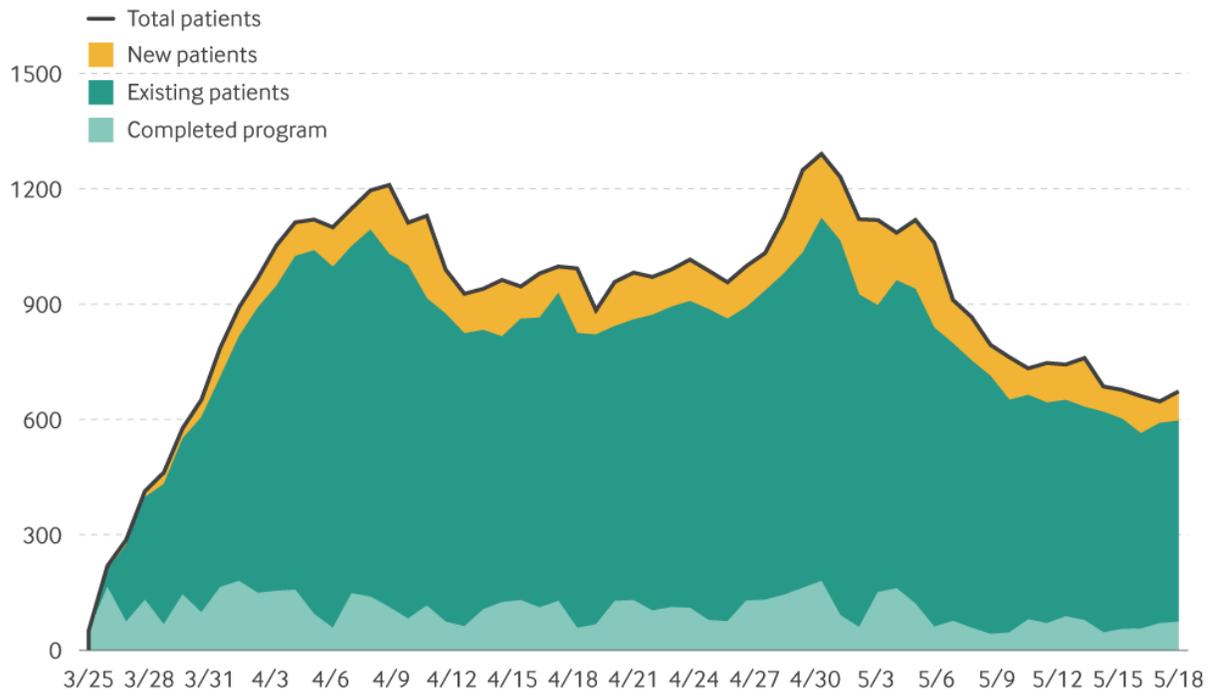
Source: Northwestern Medicine and the authors
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Other observations about the program (**Figure 3**;**Figure 4**):

FIGURE 3

Daily Symptom Score
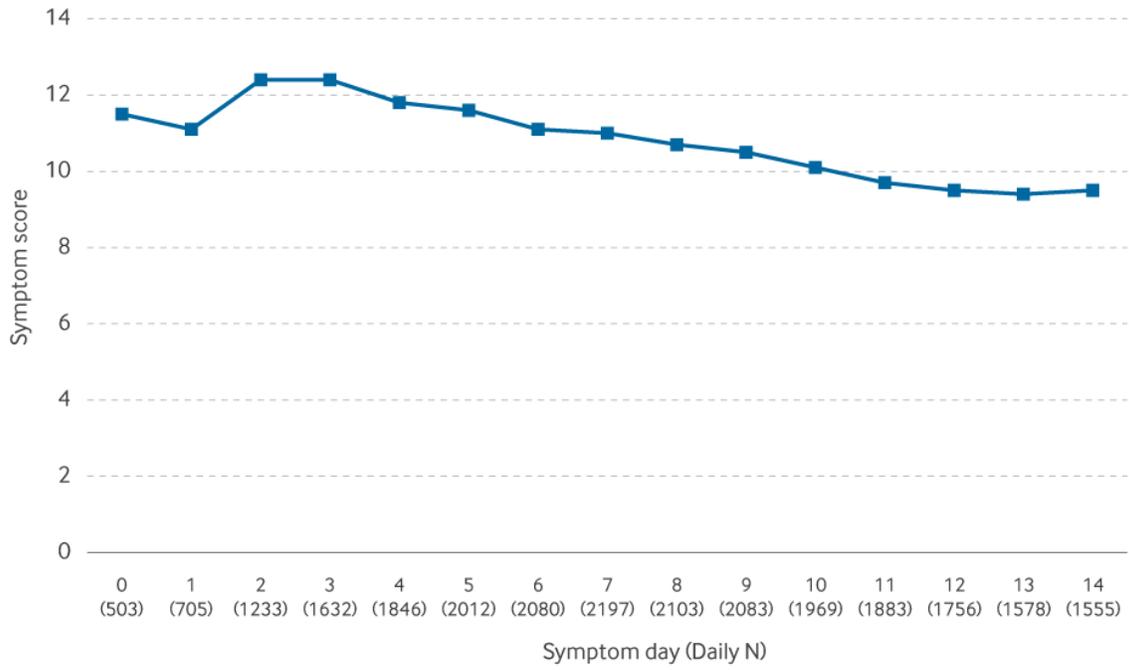
Source: Northwestern Medicine and the authors

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FIGURE 4

Daily Emergency Department Referrals
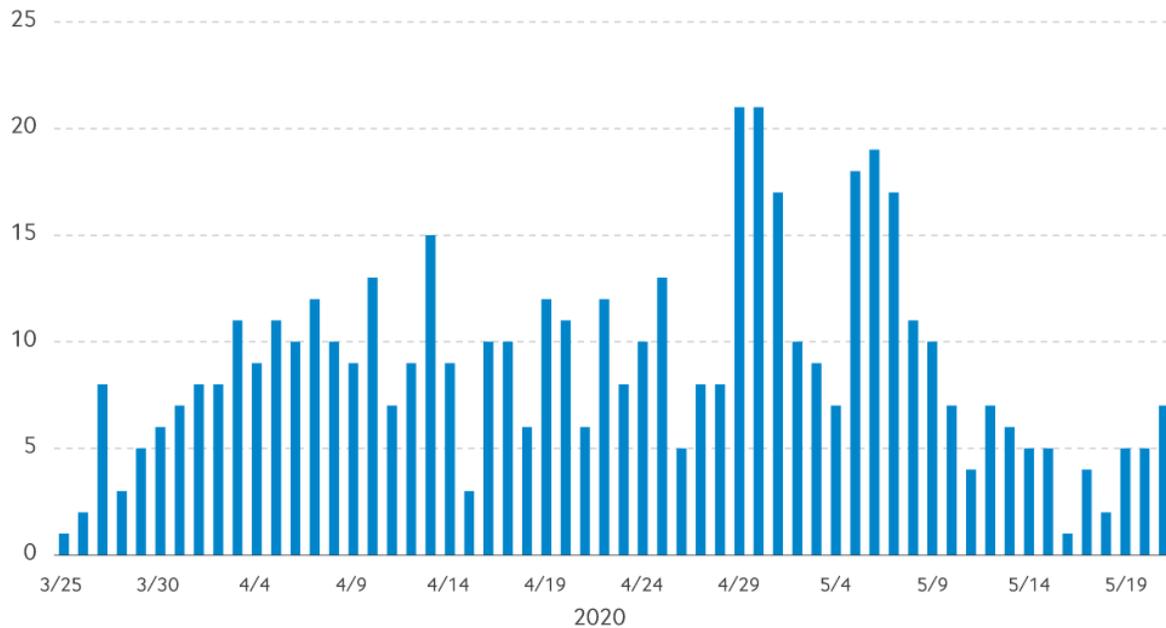
Source: Northwestern Medicine and the authors
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- Employees from our health system make up about 20% of those monitored.

- Average symptoms were mild, about 12 on a scale of 0 to 52, and, for individual patients, decreased over time.

- Of those who filled out a questionnaire, on any given day, about 20% reported concerning symptoms.

- An average of 9 patients per day went to the ED (SD, 5; range, 1 to 21).

After April 11, when we instituted stricter "graduation" criteria to remove patients who had had minimal symptoms or whom we were unable to contact for 3 days, we began to see a decrease in the number of patients in the program. On May 1, we made changes our inclusion logic, including patients with a "Covid-19 infection flag," associated with an outside positive test, which led to a temporary increase in patient volume. On May 6, as our institutional testing criteria expanded and our testing volume increased, we began only including patients who had a positive Covid-19 test.

Challenges

There have been many challenges to implementing this program. They include:

Variable patient engagement. Although we encourage all patients to sign up for the patient portal, about one-third do not. Despite EHR portal messages, texting, and phone calls, about 20% of patients do not fill out the questionnaire each day. Patients with minimal symptoms sometimes express annoyance at being contacted. Some patients expressed frustration at the lack of testing availability. However, more patients each day express gratitude that the students and nurses are following up, providing reassurance and helping them address loneliness. Patients often want to stay on the monitoring program even after they have met our stopping criteria, and we ease them out as gently as we can, so as to keep adequate capacity for incoming patients.

Balancing the available workforce with the clinical need. We quickly expanded the program from 5 medical students per shift to about 50 nurses, APPs, and medical students per shift. Nurses, who are used to operating under protocols, become very efficient once they understand the program guidelines. However, they often seek reassurance that they are applying rules properly. Medical students tend to seek support and reassurance for clinical decision-making. The medical students, nurses, and APPs have been supportive of one another and are happy to be contributing to the Covid-19 response, especially those who cannot contribute "on the front lines." Participating in the program has been an important learning opportunity for them as we learn how to best advise patients on managing Covid-19 at home. Medical students can get educational credit for their participation as part of a "virtual clerkship" in Emergency Medicine or Primary Care, which helps fulfill graduation requirements.

Lack of timely data. Technical challenges have included use of a registry that does not update in real time and takes about an hour to refresh completely. This delay requires staff to look in individual patients' charts to see if someone else is actively working on that chart. At one point, changes in the registry (e.g., questionnaire completion, call status) were queuing up faster than our system could process them. We improved performance by spacing out registry updates from every five minutes to every ten minutes, asking all users to promptly close their encounters, and doubling processing power. In addition, after about a week, we realized we had not published two fields in the daily questionnaire ("fever" and "feeling ill") and we missed collecting those data on some patients, though this gap has not caused any issues with subsequent analysis.

Next Steps and Conclusions

From a financial perspective, we are internally funding the monitoring program and not billing patients or payers. We will need to determine at some point whether the financial cost has been worth the clinical value to our patients, though the calculation is extremely complex due to the unique circumstances of the coronavirus pandemic.

> *Anecdotally, we are helping patients live more comfortably at home, providing them with education, reassurance, and comfort."*

Anecdotally, we are helping patients live more comfortably at home, providing them with education, reassurance, and comfort. We also helped patients who needed to have 911 activated, including one who was triaged to the ED and immediately put on a ventilator. Although the program seems to be the right service to provide – connecting sick patients at home with care – we have not been able to conduct a robust-learning health system effectiveness evaluation.[9,10]

We plan to layer observational and interventional research projects on the Ambulatory Monitoring Program, including studies of predictors of a severe course, home monitoring technology, treatments for Covid-19, and identification of patients who can participate in longer-term research or donation of convalescent plasma. Even after the Covid-19 pandemic eases, the outpatient home monitoring program may provide a prototype for efficient management of other acute problems or other problems where clinical deterioration is possible. Future versions should benefit from patient engagement tools, automation, artificial intelligence, and better integration with primary care.

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Creating Wellness in a Pandemic: A Practical Framework for Health Systems Responding to Covid-19

Bryant Adibe, MD, Kathryn Perticone, APN, MSW, Charles Hebert, MD

The emergence of the novel coronavirus SARS-CoV-2 and resulting global pandemic have significantly taxed the capabilities of healthcare systems around the globe. The long-term psychological impact of the Covid-19 pandemic on front line health care workers has yet to be fully understood. Attention to staff mental health and well-being is a critical aspect of crisis management. However, health systems lack a practical model for providing mental health support to front-line staff engaged with the pandemic. We describe a simple, easy to follow framework developed at Rush University Medical Center in Chicago, Illinois as an interdisciplinary, proactive effort that promotes staff well-being during Covid-19 and with generalizability to other similar healthcare crises.

The Challenge: Covid-19 Psychological Impact on Health Care Workers

Rush University System for Health is an academic health system in Chicago, Illinois, comprising Rush University Medical Center, Rush University, Rush Copley Medical Center, and Rush Oak Park Hospital, as well as numerous outpatient care facilities. As a leader in the Illinois Covid-19 response, the system has treated many critically ill patients. At one point in the pandemic, RUMC cared for 20% to 25% of all ventilated Covid-19 patients in the state.

> " *The psychological impact of the Covid-19 pandemic on frontline health care workers has yet to be fully understood.*"

The psychological impact of the Covid-19 pandemic on frontline health care workers has yet to be fully understood. As the national conversation moves to discussions of reopening and a return to a new normal, the importance of mental health and well-being is more relevant now than ever. Existing disaster models predict an impending period of disillusionment in our future, characterized by high stress, physical exhaustion, burnout and substance misuse as the adrenaline, camaraderie, and broad community support of the past few months begin to fade.[1]

Infectious disease outbreaks pose unique challenges to health care workers compared with other disasters, arising both from the nature of the disease and from the need to protect themselves from infection with measures such as quarantine and the use of personal protective equipment.[2] Undesirable effects on psychological well-being among frontline health care workers have already been documented, including increased risk of depression, anxiety, substance misuse, and sleep disturbances.[3,4]

We sought to preempt these issues by thoughtfully designing a proactive organizational approach to supporting the mental health and well-being of our frontline staff.[5] The institution's comprehensive plan for staff wellness first took into account concerns for the attainment of basic physiologic needs and the promotion of physical and emotional safety; as well as the basic needs of their immediate families.[6,7] Institution-wide measures to address these issues included the creation of additional on-site childcare, transportation assistance, and alternative lodging.

The Goal: Creating Wellness in a Pandemic

Early in our evolving response to the Covid-19 pandemic, the Office of the Chief Wellness Officer commissioned a special Wellness Task Force devoted to coordinating the institution's efforts, as part of an overarching command center structure. Representation on the Wellness Task Force included the Office of the Chief Wellness Officer, chaplains, social work, nursing (psychiatric nurse liaisons), psychiatry and behavioral sciences.

The task force used its collective expertise to develop four key mitigation strategies, described in detail below, to reinforce staff wellness throughout the crisis: Wellness Rounds, a Wellness Consult Service, an advanced mental health intervention program known as Wellness Plus, and a central Wellness Resource Hub with Wellness Rooms on frontline floors.

The task force also created an interdisciplinary Wellness Response Team to serve as the primary workforce supporting the Covid-19 staff well-being efforts. Volunteers were recruited from redeployed staff representing each of the task force departments, many of whom were available as a result of lower overall non-Covid-19 hospital census, yielding some 20-30 individuals with consistent availability. If the needs of the hospital extended beyond the capabilities of the group, as would be the case if additional ICU units needed to be opened, up to 15 additional providers were available.

Two operational leads were designated to develop consistent staffing ratios and schedules, as well as to ensure quality control for the training and on-boarding of new Wellness Response Team members. Each team member was given a resource tool kit that included an algorithm for the

triage and assessment of employees in need, an escalation pathway for rare but serious scenarios, such as an employee at risk of self-harm; as well as a list of all institutional wellness resources available for staff use. To ensure ease of communication among the group and to provide rapid responses to emerging issues, all Wellness Response Team members were given access to the Cisco Webex Teams platform. This portal functioned as the primary tool for quick group discussions, notifications, follow-up of urgent cases, and the sharing of resources and best practices.

Implementation

The initiatives outlined below were created to promote mental health and well-being for staff during the Covid-19 pandemic.

Wellness Rounds

While supportive rounding is not a new concept, distinguishing features of our approach include its formal structure, consistency, interdisciplinary composition, and empowerment of the participating group to address urgent issues through a real-time feedback loop with the highest levels of organizational leadership. These characteristics create a dynamic and agile framework for organizational decision-making.

Members of the Wellness Response Team were divided into unit-specific teams targeting areas of the medical center with the heaviest Covid-19 clinical burden. Five standing teams were created, with an additional "flex" team that covered general medical (non-Covid-19) floors and a night team that covered all floors three times a week, from 10pm to midnight.

Each team has a physician leader, a psychologist, a nurse (often a psychiatric nurse liaison), a chaplain, and a licensed clinical social worker. Each team rounds on the same locations at the same time every day, to create familiarity and a sense of rapport with the clinical teams. Wellness Response Team members were preferentially assigned to floors where they have established relationships, promoting rapid assimilation into the units.

Because mornings are busy for clinical staff on patient units, the wellness rounds take place in the afternoon. Each day the Wellness Response Team huddles at 2:30 pm for a regular briefing, and the rounds begin at 3 pm. These briefings include updates from the Chief Wellness Officer regarding the latest developments from our Covid-19 command center and the latest talking points on emerging issues. Team members also share their key findings from rounds the day before.

Wellness Consult Service

We established a consult service **(Figure 1)** where any clinical unit or individual can connect directly with a member of the Wellness Response Team for evaluation, triage, and recommendations to improve mental health and well-being. Clinicians are familiar with the "consult" model, and this approach helps us normalize the concept of wellness by incorporating it more formally into the clinical environment. Group sessions are made available for entire units,

departments, or clinical teams in need. All individual consults are anonymous and are not added to a staff member's medical record.

FIGURE 1

Wellness Consult Service Triage Algorithm.
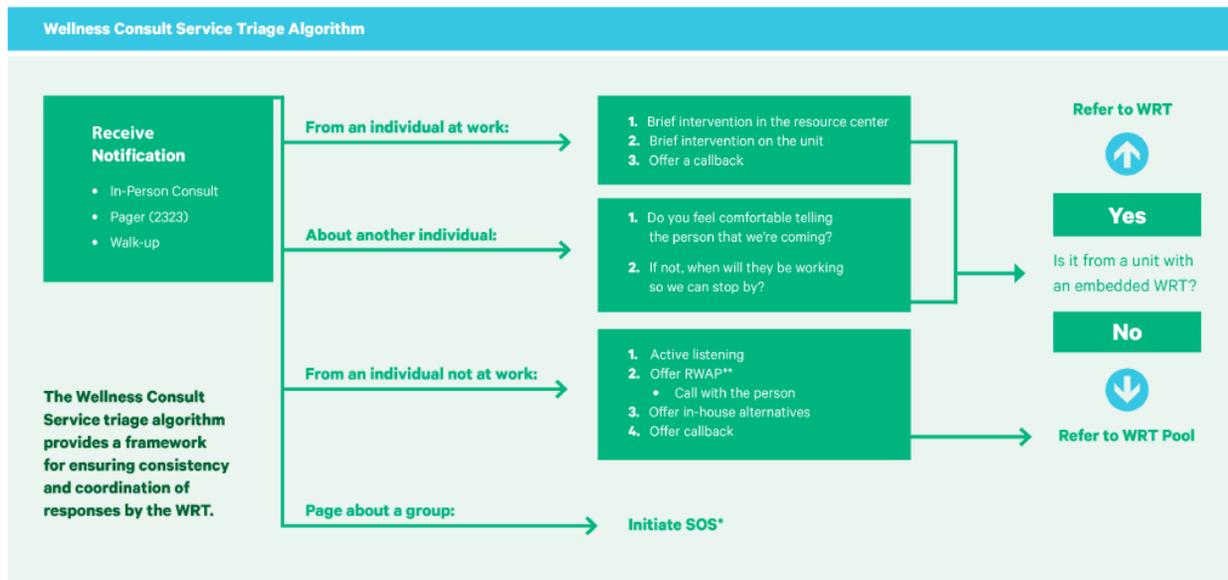
Source: Adibe, Bryant. "Creating Wellness In a Pandemic: A Practical Guide for Health Systems Responding to Covid-19." NEJM Catalyst (catalyst.nejm.org) © Massachusetts Medical Society

Wellness Plus

We created an immediate, targeted response to individual employees in a mental health crisis. Through a pre-determined escalation algorithm **(Figure 2),** any member of the Wellness Response Team can trigger the Wellness Plus pathway. When triggered, the individual is escorted to one of the unit-level Wellness Rooms or the central Wellness Resource Hub (see below) where an experienced clinician (typically a physician or other prescriber) completes a thorough mental health assessment, including identifying an immediate therapeutic intervention and appropriate follow-up.

FIGURE 2

Escalation Pathway Algorithm

Source: Adibe, Bryant. "Creating Wellness In a Pandemic: A Practical Guide for Health Systems Responding to Covid-19." NEJM Catalyst (catalyst.nejm.org) © Massachusetts Medical Society

Wellness Resource Hub / Wellness Rooms

We established a centrally-located Wellness Resource Hub, managed by psychologists and licensed clinical social workers, where any staff member can receive confidential, on-site counseling support, escape busy clinical areas, process their emotions, and relax. To facilitate respite, on entering the hub staff are greeted by calming music, a 12-foot projection of nature scenes, and available lounge chairs evenly spaced 6-feet apart. For frontline staff unable to leave the unit, a network of five Wellness Rooms were launched throughout the medical center, with a special focus on high-volume Covid-19 intensive care units. These rooms include healthy snacks, resources for self-care and written prompts on the walls to encourage reflection. Although social workers were not assigned to individual Wellness Rooms, we encouraged regular use of the Wellness Resource Hub for staff with more personalized needs.

Hurdles

We faced several hurdles in implementing this initiative.

- **Stigma attached to mental health services.** The Wellness Response Team was heavily weighted with mental health professionals, and some staff were reluctant to interact with them initially because they were concerned for their privacy and thought the team's function was to identify mental illness. To address this, we made sure that teams included a mix of disciplines--chaplains, nurses, and social workers--and that their on-boarding emphasized a consistent message of wellness. If an employee specifically requested a mental health evaluation, or was demonstrating poor coping strategies that interfered with patient care duties, team members were encouraged to default to their professional judgement. In these cases, the framework of the Wellness Response Team provided rapid linkage to a mental health practitioner for prompt assessment via the Wellness Plus pathway.

- **Integrating the Wellness Response Team into the daily routine.** In the initial phases of rolling out this program, Wellness Response Team members were often met with skepticism and, at times, even confusion. Clinical teams were often busy, did not want to be interrupted, or were otherwise reluctant to talk. This was overcome through an emphasis on consistency; each unit had a designated team that rounded at the same time each day. The teams were encouraged to engage only when clinicians were available and interested. As the initiative continued, Wellness Response Team members became identified experts in resources for employee well-being, as well as a low barrier access point to receive support. Over time, the teams experienced an increase in staff appreciation as well as anticipation of their visits.

- **Measuring impact.** We faced a dilemma regarding how to effectively measure impact of the initiative because we did not want to overburden clinicians with a new assessment or survey while they were grappling with the stress of an evolving disaster. In place of an initial assessment, we adapted an emotional well-being screening tool, originally developed for the identification of acute and chronic stress disorders, including PTSD, in our military veteran population, for use in front line healthcare workers. As of this writing, the tool is under IRB review; once complete we plan to disseminate it broadly throughout our community, with a particular focus on clinical units with the heaviest Covid-19 case load. The assessment will provide valuable information regarding our organization's current state, and we also hope to perform a comparative analysis against a comparable outside institution with no such wellness infrastructure in place. Further, the screening tool includes an assessment of burnout prevalence, which we can compare against existing internal data.

Lessons Learned

Across the board, the initiatives have been incredibly well-received since their launch. Increasingly, we found staff to be more at ease contributing concerns, thoughts, and feelings that they faced when interacting with Covid-19 patients. Over time, staff have moved from the "I'm fine" position to being more forthright about their distress and anxieties. Centrally recurring themes include the following: *(1) moral distress around patient deaths, resource allocation, and absolute scarcity, (2)*

personal safety, (3) economic insecurity, (4) social and family life disruption, (5) stigmatization of health care workers, and (6) sense of powerlessness.

> " *Over time, staff have moved from the "I'm fine" position to being more forthright about their distress and anxieties."*

Calls to the Wellness Consult Service and escalations to Wellness Plus varied in scope, but steadily increased over time. These ranged from practitioners whose levels of anxiety made them apprehensive about providing needed care to Covid-19 patients, to requests from managers elevating concerns about employee well-being. Over a four-week period utilization of the Wellness Resource Hub increased from 5-10 people per day to 30 or more per day with a total to date of more than 400 people. The majority of visitors are daytime employees encompassing a wide range of departments and functions in the hospital. As the number of visitors increased, we established back-up staffing from Wellness Response Team members for additional immediate support in the Wellness Resource Hub. Unit-level Wellness Room use was not tracked, but anecdotal evidence suggests a similar trend of increasing use over time.

In order for an initiative like this to work, having a senior-level executive champion is critical. In our hospital system, senior-level leadership was provided by the Chief Wellness Officer. However, this need not be the case, and institutions may appoint a different executive leader for such efforts, particularly one who does not have competing responsibilities within the overall pandemic response and has the ability to oversee an interdisciplinary team and convey emerging concerns to appropriate channels among hospital decision-makers. We believe that without clear leadership, the initiative will breakdown over time; we found that the daily huddles with the Chief Wellness Officer re-energized the team and helped it focus on its mission.

Future Considerations

Covid-19 has presented unique challenges to health systems across the globe. The impact of this pandemic on the psychological well-being of frontline health care workers is expected to be widespread. As we continue to reflect on our experiences thus far and understand more about this evolving situation and its broad impacts, we are progressing to the next phase of our institutional wellness response.

While Wellness Rounds have taken place in one form or another throughout our health system since their inception at RUMC, the comprehensive framework detailed here will be implemented more formally at each site going forward, including the identification of an executive sponsor to ensure local support. As Rush looks to resume normal clinical operations, we plan to continue this infrastructure for the next 6-12 months, albeit with a less frequent rounding schedule (likely 2-3 times per week), as redeployed staff return to their original roles. Most importantly, we will allow the data obtained from the emotional well-being screening tool to inform our next phase of targeted interventions.

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ARTICLE

Covid-19 X-Curves: Illness Hidden, Illness Deferred

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NYC Health + Hospitals has played a crucial role in New York City's response to Covid-19. In this work, we investigated the striking *X-curve* of ICU utilization: a surge in Covid-19 patients accompanied with dramatic drop in non-Covid-19 patients. We found there was an 88% drop in non–Covid-19 ICU volume within the period from February 15 to April 15, 2020. The changing distribution of ICU patients' diagnoses across the study period raises the specter of *illness hidden* and *illness deferred*. Illness hidden could represent patients who would have otherwise been hospitalized for another condition being hospitalized for Covid-19 instead of, or in addition to, that condition. Illness deferred could represent patients experiencing symptoms of serious conditions choosing not to seek care, perhaps due to stay-at-home orders or fear related to contagion.

As an $8 billion public health care system with 11 acute-care hospitals and five post-acute care facilities, New York City Health + Hospitals (H+H) has played a vital role in responding to the city's Covid-19 outbreak, particularly for low-income New Yorkers. On April 15, H+H had 2,559 Covid-19 patients in its hospitals as well as other sites, including 712 patients in intensive care. Leading up to that date, while the intensive care units (ICUs) surged with Covid-19 patients, the number of non–Covid-19 patients dropped precipitously, resulting in a striking *X-curve* of utilization (Figure 1).

FIGURE 1

ICU Census for Covid-19 and non–Covid-19 Patients, February 15 to April 15, 2020

This X-curve representation shows the decrease in non–Covid-19 ICU patients was concurrent with the rise in Covid-19 ICU patients at New York City Health + Hospitals from February 15 to April 15, 2020, by latest Covid-19 Status. The shift began in March 2020 and the gap continued into April.
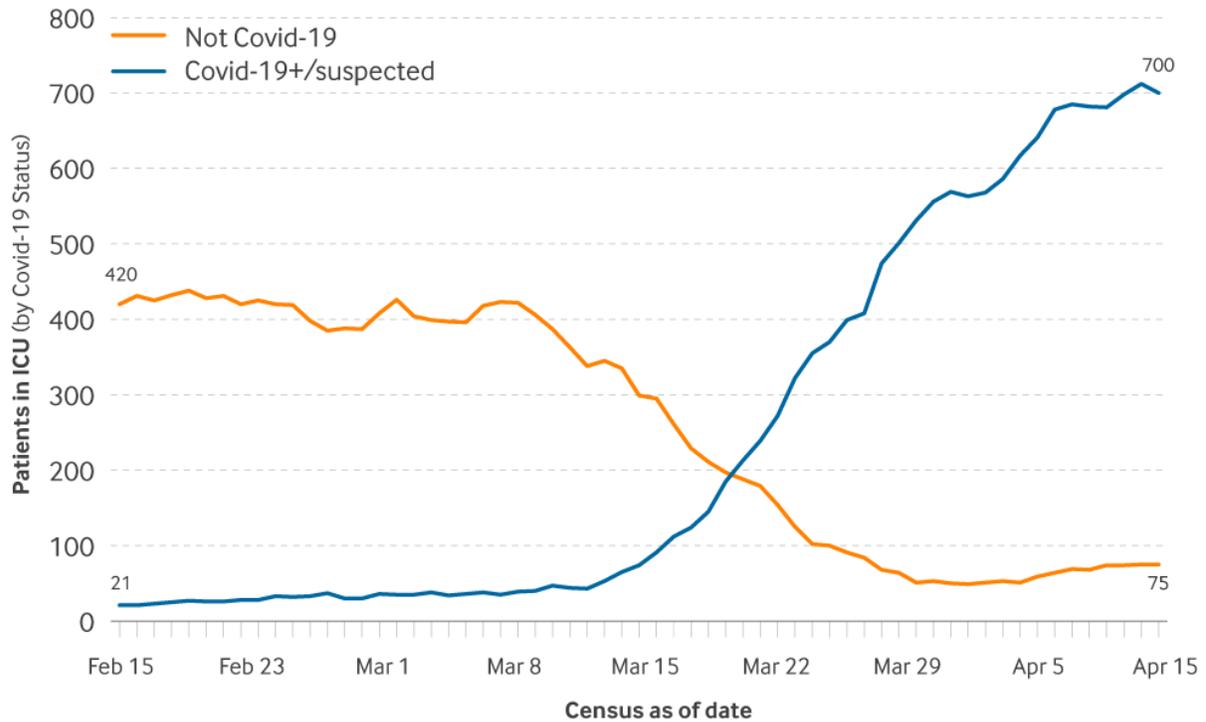
Note: Counts in the blue line from February and early March reflect patients who were in the ICU on those dates and were later found to be Covid-19 positive/suspected.

Source: The authors

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We examined daily patient census in adult and surge-specific ICUs (ad hoc spaces created to expand critical care capability as traditional ICUs reached maximum capacity) across our facilities and departments by Covid-19 status from February 15 to April 15, 2020. Patients were categorized as *confirmed* (positive Covid-19 PCR result or infection status), *suspected* (Covid-19 or pneumonia ICD-10 diagnosis upon hospital admission or in their problem list, or pending Covid-19 PCR result), or *negative* (no evidence of Covid-19 infection via diagnosis, Covid-19 PCR result, or pending test). We also tracked grouped, co-occurring non–Covid-19 diagnoses over time.[1] Data from Epic Clarity was analyzed using SQL Server Management Studio and visualized with Tableau 2019.4. ICU departments were identified based on a department grouper created and maintained specifically to keep track of departments undergoing shifts to incorporate additional ICU beds during the Covid-19 surge.

At the start of the analyzed period, adult and surge ICU departments were caring for 420 negative or untested patients and 21 patients whose subsequent Covid-19 tests were positive. Within two months, these same departments served a total of 775 patients, the vast majority of them Covid-19–positive. Covid-19 patient volume began to grow in mid-March, cresting at 712 patients in mid-April. Some Covid-19 patients who would have otherwise been in an ICU did receive intensive care on hospital wards, making this a conservative estimate of Covid-19 patients with critical illness. Contemporaneously, Covid-19–negative ICU volume began to decline on March 9, reaching a low of 49 patients on April 4, a census decrease of 88%.

What was happening to these "missing" non–Covid-19 patients?

To elucidate, we visualized the changing distribution of ICU patients' diagnoses across the study period (Figure 2a, Figure 2b, Figure 2c).

Changes in Diagnosis Groups of ICU Patients, February 15 to April 15, 2020

These charts depict changes in diagnosis groups of patients in Intensive Care Units at NYC H+H from February 15 to April 15, 2020. Respiratory diagnoses increased markedly, and diabetes and kidney-related diagnoses also increased. Several other diagnosis groups, such as heart failure and stroke, declined in volume.

Circulatory System

Essential hypertension
Stroke
Heart failure
Cardiac dysrhythmias
Myocardial Infarction/Coronary Artery Disease
Cardiac arrest and ventricular fibrillation

Endocrine, Nutritional and Metabolic

Fluid and electrolyte and other metabolic disorders
Diabetes
Malnutrition
Disorders of lipid metabolism
Thyroid disorders
Obesity

Genitourinary System

Acute and unspecified renal failure
Chronic kidney disease
Urinary tract infections

Source: The authors

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Changes in Diagnosis Groups of ICU Patients, February 15 to April 15, 2020

Respiratory System

Legend:
- Respiratory failure; insufficiency; arrest
- Pneumonia and other lower respiratory disease
- Chronic obstructive pulmonary disease and bronchiectasis
- Respiratory signs and symptoms
- Pleurisy, pleural effusion and pulmonary collapse
- Asthma
- Other specified upper respiratory infections

Y-axis values: 0, 50, 100, 150, 200, 250, 300
Starting values: 63, 54, 13
Ending values: 282, 83, 41, 25, 13
X-axis: Feb 15 to Apr 15

Infectious diseases

Legend:
- Bacterial infections
- Sepsis/Shock
- Viral infection

Y-axis values: 0, 20, 40, 60, 80, 100, 120
Starting values: 60, 43, 13
Ending values: 86, 78, 68
X-axis: Feb 15 to Apr 15

Hematologic diseases; Mental, behavioral and neurodevelopmental disorders; Nervous system diseases

Legend:
- Nervous system disorders
- Aplastic anemia
- Alcohol-related disorders
- Epilepsy; convulsions
- Coagulation and hemorrhagic disorders

Y-axis values: 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100
Starting values: 43, 26, 19, 11
Ending values: 51, 24, 22, 15, 11
X-axis: Feb 15 to Apr 15

Source: The authors

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Changes in Diagnosis Groups of ICU Patients, February 15 to April 15, 2020

Digestive System; Dysphagia; External causes of morbidity

Legend:
- Abdominal pain and other gastrointestinal disorders
- Gastrointestinal hemorrhage
- External cause codes: intent of injury, accidental/unintentional
- Dysphagia

Notes: Patient counts of fewer than 10 in a diagnosis group on a particular day are suppressed. Diagnoses were grouped using AHRQ's CCSR grouper and combined as clinically relevant. (For instance, Myocardial Infarction and Coronary Artery Disease patients were grouped together.) Diagnoses from the same body system are grouped together and colored as shown in the legend. Some irrelevant diagnosis groups such as *Factors affecting health conditions* are excluded.

Source: The authors

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Concomitant with the sharp rise in respiratory system diagnoses driven by Covid-19, diagnoses of hypertension, diabetes, and chronic kidney disease more than doubled from baseline levels and renal failure tripled. However, there was a greater than 50% drop in other conditions compared to baseline, raising the specter of illness hidden or illness deferred.

Illness hidden could represent patients who would have otherwise been hospitalized for another condition being hospitalized for Covid-19 instead of, or in addition to, that condition. For example, ICU patients with myocardial infarction dropped over the early weeks of the pandemic. However, in late March through early April, the number of patients with myocardial infarction rose back up to about two-thirds of the initial volume — and most of these were Covid-19–positive or –suspected. (Figure 3).

FIGURE 3

Weekly Average Count of Patients with Myocardial Infarction, by Covid-19 Status, February 16 to April 15, 2020

While myocardial infarction patients continued to be admitted to the ICU during the coronavirus pandemic, it is notable that such patients without a Covid-19 infection dropped considerably from typical rates; part of that volume was made up by Covid-19 positive patients who were admitted with myocardial infarction.
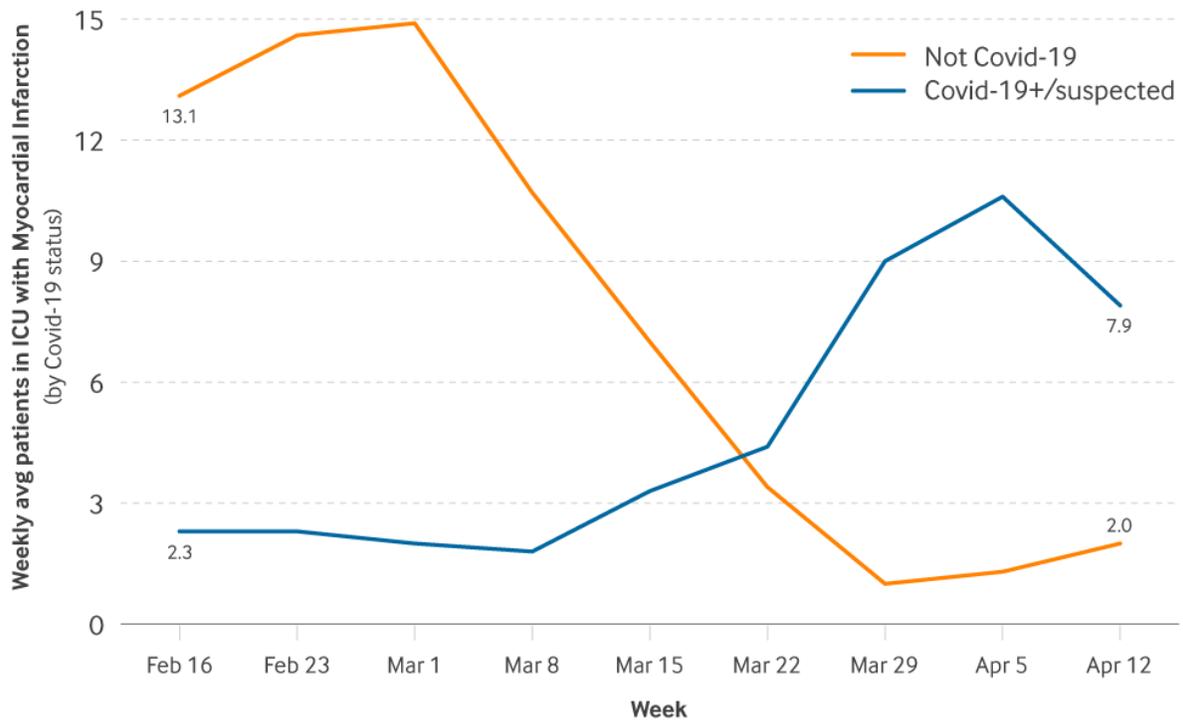
Source: The authors

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Chronic obstructive pulmonary disease, venous thromboembolism, and acute kidney injury may represent other "masked" diagnoses accompanying Covid-19 clinical presentations. A more tragic dimension of illness hidden to our hospitals is the possibility that patients who would have otherwise been hospitalized in an ICU were instead dying at home. There was some evidence that this was happening. A preliminary estimate of excess deaths (number of deaths above expected seasonal baseline levels) in New York City during March 11–May 2, 2020 found 5,293 deaths that were not identified as either laboratory-confirmed or probable Covid-19–associated deaths.[2]

Illness deferred could represent patients experiencing symptoms of serious conditions choosing not to seek care, perhaps due to stay-at-home orders or fear related to contagion.[3,4] For instance, daily trends of heart failure and stroke patients in intensive care remained relatively consistent from February 16 until March 16, but then declined steeply for the following two weeks (Figure 4).

FIGURE 4

Heart Failure and Stroke Patients in the ICU During the Covid-19 Surge, February 15 until April 15, 2020

In Mid-March, the census of ICU heart failure and stroke patients dropped precipitously.
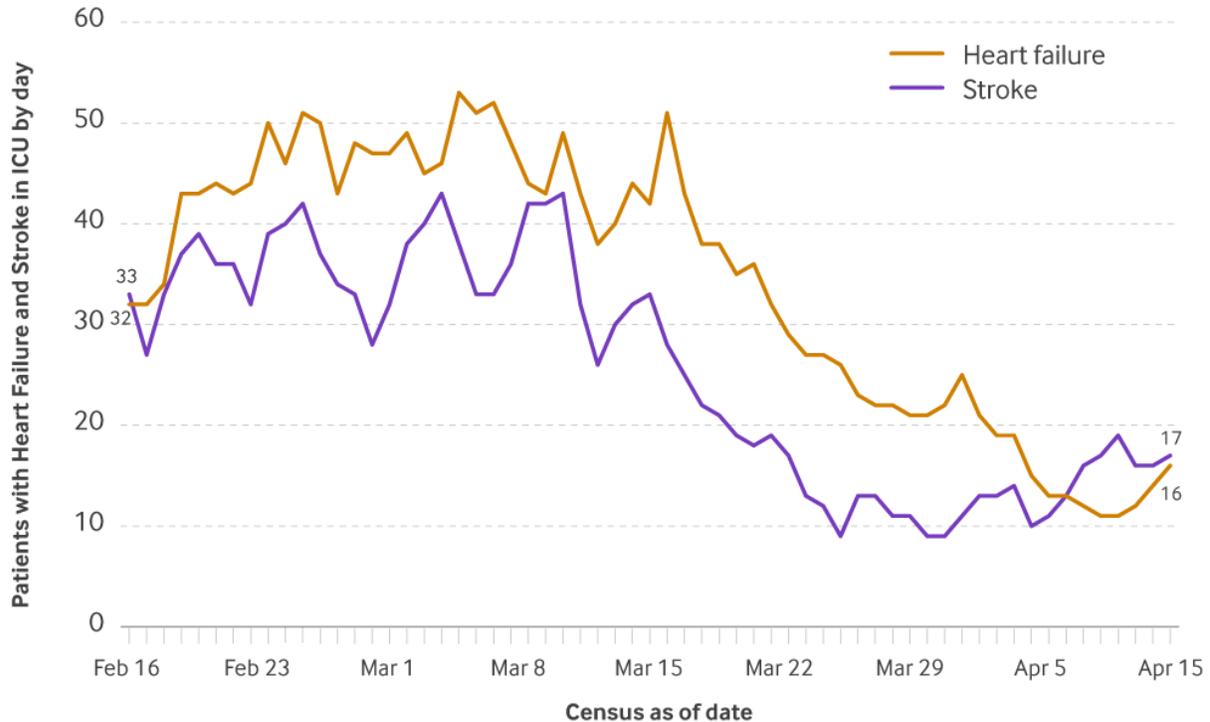
Source: The authors
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Social distancing measures in New York included a March 7 state of emergency declaration, increasing restrictions on crowd size starting March 12, school closures on March 15, and additional business closures beginning March 16.[5] A reduction in ST-segment elevation cardiac catheterization laboratory activations has also been seen in other jurisdictions.[4-7] The most worrisome interpretations of these findings are that patients may be suffering at home, and also may contribute to subsequent surges during the pandemic.

Hospitalizations due to Covid-19 are now declining in New York City, but admissions and ICU utilization for other conditions has not yet returned to baseline levels. These findings have important ramifications for future surge planning. Critical care capacity must be ramped up quickly in the context of a Covid-19 outbreak. We must also pay attention to the pandemic's reverberating effects, including illness hidden and illness deferred, which are more likely to cause suffering among low-income and marginalized patient populations. Further, a surge of patients who deferred

medical care might be possible when social restrictions are eased. Thousands of people have been directly affected by Covid-19, but these X-curves demonstrate the indirect effects on many more.

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Developing an Intensive Community Covid-19 Management Strategy: Helping Our Patients Access Patient-Centered Care across a Continuum of Covid-19 Disease Needs

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The Covid-19 pandemic is overwhelming hospital and emergency response systems in the US, and is expected to affect provision of care years to come. Community management of Covid-19 reduces strain on inpatient resources and on patients. We describe our experience developing a community Covid-19 management strategy, what we have learned, and our next steps.

Background

The Covid-19 pandemic is overwhelming hospital and emergency response systems in the United States. Healthcare systems are rapidly increasing the number of inpatient beds, managing health care worker shortages, and working to ensure adequate supplies of personal protective equipment (PPE). Despite these intensive efforts, most healthcare systems are struggling with resource limitations. Rural communities and communities of color are most affected, exacerbating inequities. At the same time, experts warn that the pandemic is likely to affect healthcare systems for years to come, suggesting that health systems will need to develop a longer term Covid-19 management strategy.

> *Avoidance of unnecessary hospitalization can be beneficial to patients by reducing hospital-acquired infections and other complications, and avoiding the emotional toll of being isolated from visitors while hospitalized."*

While there is a clear need for inpatient management of patients with a disease trajectory requiring ventilator support, there is no proven benefit of hospital support for other Covid-19-positive patients. Avoidance of unnecessary hospitalization can be beneficial to patients by reducing hospital-acquired infections and other complications, and avoiding the emotional toll of being isolated from visitors while hospitalized. Fewer hospitalizations benefit healthcare workers by reducing potential Covid-19 exposures and the physical and emotional strain of caring for large numbers of hospitalized patients.

However, many patients with Covid-19 are left with few options for care outside of the hospital. Primary care practices have limited in-person visit evaluations or have closed entirely. ED systems in many areas are stretched thin, and are not the best care setting for many patients who don't need to be admitted to the hospital.

To alleviate the pressure on these resources, healthcare systems are developing outpatient management processes. However there is no roadmap for how to do this in the US context. The most successful model available for managing Covid-19 comes from China. In this model, patients with symptoms are evaluated in person at a "fever clinic."[1] Patients with symptoms consistent with Covid-19, regardless of severity, are referred to the hospital. China implemented this approach as a containment strategy, to provide supportive housing that served the public health need for social isolation. This strategy does not transfer well to the U.S. system, where hospitals are used for medical management and their cost structure makes them unsuitable for use as housing. Seeing all patients in person before referring them to inpatient evaluation would also be an inefficient use of resources in the US context.

In the US, many outpatient health systems have rapidly adapted to the Covid-19 crisis by increasing the availability of telemedicine,[2] creating an opportunity to manage care at home. Yet, to optimally manage resources, telemedicine needs to be optimized to assess Covid-19 patients, and needs to be coordinated with in-person evaluation and a population health management approach to ensure the safety of patients.

We describe a community Covid-19 management strategy, early lessons learned, and our next steps.

Developing an intensive community Covid-19 management model

Cambridge Health Alliance is a community teaching public hospital system in Massachusetts. Cambridge Health Alliance Primary Care serves a diverse patient population of about 130,000, through 290,000 annual visits to 11 ambulatory care centers and 3 teen centers. There are

approximately 10,000 discharges per year between two hospitals. A quarter of patients receive care in a language other than English and approximately 65% are publicly insured or uninsured.

> " *The pillars of the Covid-19 community model are prevention, identification of cases, early management at home, escalated management in a specialty respiratory clinic, late management at home and, finally, escalated management in the ED and hospital.*"

We have developed an intensive community management strategy for Covid-19 (See Appendix). The goals are to provide patient-centered care, avoid exposing healthy primary care populations, reduce strain on emergency and hospital systems, and conserve PPE by managing patients at home when appropriate. The pillars of the Covid-19 community model are prevention, identification of cases, early management at home, escalated management in a specialty respiratory clinic, late management at home and, finally, escalated management in the ED and hospital.

The model reflects our understanding of the disease process, based on the literature and refined through management of thousands of patients with suspected or presumed Covid-19.[3,4] This experience has shown that although presentations are heterogeneous, there are somewhat predictable patterns. Pulmonary involvement develops before pathophysiologic consequences, and often follows a classic trajectory with viral upper respiratory symptoms at roughly four days, worsening cough and dyspnea at around seven days, and severe respiratory symptoms around 10 days after onset of symptoms. In addition to this disease trajectory, our model is built on the understanding that Covid-19 cannot be excluded on the basis of clinical signs or symptoms alone, and that clinicians must fully evaluate patients to avoid missing other important disease processes.

Our model spans the continuum of care and includes six key components: high-risk outreach, telephonic primary care, a phone triage system, a community management group, a respiratory clinic, and integrated emergency room/hospital care (Figure 1).

FIGURE 1

Cambridge Health Alliance Covid-19 Community Management Program: Key Components
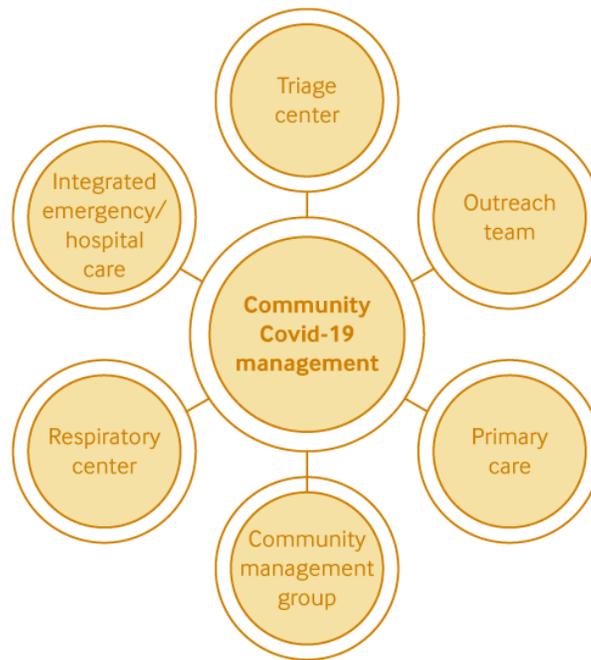
Source: Cambridge Health Alliance
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High-risk outreach. Medical assistants in the primary care clinics reach out to primary care patients at higher risk for complicated disease, principally patients with multiple medical comorbidities (such as age 65 or older, diabetes, congenital heart disease, heart failure, coronary artery disease, end stage renal disease, end stage liver disease, chronic obstructive pulmonary disease, pregnancy). These primary care team members use a single call to provide information on social distancing and other protective measures like handwashing, and to ensure that these patients have needed prescription refills.

Primary care teams. In addition to continuing to provide primary care, primary care teams perform two key functions. First, they refer any symptomatic patients to the triage center. These patients are identified during routine care – that is, during televisits, in-person visits, and patients calling into routine primary care telephone triage lines. Nurses at these primary care triage lines refer patients with any one of the following symptoms to the Covid-19 triage center: fever, cough, shortness of breath, anosmia, sore throat, myalgias, rhinorrhea, and diarrhea. Second, any patients triaged by the triage center as having only low-risk symptoms, such as loss of taste and smell, are instructed to call their primary care team if they experience changes. The primary care team

Table 1. Risk factor stratification criteria

Moderate risk	High risk
• Chronic kidney disease or end stage renal disease • Cirrhosis • Neurodevelopmental or neurological disease (prior stroke, spinal cord injury, amyotrophic lateral sclerosis, multiple sclerosis, muscular dystrophy), dementia/cognitive impairment • Pregnancy • Age < 1 year • Immunosuppressed patients (patients with active cancer, solid organ transplant, immunosuppressive medications, human immunodeficiency virus) • Patients identifying as black or Hispanic/Latinx • Smoking	• Adults>65 • Patients with current/active pulmonary disease (asthma, chronic obstructive pulmonary disease, interstitial lung disease, bronchiectasis, cystic fibrosis, obstructive sleep apnea etc.) • Patients with heart disease (congenital heart disease, coronary artery disease, heart failure) • Patients enrolled in complex care management program • Diabetes • Hypertension • Body mass index≥40

manages these patients in three ways. First, they assess these changes in symptoms to identify other possible etiologies. Second, they give instructions on symptom management. Finally, they refer any patients that show evidence of more complicated disease to the triage center for further management by the Community Management group.

Triage center. All patients who call CHA with symptoms of coronavirus or questions about coronavirus have been routed to a dedicated triage center since community spread was detected in the state of Massachusetts. The triage center is a dedicated group of nurses supported by on-site physicians who (1) determine whether patients' symptoms are clinically consistent with Covid-19 using a symptom checklist, (2) risk-stratify patients for severe disease complications using risk stratification criteria (Table 1) (3) determine whether patients meet criteria for testing, (4) conduct robust education (about 10-15 min) on home care with attention to self-isolation and self-quarantine and (5) evaluate patients for symptoms requiring urgent in-person assessment at the respiratory clinic based on identification of potential pulmonary involvement. Patients are referred to the respiratory clinic if they have 1) dyspnea especially at or after the fourth day since symptom onset; 2) fever/cough and COPD/asthma/other pulmonary disease; 3) increased use of inhalers or supplemental oxygen; 4) any respiratory symptoms and a history of cardiac or pulmonary disease; 5) any other reason for in-person evaluation.

Community management group. The community management group draws from a pool of 49 providers (MDs, NPs, PAs) from diverse disciplines. The total time they devote to this function equates to about 20 FTE. A quarter are internists, 50% are from other primary care disciplines (such as pediatrics and family medicine), while 25% are from other disciplines (e.g., neurology, surgery, women's health). Providers are drawn from these specialties for several reasons. First, diverse disciplines were helpful given the diversity of symptoms. Second, primary care providers were in short supply due to deployment to the hospital. Third, these specialties give the group the ability to provide care for all patients, including pediatric patients and pregnant women. Providers are trained in Covid-19-related management through a combination of an orientation video, daily huddles, continuing education sessions, and printed guidance on management and processes.

These providers are organized in two teams that take on "panels" of suspected and confirmed Covid-19 patients who are at higher risk for severe disease. Collectively these teams managed roughly 2900 patients in total during the first four weeks. Patients were originally assigned by triage center nurses to high risk or moderate risk panels using risk stratification criteria (Table 1),

but individual patients' risk level can be modified by providers based on other factors, including symptomatology and medical or social complexity. These criteria were developed based on the literature and refined by our experience, and are modified over time as new information becomes available. The high risk team manages patients at high risk for complications or with evidence of significant pulmonary involvement and is largely composed of primary care providers who are accustomed to evaluating diseases that include multiple organ systems with complex biopsychosocial components. The moderate risk team manages patients at moderate risk for complications and is largely composed of providers who are volunteering to work outside their usual scope of practice.

The managers follow patients longitudinally by telephone from their first triage center call, scheduling follow-up at points in the disease process that are known to be associated with sudden changes in clinical course. Community managers reach out to patients based on a schedule guided by our understanding of the typical Covid-19 clinical course, and at a minimum on days 4, 7, and 10, with many patients receiving outreach significantly more frequently or for a longer time.

Managers pay careful attention specifically to evaluation of respiratory symptoms, treating alternative diagnoses when appropriate, and identifying patients with symptoms that suggest severe or worsening disease. Patients with severe or worsening respiratory symptoms are referred to the respiratory clinic or in emergent cases to the emergency room. Community management providers also have training in advance care planning conversations and, along with patients' PCPs, connect patients and family to palliative care at home if that is the patient's preferred management choice.

The community management group is supported by a team of MAs. This team provides additional guidance and counseling to patients based on referral from the community managers. These MAs also reach out to all patients referred to community management, regardless of risk level, for a one-time call to review self-isolation and self-quarantine instructions. The outreach team also identifies patients with any new or worsening symptoms, and connects these patients to nurse triage through a warm handoff. Finally, the MA team provides additional support to patients who request documentation for work or other resources in the setting of self-isolation.

The respiratory clinic. The respiratory clinic focuses on in-person evaluation of patients with concerning respiratory symptoms and clinical management of Covid-19 patients who are at risk for poor outcomes. The clinic is staffed by 16 primary care physicians and physician assistants. The clinic administers supportive therapies, provides connection to resources (including crisis counseling), and determines appropriate disposition (emergency department vs. home with home care instructions and close monitoring). Unlike a typical urgent care setting in which disposition may be decided based on limited algorithms, the patients in the Respiratory Clinic setting are evaluated in context of their chronic disease and accompanying risks, including medical, behavioral and social factors. Patients who develop evidence of severe illness are referred to the ED. The Respiratory Clinic has a highly optimized workflow that limits the amount of PPE required per patient to one gown - approximately one-fifth of what might be required in emergency care settings.

Integrated emergency department and hospital system. An integrated emergency department and hospital system evaluates patients with hypoxemia and severe disease. The ED is able to refer stable patients back to the community with close monitoring. Similarly, patients discharged from an inpatient admission are linked back to community management, allowing inpatient teams to consider that resource in their discharge planning. All patients with results pending at the time of discharge from the ED or hospital are also referred to community management.

Challenges

We faced a series of challenges in developing this system:

- Because we had no roadmap, we had to study our outcomes frequently (initially, on a daily basis) to collect and analyze the data we needed to modify the program from its initial design.

- Payment systems continue to create incentives to hospitalize patients, so we needed to reach alignment within our institution to take an approach that prioritized community needs over payment mechanisms, which we were able to do quickly.

- As we developed this system, our health system was already overstretched, working on expanding inpatient capacity, managing PPE needs, and healthcare worker shortages.

- Finally, this process required convening team members from diverse disciplines quickly; our community management strategy required input from a variety of disciplines (pediatrics, family medicine, internal medicine, pulmonary, infectious disease, obstetrics) and services lines (emergency, inpatient, primary care).

Lessons learned

During the first four weeks, we triaged 7,500 patients with suspected or confirmed COVID telephonically. Our community management group televisits grew to 250 daily. The numbers of patients seen in the respiratory clinic increased steadily from 30 per day during our first week to 77 per day in our fourth week (Figure 2). In total, the respiratory clinic conducted 1,117 visits during the first four weeks. This experience yielded a few key insights.

FIGURE 2

Respiratory Clinic Visits and Subsequent Emergency Department or Hospital Admissions
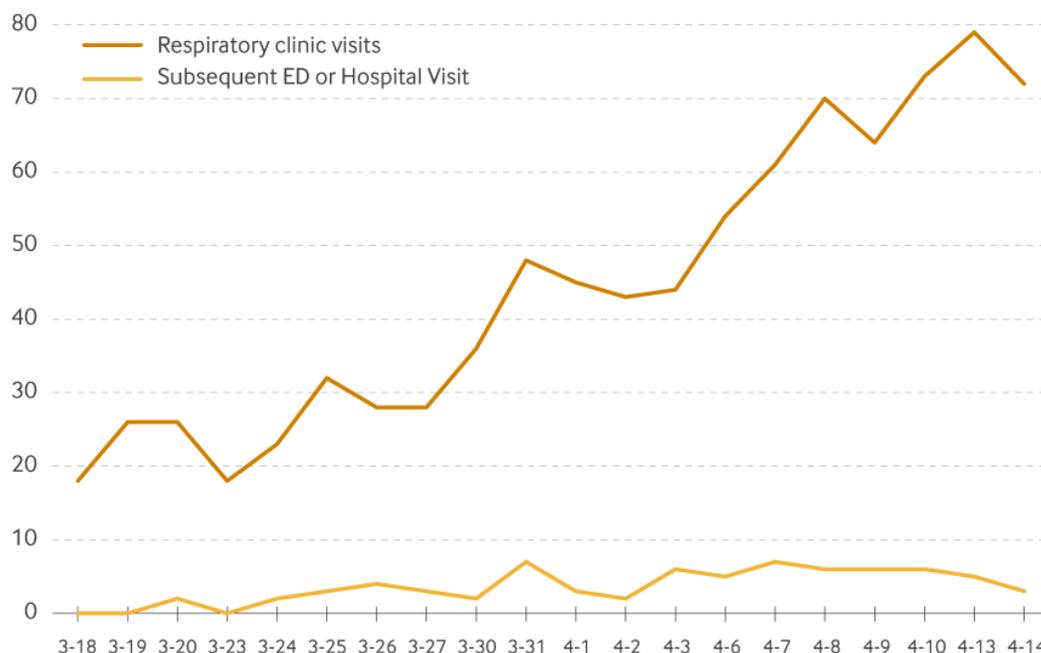
Source: Cambridge Health Alliance

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The majority of patients requiring in-person evaluation were managed in the community. In the first four weeks, this model managed 7,500 patients symptomatic for Covid-19, including roughly 2,900 at moderate to high risk for complicated Covid-19 disease. Among the moderate to high risk patients, roughly 1,800 were managed exclusively by telephone and 1,117 were seen in the respiratory clinic. Half of those seen in the clinic had moderate to severe symptoms. We managed 92% of patients with moderate to severe symptoms in the outpatient setting: that is, only 8% were subsequently seen in the emergency room and/or admitted to our hospitals.

Telephonic triage was feasible. Our triage nurses were able to identify patients requiring in-person evaluation, while other patients were managed exclusively telephonically. Of those referred to in-person evaluation at the respiratory clinic, only 6% required subsequent emergency room evaluation and half of these were discharged home after ED care with respiratory clinic follow up, suggesting that patients can be telephonically triaged successfully by a team of dedicated nurses. Patients managed by telephone exclusively may also have visited the ED.

This model may reduce emergency room visits and hospitalizations. Estimates for hospitalization rates for patients with Covid-19 are 9% in our state[5] and 21-31% nationally.[6] We

Table 2. Estimated resources used with intensive community COVID management program data, compared with state average and national average

	Intensive community COVID management program	State average[5] (9% hospitalization rate)	National average[6] (26% hospitalization rate)
	Patients	Patients	Patients
Telephonic triage	7500	7500	7500
Respiratory clinic visits	1117	0	0
Emergency department visits*	645^	1117	1950
Hospital admissions (days)	226^ (904)	675 (2700)	1950 (7800)

Sources: Cambridge Health Alliance, Mass. Dept. of Public Health,[5] CDC[6] *Emergency department visits includes visits for patients that were hospitalized from the emergency department. ^Based on data from respiratory clinic patients who are moderate to high risk with severe or worsening dyspnea, which would lead to an overestimate of ED visits and hospitalizations for less severely affected patients. We are unable to track hospitalizations and ED visits outside of our system.

examined the number of emergency room visits, hospital stays and days for a panel of 7500 symptomatic patients at our institution, compared with averages in our state and nationally (Table 2). Because most patients lack access to in-person outpatient evaluation for Covid-19 symptoms, we assumed that all patients needing in-person evaluation outside of our system were seen in the ED. We currently lack data on our full population, so we conservatively assumed that all patients had emergency room and hospitalization rates similar to that of our respiratory clinic patients; because respiratory clinic patients are the sickest patients, this method likely leads to an overestimation. Conversely, we can only track visits in our system; thus leading to an underestimate of hospitalizations and ED visits. We assume the inpatient length of stay is four days, based on our experience for non ICU patients.

In the first month, we estimate that the intensive community Covid-19 management program managed 7,500 patients with 1,117 (14.9%) respiratory clinic visits, 645 ED visits (8.6%, including visits associated with hospitalizations), and 226 (3.0%) hospitalizations. Using state and national averages, these patients would have had 3 to 12 times more hospitalizations, or 675 and 1950, respectively.

Community Covid-19 management provides patient-centered care during an emotionally vulnerable time. Patients with suspected Covid-19 or Covid-19-positive tests are particularly vulnerable. These patients face difficult choices with very little reliable information available and few options for care. We have learned that community Covid-19 management allows patients to share decision-making. We hear from our patients that scheduled telephonic follow-up is reassuring and provides much-needed information and support. Additionally, having providers explain the disease and discuss options (such as community management and palliative and hospice care) provides solace, comfort and empowerment during a time when patients otherwise experience very little power.

" *The goals for the coming weeks are to integrate behavioral health and social needs support into the model."*

Our model is evolving by the day and we have many steps ahead. The goals for the coming weeks are to integrate behavioral health and social needs support into the model. We are striving to understand which touchpoints are of greatest value to our patients and clinicians. We also will need to modify the model as we learn more about the disease process. As we look to the next phase of the Covid-19 response, we are developing a strategy that would allow the system to both evolve but also grow or shrink in a nimble fashion in response to the changing prevalence of Covid-19 in our community.

We recognize that the looming surge will eventually fade, and we will need to have a long-term strategy in place to manage our patients. For now, our community Covid-19 management strategy allows us to meet our patients' needs, prepare for the illness to come, and provide the basis to more effectively manage our community's Covid-19 needs in the future.

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Disclosures: Janice John, Lora Council, Leah Zallman, and Jessamyn Blau have nothing to disclose.

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A Beacon for Dark Times: Palliative Care Support During the Coronavirus Pandemic

Claire K. Ankuda, MD, MPH, Christopher D. Woodrell, MD, Diane E. Meier, MD, R. Sean Morrison, MD, Emily Chai, MD

Palliative care physicians can provide critical expertise in communication and symptom management to help seriously ill patients in the coronavirus disease 2019 pandemic. However, with an existing shortage of palliative care specialists, the surge of Covid-19 cases in New York City required rapid expansion of palliative care services, particularly to emergency departments (EDs). In response to these needs, the Icahn School of Medicine at Mount Sinai developed and adapted a 24-7 PAlliaTive Care Help line (PATCH-24) with focused in-person ED supports to serve 873 of the sickest patients with Covid-19 over 4 weeks in late March and April 2020. The authors describe key principles and lessons learned from this process.

The pandemic of coronavirus disease 2019 has been accompanied by high levels of suffering. Patients experience unpredictable rapid health decline and symptoms such as dyspnea, anxiety, and isolation.[1,2] Families, who may themselves be sick, are unable to visit their loved ones due to infection-control policies and are often tasked with making difficult decisions about ventilators and resuscitation for patients with low likelihoods of survival.[3,4] Health care workers struggle with sustained high volumes of clinical work, emotional strains of witnessing death and severe illness, and fears for their own health and that of their families.[5,6]

Palliative care clinicians are uniquely equipped to address the suffering of Covid-19, especially in epicenters where the health system is particularly strained. Palliative care is a team-based specialty that provides an added layer of support for those with serious illness, with high-level communication and symptom management skills and a transdisciplinary approach to address physical, emotional, and existential suffering.[7] However, even under normal conditions, there is a significant shortage of palliative care clinicians.[8,9]

We developed a novel palliative care telephonic support line to extend the reach of palliative care as a critical component of a health system disaster response for Covid-19. We outline our initial conceptual approach, the rapid implementation of our 24-7 PAlliaTive Care Help line (PATCH-24), the real-time innovations and adjustments we made, and the core principles that we identified as essential to such an effort, all of which were fundamental to the success of this program.

Program Description: Responsive, Round-the-Clock Support That Can Be Restructured Based on Call Volume

We initiated planning for our telephonic support line, PATCH-24, on Monday, March 23, 2020, and began receiving calls on Wednesday, March 26. We tracked call volume, PATCH-24–associated emergency department (ED) consults, and the caseload of Covid-19–positive or presumed positive patients within the Mount Sinai system (Figure 1).

FIGURE 1

Daily Volume of the PATCH-24 Telephonic Palliative Support Line and Associated ED Consults During the Covid-19 Pandemic.

The daily volume of the PATCH-24 telephonic palliative support line and associated ED consults rapidly grew to the peak of the pandemic in our health system and then began to decline.
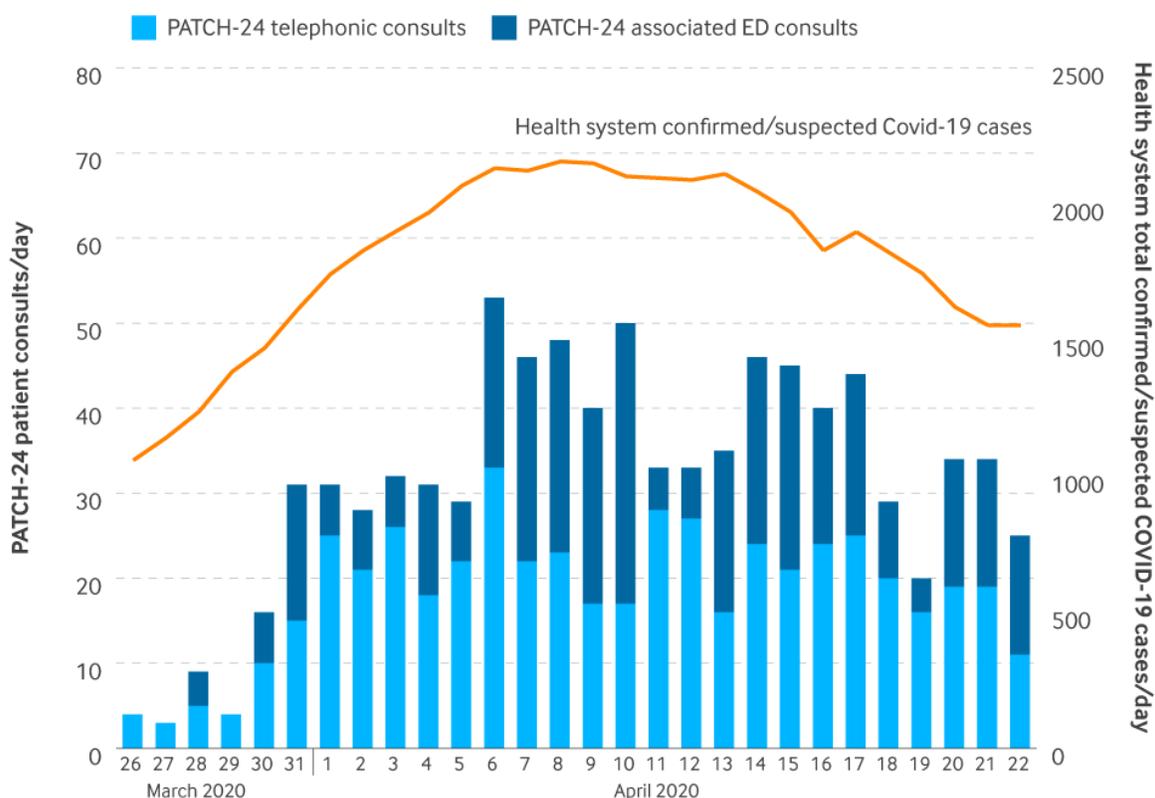
Note: PATCH-24 telephonic consults were directly received by front-line physicians. PATCH-24 associated ED consults were referred by ED clinicians to an in-person PATCH-24 physician in the ED who called the patient's family.

Source: The authors

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The call line was promoted through system-wide and departmental emails, fliers distributed by clinicians based at each site, and attendance at clinical rounds. These efforts were designed to emphasize the availability of and the high need for PATCH-24 in settings such as the ED and intensive care unit (ICU). The PATCH-24 acronym branded the line as distinct from traditional inpatient palliative care services. The line was available to six hospitals within the Mount Sinai Health System throughout New York City. The health system consists of a 1,100-bed quaternary care hospital, three 500- to 700-bed community and tertiary hospitals, two 200-bed community hospitals, and a temporary 70-bed field hospital (operated by a disaster relief group) that opened on April 1, 2020, to provide overflow capacity.

> " *The PATCH-24 call line provided a guiding light to improve patient care and support clinicians with 873 of the most difficult of cases over 4 weeks during the peak of the Covid-19 pandemic in New York City.*"

Initially, the PATCH-24 line was staffed by two board-certified palliative medicine physicians who alternated 12 hour shifts to ensure prompt and expert response at all hours. Call line volume grew exponentially over the first week of the program: from 4 to 25 patient encounters over the first week before it stabilized as the health system reached peak volume of Covid admissions. As a result, responsiveness in the first week suffered as the physicians increasingly missed incoming calls while on the phone with families or other clinicians.

In response, two adaptive innovations were made to expand coverage while maintaining responsiveness. First, we created a backup pool of five physicians who were available to assist when multiple calls came in simultaneously. Second, we trained a cohort of medical students to receive and direct calls to the team of palliative care physicians. If another health system were to develop a similar system to support an estimated census of 200 additional severely ill patients, we would recommend staffing two full-time equivalent (FTE) (for day and night coverage) palliative care physicians, as well as four FTE physicians on staggered backup shifts to make calls as needed. We also utilized three medical students per day (working 4-hour shifts each) to triage phone calls.

In support of the effort, we find that six principles are indispensable for the PATCH-24 model.

Principle 1: Direct palliative clinician-to-family communication support is required in the highest-need settings.

Initially, the intended purpose of PATCH-24 was to coach frontline clinician teams in communication and symptom management. During the first week of operations, however, it became apparent that this approach was insufficient as the Covid-19 pandemic surged. Physicians in the ED did not have time to receive coaching and conduct goals-of-care discussions with families, while simultaneously handling high volumes of Covid-19 patients with acute clinical needs. Calls frequently came from clinicians who had been redeployed from their primary departments to care for Covid-19 patients in the hospital and needed help conducting complex goals-of-care discussions. We quickly changed PATCH-24 from teleconsultation (physician-to-physician) to direct telemedicine (palliative medicine clinician-to-family) to better align with hospital workflow and meet clinical needs.

Changing to a telemedicine role required our palliative physicians to adopt new practices as they could not be physically present at patients' bedsides and were under considerable time pressures due both to patient volume and the speed at which decisions needed to be made. Scripts were developed by our department's communication experts in collaboration with colleagues from the VitalTalk communication program for use in commonly encountered Covid-19 situations.[10]

PATCH-24 physicians were required to attend roughly 2 hours of virtual training that focused both on PATCH-24 procedures and communication using the newly developed scripts. The scripts included scenarios such as patients in the ED at high risk of intubation and low likelihood of survival, mechanically ventilated patients in intensive care units with progressive multi-organ failure, or decision-making regarding an ICU transfer for patients on a regular floor whose clinical conditions were rapidly deteriorating. Customized electronic health record note templates reflected this standardized language to facilitate rapid charting and promote best practices in peer-to-peer communication.

Principle 2: Monitoring call line volume can guide targeted palliative care supports to hot spots.

Medical student phone operators kept daily logs of calls, including the hospital and unit of the caller; these records were reviewed during daily shift-change huddles at 9 a.m. and 9 p.m. This allowed us to identify the clinical sites of highest need. For example, we found that one community hospital without an inpatient palliative care team had a consistently high call volume.

In response, we designated an on-site palliative care physician whose physical presence facilitated better collaboration. This allowed for enhanced palliative care support at that site and led to earlier consults. Prior to Covid-19, another one of our hospitals relied upon telephone coverage during the weekend rather than on-site palliative care coverage. During the New York City surge, weekend call volume at this hospital become so high — 19 consults on one Sunday — that on-site weekend coverage was instituted.

Principle 3: Hot spots gone cold may indicate areas that are overwhelmed.

While the ED at our main hospital had been the source of the majority of calls initially, on day 3 of PATCH-24 operations, no calls were received from the EDs despite rising patient volume. Discussions with ED and health system leadership revealed that the volume of critically ill patients arriving to the ED had precipitously increased, making it now impossible for ED physicians to make time to call PATCH-24.

> *We quickly changed PATCH-24 from teleconsultation (physician-to-physician) to direct telemedicine (palliative medicine clinician-to-family) to better align with hospital workflow and meet clinical needs."*

In response, we physically embedded one of the PATCH-24 palliative care physicians into the Covid acute resuscitation bay of the EDs during their busiest hours. This in-person presence in the fast-paced ED allowed for close collaboration in real time, where that palliative physician could simultaneously meet with patients and families while the ED physicians triaged and stabilized

patients. It allowed closer integration of PATCH-24 into the ED, with the in-person palliative physician at times requesting the PATCH-24 physician to assist with calling families. Ultimately, this in-person presence led to increased utilization of the PATCH-24 line by the ED during hours when a palliative clinician was not physically present.

Principle 4: Staffing expansion presents logistical training challenges.

Although our palliative care program is one of the largest in the country in number of faculty and fellows, at the peak of the surge, our staffing could not accommodate the number of patients being referred. To address the needs of patients and families, we contacted palliative care physicians practicing in regions less impacted by the Covid-19 pandemic; they had asked if they could be of assistance and we accepted the offer. Under Covid-19 emergency procedures established by New York state and the Mount Sinai Health System, we credentialed these individuals as temporary Mount Sinai faculty and trained them to assist on the PATCH-24 call line.

During peak weeks of the pandemic, these volunteer faculty joined the pool of backup PATCH-24 physician staff to handle surges in call volume over the day as well as to allow for department faculty to take much needed shift breaks. Backup faculty were trained in communication skills as described above as well as in PATCH-24 operations and practices.

Although we developed detailed protocols that described variations in documentation, processes, and culture across hospital sites, nuances of cultural and electronic health record differences across sites posed significant challenges for volunteers to learn. In response to this issue, we identified a backup physician from our health system who was available to both serve as a sounding board for difficult cases as well as assist volunteer physicians with navigating the multiple system hospitals.

Principle 5: The call line supports clinicians as well as patients and families.

It became clear soon after the call line opened that clinicians calling for assistance were often fatigued and overwhelmed. One hospitalist calling for symptom management advice late at night for a patient with comfort-focused goals but persistent dyspnea began to cry while explaining the patient's clinical history. What would start as a clinical question would frequently reveal itself to be distress about a dying patient's isolation in the hospital, away from family.

> *The role of PATCH-24 in not just caring for patients, but also in supporting clinicians in this extraordinarily difficult work became a prominent feature of the line. Palliative care physicians staffing the line provided empathic listening and encouragement for frontline clinicians."*

The role of PATCH-24 in not just caring for patients, but also in supporting clinicians in this extraordinarily difficult work became a prominent feature of the line. Palliative care physicians staffing the line provided empathic listening and encouragement for frontline clinicians. They arranged for video visits with family, chaplaincy calls, child life specialists, art therapy support, and mindfulness coaching for families to not only support patients and families, but also to help distressed clinicians see the range of care that can be delivered even when death is imminent.

When practical, PATCH-24 attendings coached colleagues through symptom management and family meetings to support trainees and clinicians practicing in new roles. In one example, a team of subspecialists practicing outside their field listened in as the palliative care physician led a family update and expressed that they felt empowered to lead similar calls. Among the PATCH-24 team, morning and evening huddles to review call numbers and troubleshoot issues that arose were also useful times to support each other and maintain camaraderie in the face of this emotionally difficult work.

Principle 6: The call line is ideal for crisis response, but not continuity.

As call line volume and the number of palliative care physicians staffing PATCH-24 grew, managing follow-up after calls and integrating with in-patient palliative care teams became more challenging. We emphasized that our call line did not automatically follow patients, and encouraged teams to call us again if assistance is needed, reinforcing this in our documentation. We were cautious to not necessarily promise follow-up to family, and instead provided appropriate phone numbers so that they could contact the patient's unit and their clinical teams. We refined our workflows and integration with the available inpatient palliative care teams for patients who required in-person follow-up.

For future times of surge and iterations of the PATCH-24 line beyond Covid-19, we plan on developing workflows that could accommodate PATCH-24 follow-up.

The Challenges Ahead

Finally, as call volume has begun to slowly decrease, we are faced with new challenges of integrating with existing palliative care infrastructure while maintaining the critical elements of 24-7 availability and responsiveness to pockets of our health system that lack a palliative care presence. This involves nuanced, hospital-specific work to partner with our palliative care colleagues and integrate into diverse hospital and practice cultures across the health system. In addition, we continue to seek opportunities to teach skills in symptom management and communication to all frontline clinicians across the system through online learning, coaching, and collaborative family meetings.

The PATCH-24 call line provided a guiding light to improve patient care and support clinicians with 873 of the most difficult of cases over 4 weeks during the peak of the Covid-19 pandemic in New York City. The structure of the call line allowed us to rapidly extend specialist palliative care across the health system, and was helpful in prioritizing allocation of inpatient palliative care resources. This approach is useful for hospital systems both responding to Covid-19 and for those looking

to expand the presence of palliative care beyond what is possible with a traditional inpatient consulting team. As we look to the future, while we hope to never again have to respond to the degree of suffering our community has experienced, we are comforted that we are well equipped to do so.

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Addressing Equity in Telemedicine for Chronic Disease Management During the Covid-19 Pandemic

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Health systems have adopted telemedicine with remarkable speed not only for Covid-19–related care, but also for chronic disease management. But without proactive efforts to ensure equity, the current wide-scale implementation of telemedicine may increase disparities in health care access for vulnerable populations with limited digital literacy or access, such as rural residents, racial/ethnic minorities, older adults, and those with low income, limited health literacy, or limited English proficiency. To ensure that the current telemedicine implementation does not exacerbate health disparities, the authors propose four key actions for clinicians and health system leaders: (1) proactively explore potential disparities in telemedicine access, (2) develop solutions to mitigate barriers to digital literacy and the resources needed for engagement in video visits, (3) remove health system–created barriers to accessing video visits, and (4) advocate for policies and infrastructure that facilitate equitable telemedicine access. Without taking these actions now, health care systems risk creating telemedicine programs that exclude vulnerable populations.

Over the past few weeks, our primary care practices (UCSF General Internal Medicine Practice, an academic medical center practice with three clinics, and Richard Fine People's Clinic at Zuckerberg San Francisco General Hospital, an urban safety-net practice) have transitioned almost entirely from in-person to remote patient visits. This ramp-up in telemedicine has occurred with remarkable speed across the country,[1] underscoring its necessity in response to social distancing measures during the Covid-19 crisis. It has been facilitated by rapid changes to reimbursement policies for telemedicine by the Centers for Medicare & Medicaid Services,[2] with other payers following suit.

Currently, most health systems are using a combination of video and telephone visits; notably, video communication is associated with higher patient understanding and satisfaction compared with telephone communication.[3,4] This is particularly important to consider in primary care — where ongoing relationships and clear communication are essential to successful chronic disease management — and among populations with limited digital access or digital literacy (the ability to use and understand information from digital devices), who are already less likely to use digital health tools.[5,6]

As primary care clinicians, we are already seeing early signs of disparities in access to care delivered through telemedicine. This has alarming implications for inadequate chronic disease management that may result in increased disparities in clinical outcomes as some patients disproportionately lose frontline access to primary care.

Every clinician and health system cares for vulnerable patients that may have limited digital literacy or access. Within the United States, these digital barriers are found more frequently in rural populations, older adults, racial/ethnic minority populations, and those with low socioeconomic status, limited health literacy, and limited English proficiency.[7-9] For example, among American adults >65 years old, who constitute 18% of the American population and are most likely to need chronic disease management, only 55%–60% own a smartphone or have home broadband access.[10,11] While 73% use the Internet, only 60% are able to send an email, fill out a form, and find a website.[7,11] Similarly, nearly 1 in 8 Americans lives in poverty; low-income individuals have lower rates of smartphone ownership (71%), home broadband access (59%), Internet use (82%), and basic digital literacy (53%).[7,10,11] Considered together, at least 1 in every 4 Americans may not have digital literacy skills or access to Internet-enabled digital devices to engage in video visits.[10,11] Given this, we worry that like many prior innovations,[12,13] the most vulnerable patients will be least likely (if ever) to benefit from this telemedicine implementation.

Beyond gaps in digital access or literacy, many of these populations also disproportionately experience worse health outcomes for common chronic diseases seen in primary care.[14] When the Covid-19 pandemic started, it was anticipated certain populations might be at higher risk of being affected by the virus and its health, social, and economic consequences.[15,16] Unfortunately, early reports have already confirmed this higher risk, with Covid-19 mortality being disproportionately high among low-income, minority populations.[17,18] Now that telemedicine is the default for delivery of primary care — and is likely to remain so for the near future — it is imperative that we proactively evaluate and address disparities in access to telemedicine to limit the already worsening health outcomes and health disparities.

Our two large practices care for diverse populations. At the UCSF General Internal Medicine Primary Care Practice, there are 141 clinicians (71 resident physicians, 52 attending physicians, 6 fellows, 12 nurse practitioners). The practice cares for approximately 27,000 patients, of whom 31% are ≥65 years old, 9% have a non-English language preference, 53% are racial/ethnic minorities, 12% are insured by Medicaid, and 24% are insured by Medicare. At Richard Fine People's Clinic at Zuckerberg San Francisco General Hospital, there are 85 clinicians (46 resident physicians, 30 attending physicians, 1 fellow, 8 nurse practitioners) who care for approximately 9,200 patients. Of these patients, 25% are ≥65 years old, 44% have a non-English language preference, 84% are racial/

Table 1. Recommendations with Key Actions for Clinicians and Health Systems to Consider in Order to Ensure Equitable Access to Telemedicine.

Goal	Key Actions
Identify potential disparities in access	Explore potential improvements in access to care (e.g., number of visits) for patient subgroups with known limited digital literacy and access - Older adults - Low socioeconomic status - Limited health literacy - Limited English proficiency - Racial/ethnic minorities Continue monitoring data to evaluate impact of any interventions
Mitigate digital literacy and resource barriers	Develop education and training to teach patients the digital skills to conduct video visits Inform patients about newly free or reduced-cost broadband Internet in their area
Remove health system–created barriers	Offer video visits to every patient Ensure adequate language interpreter access Screen for patients at high risk of not being able to engage in video visits (no device, Internet/data, privacy) Consider offering telephone visits if unable to mitigate barriers to video visits Increase system leadership awareness of barriers to telemedicine
Advocate changes to support sustained and equitable access	Permanent expansion of low-cost or free broadband Funding for telemedicine expansion in less resourced health centers Pay parity for telephone and video visits by all payers

Source: The authors

ethnic minorities, and nearly 100% are covered by government-sponsored plans (36% Medicaid, 18% Medicare, 44% San Francisco health access plans).

Based on our experiences at these two primary care practices, we describe challenges we have encountered thus far in ensuring equitable access to telemedicine. We outline four key actions that clinicians and/or health systems should consider in order to address this issue (Table 1). Below we describe solutions our practices have begun implementing in response to the Covid-19 pandemic to ensure equity.

Proactively Explore Potential Disparities in Telemedicine Access

At our practices, we have started data collection to evaluate whether there has been a change in the pattern of patients accessing care before and after the rapid implementation of telemedicine related to the Covid-19 pandemic. For example, at our academic primary care practice, we extracted data about visit encounters and patient characteristics from the electronic health record to examine changes in clinic access among populations that may have barriers to accessing telemedicine, including patients with older age, reporting a language preference other than English, insured by Medicare or Medicaid, or identifying as a racial/ethnic minority.

> " *These early signs of disparities in access heighten the importance of identifying patient populations that are at risk of poor access as well as ongoing monitoring of access disparities."*

When we compare a 2-week period before telemedicine implementation (February 17–28) to a 2-week period after implementation (March 23 – April 3), video visits increased from 3% (of a total

weekly average of ~1,000 visits) to 80% (of a total weekly average of ~550 visits), and telephone visits increased from 0% to 16%. Notably, the proportion of visits with populations at risk for limited digital literacy/access have decreased significantly, including among these patient groups: ≥65 years old (41% to 35%, P=0.002), non-English language preference (14% to 7%, P<0.001), insured by Medicare (43% to 22%, P<0.001) or Medicaid (17% to 10%, P<0.001) (Figure 1).

FIGURE 1

Patient Visits by Age, Language, and Insurance Before and After Telemedicine Scale-Up

This chart shows the proportion of patient visits seen by age, language preference, and insurance type prior to (2/17–2/28/2020) and after (3/23–4/3/2020) scaled-up telemedicine implementation to address the Covid-19 pandemic at the UCSF General Internal Medicine Primary Care Practice (P=0.002 for age ≥65 and P<0.001 for other comparisons). A significantly smaller proportion of visits after scaled-up telemedicine implementation were with vulnerable patients.
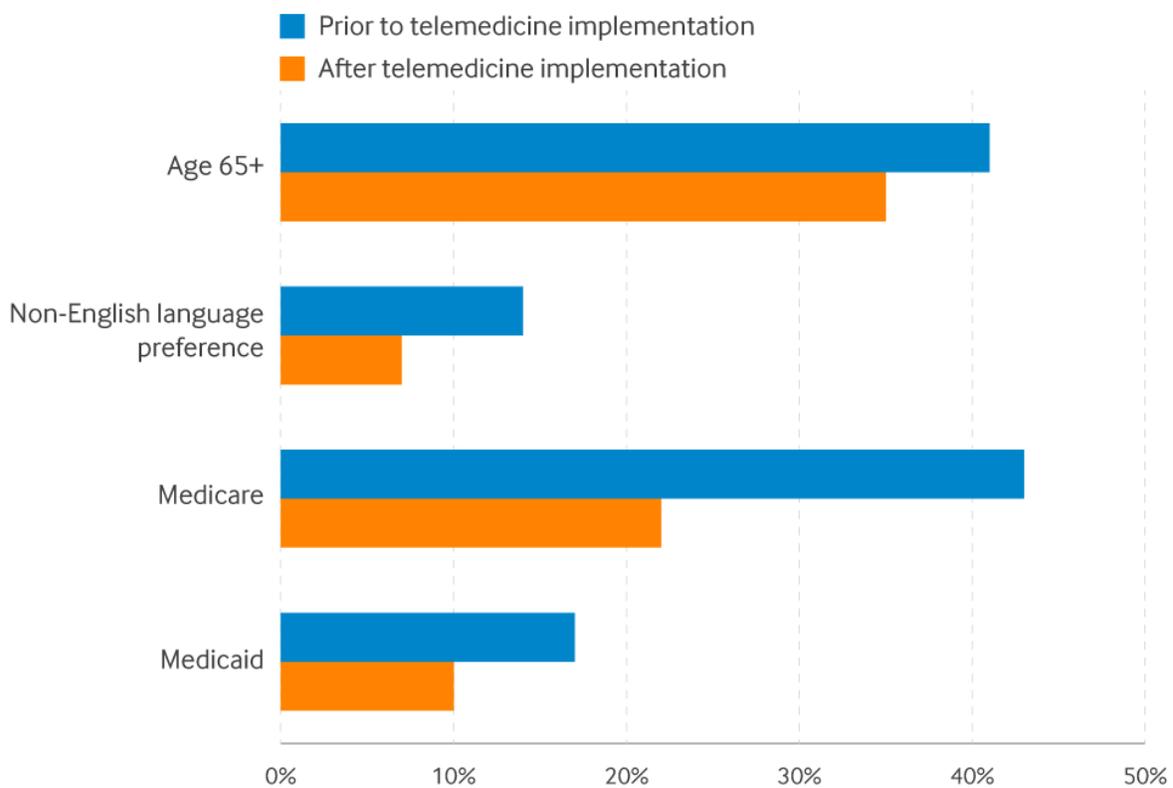
Source: The authors
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When examined by race/ethnicity, we also see that patients identifying as Non-Hispanic White, and Other represented a higher proportion of visits while all other groups (Black/African-American, Latinx, and Asian/Pacific Islander) were a smaller proportion of visits (P=0.006) (Figure 2). These

early signs of disparities in access heighten the importance of identifying patient populations that are at risk of poor access as well as ongoing monitoring of access disparities, particularly as practices continue to change their workflows on a daily to weekly basis. While these numbers are very concerning, given anecdotal reports from around the country of lower visit volumes in primary care, we believe they likely are not unique.

FIGURE 2

Patient Visits by Race/Ethnicity Before and After Telemedicine Scale-Up

This chart shows the proportion of patient visits seen by patient race/ethnicity prior to (2/17–2/28/2020) and after (3/23–4/3/2020) scaled-up telemedicine implementation to address the Covid-19 pandemic at the UCSF General Internal Medicine Primary Care Practice (P=0.006 using chi-squared test). A smaller proportion of visits with vulnerable populations occurred after implementation.
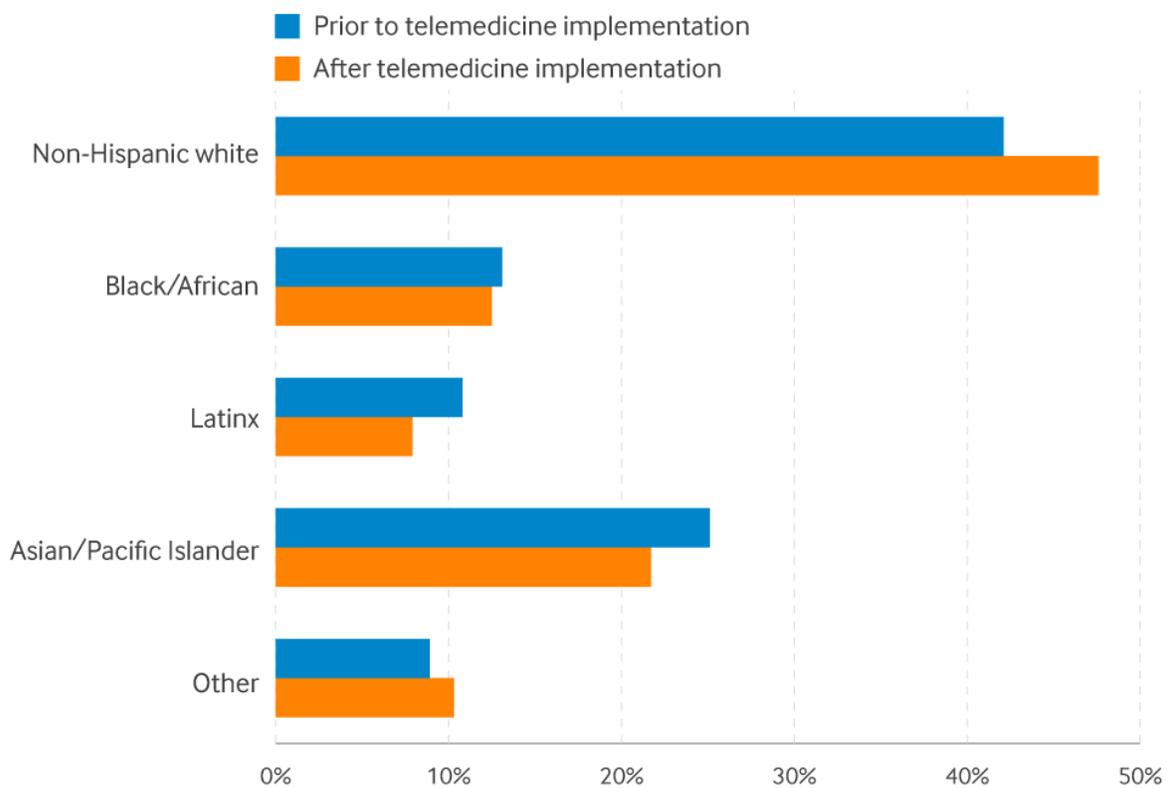
Source: The authors
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Develop Solutions to Mitigate Barriers to Digital Literacy and the Resources Needed for Engagement in Video-Visits

While the majority of adults in the United States own smartphones,[10] having access to a video- and data-enabled device does not guarantee having the digital skills to use a specific video application to conduct a visit. Patient-facing health apps have poor usability for populations with limited health literacy[19]; additionally, few digital health tools explicitly consider digital literacy, health literacy, age, or English proficiency in their design.[20,21] Most health systems do not provide training or teaching to populations on how to use these tools, though studies have shown this to be an effective approach for ensuring adoption of digital health tools.[22-24] To address this, at our academic practice we have started an outreach program to all patients ≥65 years old; staff members contact patients with scheduled visits by phone and walk them through setting up our video platform application and practice connecting to the video.[25]

To achieve this time-intensive work and offload clinical administrative staff, we have recruited members of our health system community who have newly available time (e.g., clinical research coordinators, medical students) to help. At our safety-net practice, we have created video tutorials as well as sample workflows (Figure 3) about how to set up and conduct video visits.[26] At both sites, these changes have been inclusive of the language needs in our patient populations. To develop and disseminate materials (e.g., video tutorials), clinicians and health systems can consider partnering with local organizations, including libraries and community-based organizations as well as patient advocacy/advisory groups, many of whom have longstanding expertise in digital literacy training.

FIGURE 3

Sample Clinic Workflow for Conducting Remote Visits

This diagram demonstrates a sample workflow for conducting remote visits, and specifically highlights opportunities for choosing video visits when possible. It can be adapted to different clinical environments.

Completed by clinic staff before visit

- Action item
- Decision point
- Video visit
- Phone visit

Patient scheduled for phone appointment

Clinic staff calls to confirm their appointment time

Able to reach patient to confirm appt time? — Yes → Offer video visits as an option for upcoming appointment

Able to reach patient to confirm appt time? — No → Patient registered for patient portal?

Patient registered for patient portal? — Yes → Secure message to offer video visit, provide Zoom instructions

Patient registered for patient portal? — No

Offer video visits as an option for upcoming appointment → Patient interested in video visit?

Patient interested in video visit? — Yes → Help patient download Zoom, practice using app

Patient responds before visit? — Yes → Patient interested in video visit?

Patient interested in video visit? — Not at this time

Patient responds before visit? — No

Completed by provider at time of visit

Help patient download Zoom, practice using app → Provider calls patient, gives provider meeting ID

Provider calls patient at scheduled time, assess interest in video visits

Provider calls patient, gives provider meeting ID

Patient interested in video? — Yes → Patient has a smartphone or computer?

Patient has a smartphone or computer? — Yes → Help patient download zoom (1-2 min), give provider meeting ID

Help patient download zoom (1-2 min), give provider meeting ID → Conduct Zoom video visit

Provider calls patient, gives provider meeting ID → Conduct Zoom video visit

Patient has a smartphone or computer? — No → Conduct telephone visit

Patient interested in video? — No → Conduct telephone visit

Source: UCSF Center for Vulnerable Populations at Zuckerberg San Francisco General Hospital
NEJM Catalyst (catalyst.nejm.org) © Massachusetts Medical Society

Strategies to mitigate resource barriers include helping patients obtain devices (e.g., used/ refurbished laptops or iPads, low-cost phones, and plans through the Lifeline program[27]) and increasing access to broadband Internet (e.g., low-cost commercial services available to seniors and low-income adults). Broadband access has been shown to be a crucial determinant in use of digital health tools, such as patient portals.[28] Lack of broadband access is also likely to pose a barrier to video visits, as broadband often facilitates better video quality and does not usually come with a

monthly cap on data download/upload compared to cell phone data. Given this, health systems could make patients aware of newly free or reduced-cost broadband Internet expansion occurring in many parts of the country. The National Digital Inclusion Alliance maintains a list of nationwide broadband plans that are <$20/month.[29] Many local governments have also collected resources about low-cost Internet for their residents.[30,31]

Remove Health System–Created Barriers to Accessing Video Visits

Some barriers to video visits have been artificially created by inflexible health system processes or workflows. Examples of this include requiring that patients are enrolled in the patient portal, no plan for interpreter inclusion, and failing to elicit technical or logistical challenges when scheduling video visits. In some health systems, patient portal enrollment is a requirement for video visits. Because it is well documented that vulnerable populations are less likely to use patient portals,[23] this requirement almost ensures inequitable access. One of our practices previously had this policy but has since revised its approach to offer video visits to every patient — even those who have not activated their patient portals. Several colleagues have noted that many patients without prior portal use have expressed interest and successfully engaged in video visits, consistent with literature that patients are interested and willing to do video visits with a clinician they already know.[32]

> " *Patient-facing health apps have poor usability for populations with limited health literacy; additionally, few digital health tools explicitly consider digital literacy, health literacy, age, or English proficiency in their design."*

Adequate language interpreter access in video visits should be guaranteed. Many video applications have the capability of calling out to telephone interpreters. Our health systems have created brief tip sheets and instructions to help ensure all providers know how to use this resource. In addition to on-demand access to telephone interpreters and scheduling of American Sign Language interpreters to join a visit via video, we are working with our health system on innovative ways to automatically dispatch staff interpreters to join visits as video interpreters.

For many patients, participating in a video visit may require planning to ensure availability of a family member/friend to help navigate technical challenges or access to a video-enabled device, private location, or adequate Internet or data bandwidth. This type of planning may be necessary if individuals share devices with others, live in a group setting without a private room, or do not have reliable access to electric outlets to keep devices charged. Health systems should actively screen for these types of barriers to video visits when scheduling visits and work with their patients to mitigate these barriers. For example, scheduling on a day and time that considers their restrictions may help. Alternatively, though video visits are preferable, if they are ultimately not possible, systems could determine whether some patients are better served by telephone or in-person visits instead.

With their firsthand experience, frontline clinicians may be more aware than leadership of telemedicine barriers. We have spoken to several clinicians who have adapted their own clinical practice in an attempt to ensure outreach to all patients. However, system-wide changes are required to facilitate more expedient and sustainable approaches to ensuring telemedicine access for all patients. These changes cannot occur without system leadership awareness and buy-in. Therefore, although system and practice leaders are busy, frontline clinicians should sound the alarm early about potential disparities in telemedicine access so that leaders can facilitate changes to reduce disparities now and actively consider the impact of any future changes on equity.

Advocate for Policies and Infrastructure that Facilitate Equitable Telemedicine Access

We strongly recommend all clinicians advocate for changes at local, state, and federal policy levels that: (1) expand low-cost or free broadband Internet access temporarily (and potentially permanently)[33]; (2) fund equipment purchase and development of digital infrastructure for federally qualified community health centers that may have had fewer telemedicine services prior to Covid-19[34,35]; and (3) ensure pay parity for both telephone and video visits by all payers (especially Medicaid). Through several federal actions including Section 1135 waivers, many state Medicaid programs have expanded telehealth, but it has not been systematic and often lags behind Medicare's policies.[36] Given its patient population, Medicaid changes are crucial to ensuring equity. Partnering with or supporting organizations working on these efforts — either by organizing within the medical community for digital access and literacy or expanding capacity for government, nonprofit, and community-based organizations to do this work — can be effective ways to advocate for long-term changes that support telemedicine equity.

> " *We strongly recommend all clinicians advocate for changes at local, state, and federal policy levels."*

We hope these early findings and recommendations will guide clinicians, health systems, and policy leaders as they continue to ramp up support for telemedicine services. With estimates that some social distancing measures may need to continue for at least 1 year,[37] it is clear that telemedicine will continue to play an increasingly prominent role in health care delivery. Assuming payers continue telemedicine reimbursement, it is also likely that patients and clinicians will want to continue some care delivery via telemedicine after the Covid-19 crisis.[38] Still, even with all of the demands associated with the coronavirus pandemic, we need to keep equity at the forefront. Disparities in access to telemedicine care today can easily exacerbate the preexisting challenges in providing primary care and chronic disease management for vulnerable populations. By employing simple, effective strategies for increasing the reach and adoption of digital health now, we may mitigate disparities resulting from the current crisis and be better positioned to ensure more equitable telemedicine in the future.

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ARTICLE

Best Practices for a Covid-19 Preparedness Plan for Health Systems

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To combat the Covid-19 crisis, health systems leaders need a clear, systematic approach to quickly evaluate critical needs and identify areas of weakness. In addition, to flatten the curve of the rates of infection and hospitalization, health systems need to proactively deploy a robust preparedness strategy. This compilation of best practices for Covid-19 preparedness is based on established guidelines and firsthand experiences on the front lines of the Covid-19 pandemic. The cornerstones of an effective Covid-19 preparedness plan for a health system are: (1) mitigating local transmission; (2) conserving, supporting, and protecting staff; (3) eliminating nonurgent strains on the system; and (4) coordinating communication. Health systems should not wait until they face a surge in Covid-19 cases to implement a comprehensive response. By acting early, health systems may avoid being crippled by crisis and continue to be operational and provide critically important care.

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Introduction

In times of crisis, health systems leaders need a clear, systematic approach that will enable them to quickly evaluate critical needs, identify areas of weakness, and develop a strategic plan of attack. Given the rapidly evolving Covid-19 pandemic and the speed of its spread, health care organizations across the nation are frantically deciding which steps are needed to prepare for Covid-19 while continuing usual health care delivery operations.

We provide a compilation of best practices for Covid-19 preparedness that will allow health systems leaders to rapidly identify key areas to address. Recommendations are based on established guidelines and frontline experiences from a national collaboration of 18 providers with collective expertise in quality improvement, patient safety, health care administration, and clinical care on the front lines of the pandemic. All collaborators are Presidential Leadership Scholars, Aspen Institute Health Innovators, or Eisenhower Fellows, and their teams.

The cornerstone of a health system's Covid-19 preparedness plan needs to address the following critical elements: (1) mitigating local transmission; (2) conserving, supporting, and protecting staff; (3) eliminating nonurgent strains on the system; and (4) coordinating communication.

Mitigating Local Transmission

Hospitals and clinics are hubs for the spread of Covid-19.[1] Three core strategies should be taken to minimize unnecessary exposure and transmission of Covid-19: (1) limit those entering the health care facility; (2) reduce staff to essential personnel; and (3) screen all people entering the facility.

Limit Those Entering the Health Care Facility

Limiting the number of individuals who enter the hospital and clinic is essential to help protect patients and health care workers from Covid-19 exposure and to mitigate local transmission. In addition, patients are at risk for exposure to Covid-19 in transit to — and during — their visit.

Patients should remain at home unless they require urgent or emergent medical care. Instead, telemedicine should be utilized as the default approach. Telemedicine allows continued care while reducing unneeded exposure to patients and health care workers.[2,3] Although reimbursement and policy barriers have prevented widespread adoption of telemedicine, legislation as of March 6, 2020, reduced such barriers by allowing Medicare fee-for-service billing for telemedicine services.[4] In addition, restrictions surrounding patients and physicians being in different states have been relaxed. The United States Veteran Affairs Department issued a policy statement on March 18, 2020, stating any platform of video communication, including FaceTime, Google Hangouts, Skype, and others, are allowed for telemedicine. Furthermore, the U.S. Centers for Medicare & Medicaid Services (CMS) has waived penalties for HIPAA violations when serving patients in good faith through these modes of communication.[5]

Visitors and vendors should be limited or excluded altogether, as they could be potential vectors of spreading infection. While some hospitals employ passive strategies to deter visitors, implementing

strict visitation policies at health care facilities is essential.[6] Though many facilities have chosen to exclude all visitors, some are allowing visitors only in extenuating circumstances. In those instances, any visitor should remain in the room of the person they are visiting. Patients who need to be accompanied (such as minors, those with cognitive or developmental delays, behavioral concerns, obstetric patients needing support, or patients undergoing a procedure) should be allowed no more than one person with them. Patients at the end of life or those in hospice care may need more lenient guidelines. Elderly or immunocompromised visitors should be strongly discouraged from visiting facilities in order to protect themselves. Confirmed Covid-19 patients, and Patients Under Investigation (PUIs) should not be allowed to have visitors in their room.

Reduce Staff to Essential Personnel

To limit hospital and clinic staff foot traffic, non-frontline health care workers, defined as those not involved in direct patient care, should be deemed nonessential personnel and asked to work from home, if possible.

> *In times of crisis, health systems leaders need a clear, systematic approach that will enable them to quickly evaluate critical needs, identify areas of weakness, and develop a strategic plan of attack."*

This goal can be accomplished by canceling and rescheduling any nonurgent procedures (discussed more below), converting in-person meetings to virtual meetings, and implementing mechanisms for telework and telehealth. Paring down in-person staff to only essential personnel (including physicians, advanced practice providers, nurses, technicians, engineering and environmental management workers, and food service workers) will not only mitigate local transmission, but also provide for staff conservation and protection. Students have been removed from clinical clerkships at many hospitals, not only to limit foot traffic, but also for their own protection.

Among essential health care workers, foot traffic with PUIs and confirmed Covid-19 cases should be minimized to every degree possible. Any procedures for PUIs or confirmed Covid-19 cases should be performed by the attending physician to limit exposure to trainees who may require more than one attempt in procedures such as intubations or bronchoscopies. Such strategies will also minimize the use of essential supplies, a vital component of crisis-management strategies for Covid-19.

Measures to reduce nonessential foot traffic among non-PUIs should also be enforced to minimize cross-infection. These measures include rounding on patients using fragmented teams (e.g., if on a team with two residents, rounding on one resident's patients, then separately rounding on the other resident's patients), communicating with other patient care team members (e.g., consult services, social work, etc.) via phone instead of face-to-face, and minimizing coincidental congregation in patient rooms (e.g., waiting until the nurse is finished taking vital signs and exiting the room before the primary health care team enters the room to examine the patient).

Screen All People Entering the Facility

Anyone entering the health care facility (patients, staff, visitors, and vendors) should be screened outside the point of entry for Covid-19 risk. Screening may be through active means (assessing fever, asking about known or presumed exposure, symptoms, and recent travel), but if that is not possible, at the very minimum, passive screening (signage at every entrance with screening questions, directing self-identified at-risk individuals to a triage area) should be enacted (Figure 1).

FIGURE 1

Covid-19 Active Screening Template

1. Do you have a fever, chills, new or worsening cough, shortness of breath, sore throat, myalgias, gastrointestinal symptoms or other flu-like symptoms?

    _____Yes   _____No

2. Have you traveled to any countries or regions with positive cases of Covid-19 in the last 14 days?

    _____Yes   _____No

3. Have you been in close contact with anyone, including health care workers, confirmed to have Covid-19?

    _____Yes   _____No

Screen Positive_____   **Screen Negative_____**

Source: The authors
NEJM Catalyst (catalyst.nejm.org) © Massachusetts Medical Society

If a patient screens positive and is stable, they should be given a mask and sent to a triage area for further evaluation by staff in full personal protective equipment (PPE). If symptoms are mild and they are stable, they could be sent home with anticipatory guidance for self-care, when to seek emergency care, and instructions for self-isolation. If the patient screens positive and exhibits respiratory compromise, including hypoxia or respiratory distress, they should be admitted for further diagnostic workup and management. If patients screen negative, they should be allowed entry as normal. For health care workers, if they screen positive, but appear medically stable, they should be sent home for self-quarantine, per the Centers for Disease Control and Prevention

(CDC). If possible, two separate screening stations should be established — one for patients and visitors and a separate one for health care workers — to minimize congregation in screening areas and decrease risks of cross-infection.

Facilities may also consider implementing drive-through screenings in parking garages or other spaces outside the facility, thereby preventing patients and visitors with an infection risk from entering the hospital.[7] Additionally, facilities should encourage patients and visitors to call into the hospital or clinic ahead of time if they feel poorly or have presumptive Covid-19 symptoms to ensure they go to triage stations and further reduce exposing others at screening stations.

Pitfalls regarding screening: Despite proactive outreach, patients are still likely to present to outpatient clinics for nonurgent care. In resource-poor communities, many patients lack stable housing, phones, or Internet access and can be difficult to reach. In addition, patients, after visualizing the bottleneck upon entry to the hospital or clinic, may mischaracterize their subjective symptoms during mandatory screening to gain entry faster, only later to reveal they have concerning symptoms of Covid-19. Given that pulmonary pathology can be an early sign of Covid-19, auscultating the lungs in addition to temperature check may help identify PUIs.[8,9]

Conserving, Protecting, and Supporting Staff

Health care systems must rapidly evolve staffing protocols to keep their health workforce strong enough to treat rising volumes of patients. In China, as of March 12, 2020, an estimated 3,000 health care workers had been infected and 22 died.[10] In Vacaville, California, one case of Covid-19 — the first documented instance of community spread in the United States — resulted in 200 hospital workers being quarantined and unable to work for weeks.[11] As community transmission of Covid-19 explodes in the United States, health care systems must be flexible with staffing, paying key attention to conserving, supporting, and protecting frontline staff.[12] Strategic workforce planning should be developed and preemptively implemented well before the number of Covid-19 infections surges locally.

Health care facilities should also rotate staff in high-risk settings to minimize exposure, consider maintaining minimal staffing levels in house, and keep other colleagues at home for back-up and to deliver telehealth services and run virtual clinics. It is imperative that health care facilities postpone elective procedures. This approach will protect staff from unnecessary exposure to Covid-19; preserve PPE equipment, especially surgical masks, eye protection, and gowns; release anesthesiologists to provide ICU care; and conserve back-up staff for when in-house staff become incapacitated. Delaying elective surgeries will cause financial strain for hospitals and health systems. Rural hospitals are particularly precarious and risk closure due to revenue loss. Congress has responded with $100 billion in hospital funds through the CARES Act.[13,14]

> *" The cornerstone of a health system's Covid-19 preparedness plan needs to address the following critical elements: (1) mitigating local transmission; (2) conserving, supporting, and protecting staff; (3) eliminating nonurgent strains on the system; and (4) coordinating communication."*

Supporting frontline clinical and administrative staff is paramount. Expanding the essential clinical workforce will be instrumental in doing so. The governors of New York, California, and Colorado, among others, have asked retired doctors and nurses to reenter clinical care to create a reserve pool of health care professionals to replace frontline staff who become ill or need respite.[15]

Revising approaches to clinical training and utilization of resources can contribute to supporting essential staff. Traditionally, attending physicians round on patients with a large team of trainees and advanced care providers; during Covid-19, only a skeleton crew should visit patients confirmed or suspected to have the disease. Instead of PUI consults being seen by the student, intern, chief resident, and ultimately the attending, much of the hierarchical redundancy must be cut to promote safety and efficiency and preserve PPE.

As states enact more stringent social distancing measures and order nonessential businesses to close, health care workers struggle to find adequate childcare while schools and daycare centers temporarily cease operations or convert to distance learning. Although some employers provide paid leave to their health care staff, this is not universal, and there are other ways to support frontline staff. Nonessential staff and trainees, including medical students and some residents who are barred from working at the hospital during the outbreak, may be able to fill in this gap by assisting physicians, nurses, and other essential staff with childcare and other needs. University of Minnesota medical students have assisted more than 160 providers in caring for their children.[16]

Protecting Frontline Employees Using Personal Protective Equipment

The use of PPE for health care personnel on the front lines is vital for the safety of caregivers. Currently, the CDC recommends the use of PPE in all known or suspected cases of Covid-19, including: (1) face mask or respirator, (2) eye protection, (3) non-sterile gloves, and (4) isolation gowns.[17] For aerosol-generating procedures (such as sputum collection), N95 respirators or Powered Air Purifying Respirators (PAPRs) are recommended. These CDC recommendations are widely accepted, currently mirroring the inpatient PPE care recommendations from the World Health Organization, the Surviving Sepsis Campaign on the Management of Critically Ill Adults with Covid-19 from the Society of Critical Care Medicine, and the European Society of Intensive Care Medicine.

All health care personnel caring for suspected or confirmed Covid-19 patients should be instructed in the proper donning and doffing of PPE, as well as how to properly dispose or disinfect used PPE. Refresher training should be offered. N95 respirators must be fit-tested to the individual, and PAPR education needs to be provided for those utilizing respirators.

Table 1. Practices to Conserve Resources During the Covid-19 Pandemic

Resource	Conservation Practice
Covid-19 tests	• Only use tests for those who need it, or when determining public health ramifications (e.g., testing a sick health care worker who was recently in contact with other immunocompromised patients) • Consider whether the test will change management and decision-making processes prior to using a test kit • Work toward transitioning from CDC testing to in-house testing capabilities
PPE	• Reschedule elective procedures and surgeries • Keep PPE in secure locations to deter unnecessary use and theft • Reuse PPE (e.g., goggles that can be cleaned and reused, wear N95 masks until visibly soiled or torn or disinfected, keep single-use gowns in the room of patient) • Limit number of staff who enter each patient's room • Find ways to make or manufacture PPE (e.g., 3-D printing, sewing patterns)
Equipment	• Reschedule elective procedures and surgeries to conserve resources for critically ill patients • Borrow from areas (e.g., operating rooms), outpatient centers, other hospitals that have equipment that is not in use
Hospital beds	• Reschedule elective procedures and surgeries that would require a hospital bed • Use phone services to triage sick patients and keep low-acuity patients at home to self-quarantine • Utilize telemedicine services

Notes: *PPE = Personal Protective Equipment; CDC = Centers for Disease Control and Prevention. Source: The authors.

Pitfalls regarding supplies: Despite recommendations to use strict PPE protocols when seeing PUIs and confirmed Covid-19 cases, there are critical shortages of essential equipment and services, including PPE, lab tests, and imaging. Hospitals must balance rationing resources to meet public health needs with the ethical dilemmas that come with doing so.[18] Forward-thinking and creative solutions for both conserving and obtaining additional resources through alternate supply chains can help mitigate shortages, as can ensuring hospital staff have up-to-date information on PPE guidelines and recommended practices (Table 1).

Eliminating Nonurgent Strains on the System

The Covid-19 pandemic does not change the need for the operating room, the gastrointestinal suite, or the dental clinic for many patients. However, we must minimize stress on systems during this crisis. To do this, facilities need to postpone elective procedures. This approach has a significant financial impact on hospitals because elective procedures are a major source of revenue. However, reducing cross-infection risks and conserving resources must be the first priority. Furthermore, cancellation of elective procedures has been recommended by CMS and multiple state licensing boards and health departments.[19] Reducing procedure volume in this way will minimize PPE consumption, decrease unnecessary Covid-19 exposure, save valuable critical care and floor rooms, conserve medications and blood products (which are already thinning with the millions of Americans self-isolating), open procedure rooms for more emergent cases, and provide the opportunity to move health care workers and equipment (e.g., ventilators, infusion pumps, monitors) where they are urgently needed.

However, there is not broad agreement on a standard definition of *elective*. As a result, there is wide variation in how hospital systems and group practices have adopted, or in some cases, not adopted these recommendations during the Covid-19 crisis.[20] The American College of Surgeons (ACS) published guidelines[21] establishing a triage system that allows providers to objectively assess the urgency of surgical cases (Table 2). These have now been also adopted by CMS. Different surgical specialty societies have put forth field-specific guidelines.

Table 2. Triaging Elective Surgeries

Tier	Definition	Locations	Examples	Action
Tier 1	Tier 1a: Low-acuity surgery/ healthy patient Outpatient surgery Not life-threatening illness	HOPD ASC Hospital with low Covid-19 census	Carpal tunnel release Penile prosthesis EGD (esophagogastroduo-denoscopy) Colonoscopy	Perform at ASC or Postpone surgery
	Tier 1b: Low-acuity surgery/un-healthy patient			
Tier 2	Tier 2a: Intermediate-acuity surgery/healthy patient, not life-threatening but potential for future morbidity and mortality	HOPD ASC Hospital with low Covid-19 census	Low-risk cancer Nonurgent spine Ureteral colic	Perform at ASC or postpone surgery
	Tier 2b: Intermediate-acuity surgery/unhealthy patient			
Tier 3	Tier 3a: High-acuity surgery/ healthy patient	Hospital	Most cancers Highly symptomatic patients Emergent disease pro-cesses	Do not postpone
	Tier 3b: High-acuity surgery/un-healthy patient			

Notes: HOPD = Hospital Outpatient Department; ASC = Ambulatory Surgery Center. Source: The authors, based on American College of Surgeons. COVID 19: Elective Case Triage Guidelines for Surgical Care. Updated March 27, 2020. Accessed March 24, 2020. https://www.facs.org/-/media/files/covid19/guidance_for_triage_of_nonemergent_surgical_procedures.ashx.

However, patients may feel their medical needs are deemed less important when told their procedures will be postponed. Thus, while upholding ACS guidelines, comfort and assurance should be provided, along with allowing opportunity for shared decision-making. This is essential, as health care professionals can provide calm and reason during this pandemic.

Coordinating Communication

With daily changes in the Covid-19 crisis, communication between senior leadership and frontline health care staff on a regular basis is essential. Effectively carrying out this communication requires (1) establishing a centralized Covid-19 response team; (2) disseminating daily staff-wide information; and (3) hosting virtual town halls or broader virtual staff forums at least twice per week, which should be recorded and available asynchronously for those who cannot be spared from clinical duties during the forums.

> " *Health systems should not wait until they are at a crisis point in the midst of a surge in Covid-19 infections."*

The centralized Covid-19 response team should include supervisors of each of the clinical and administrative departments and should meet every morning to review the latest developments, develop a cohesive plan for the day, and coordinate among departments. Nightly update emails should be sent to all staff to communicate amendments in clinical and operational protocols; staff should be required to review these communications regularly. In addition, a single shared intranet site for the latest information minimizes the risk of staff using outdated protocols or documents.

Finally, virtual town hall meetings will allow every staff member an opportunity to be part of the discussion. These can be effectively led by a clinical lead, such as the chief medical officer or chief

of staff. There should also be a system to allow staff to report issues to leadership, with the option for the report to be anonymous.

Coordinating communication with patients before they come to the facility, during their stay, and as they leave the hospital is also important. Clinical training on communication with patients on quarantine instructions should be implemented, as well as active evaluation for vulnerabilities (e.g., a patient's housing situation). As patients leave the hospital or clinic, this general information should be given both in oral and written form.

Essential Considerations

During the Covid-19 crisis, health system leaders need a concise, systematic approach to quickly evaluate critical needs, identify areas of weakness, and develop a strategic plan of attack. This compilation of best practices for health system preparedness for Covid-19 is based on firsthand experiences on the front lines of the Covid-19 pandemic. There are many other important considerations not discussed here, such as treatment for Covid-19–infected staff and patients, special populations including low-income, pediatric, and transplant patients, and how to obtain additional PPE. However, these are the cornerstones of any effective Covid-19 preparedness plan for a health system: (1) mitigation of local transmission; (2) staff conservation, support, and protection; (3) eliminating nonurgent strains on the system; and (4) coordinating communication.

Health systems should not wait until they are at a crisis point in the midst of a surge in Covid-19 infections. Instead, action needs to be taken proactively. Through early implementation of a strategic preventive plan, health systems may avoid being crippled by these challenges, and be able to continue to be operational and provide critically important care.

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Innovative ICU Physician Care Models: Covid-19 Pandemic at NewYork-Presbyterian

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New York is the epicenter of the Covid-19 pandemic with over 288,000 confirmed cases. The rapid rise in critically ill patients with long lengths of stay has put enormous strain on hospitals. Over the last month, NewYork-Presbyterian, in partnership with Weill Cornell Medicine and Columbia University Vagelos College of Physicians and Surgeons, has redeployed physician teams to over 550 incremental ICU beds, structured around a supervised pyramid-staffing model. We supported these new teams by reimagining care models, utilizing e-consultation (e.g., e-ICU), and extending palliative care. Lessons learned include the need to maintain flexibility, off-load tasks to novel team members, and embrace the use of technology.

NewYork-Presbyterian (NYP) saw our first Covid-19 patient in early March 2020, and in the following 45 days, our hospital system admitted over 7,600 Covid-19 patients. As we prepared for the impact of Covid-19, it was clear the sheer number of critically ill patients, coupled with the long intensive care unit (ICU) stays (averaging 14–21 days), would necessitate significant growth in our critical care capacity.

NYP is a 10-hospital integrated academic health care system in New York City. In collaboration with two renowned medical schools, Weill Cornell Medicine and Columbia University Vagelos College of Physicians and Surgeons, NYP is recognized as a leader in medical education, groundbreaking research, and innovative, patient-centered clinical care. As such, it was an imperative to redefine the ICU model of care to accommodate an increase from 421 ICU beds to nearly 1,000 critical care beds across our enterprise within 3 weeks. In preparation, a multidisciplinary team consisting of critical care physicians (pulmonary, surgery, anesthesiology, and cardiology) met to develop the physician staffing complement for a Covid-19 ICU. As our experience with Covid-19 grew, the key

elements of our success were maintaining a high degree of flexibility, sharing best practices, and rapidly deploying teams across our enterprise.

Care Model

We built our revised ICU care team around the concept of a supervised pyramid-staffing model (Figure 1). As nearly 100% of Covid-19 ICU patients were intubated with acute respiratory distress syndrome (ARDS), physicians comfortable with complex ventilator management were essential to the care team and at the apex of the pyramid model. To maximize this skill set, these ICU physicians (termed ICU oversight) were elevated to a consultant role, overseeing at least two units and doing ventilator rounds twice daily. The traditional ICU attending role became a physician (termed ICU lead) who had critical care capabilities — in our model this was a medicine subspecialist (e.g., cardiology, nephrology, hospitalist), surgical subspecialist (e.g., transplant, general surgery, cardiothoracic surgery), or anesthesiologist.

FIGURE 1

Supervised ICU Physician Pyramid-Staffing Model

Role	Description
ICU Oversight	ICU oversight supervises 2+ units with at least a 20:1 patient to MD ratio (up to 50:1)
ICU Lead	ICU lead is a critical care capable attending with at least 10:1 patient to MD ratio (up to 20:1)
ICU Second (Fellow equivalent)	ICU second manages same ratio as lead (10:1 to 20:1) and in larger units can be co-lead
ICU First Call (Resident equivalent)	ICU first call is the frontline role taken by residents, CRNAs, PAs, and NPs at a 3:1 to 5:1 ratio
Float Call	Float call taken by residents for immediate tasks while training to later move into "first call" role

Source: NYP/CUIMC/WC COVID-19 critical care medicine planning committee*
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> **❝** *Our experience in New York demonstrates that the swift of growth of critically ill patients requires creatively utilizing all clinicians within a medical center."*

In New York, by executive order of the governor, we credentialed all board-eligible ACGME fellows as attendings, which allowed senior critical care fellows to serve as ICU leads. These physicians were supported by an ICU second (medical, surgical, and some pediatric subspecialty fellows). In units with 18–20+ patients, the ICU lead and ICU second split the unit into two teams to facilitate efficient rounding. The ICU first call was the frontline role staffed by a wide variety of residents, advanced practice providers (from inpatient and outpatient settings), and certified nurse anesthetists (CRNAs). This group started at a 3:1 patient to clinician ratio but quickly increased to a 5:1 ratio. Finally, there was a float call created for residents training to take on first call roles or deploying into roles such as the family support liaison. Equally important was the development of a parallel nursing pyramid-staffing model with critical care nursing in the apex oversight role and strong respiratory therapy support.

Supervised Physician Pyramid-Staffing Model

Physician Redeployment

The surge ICUs, defined as ICU beds outside of a licensed ICU setting, were rapidly constructed by a team of facilities, biomed, and information technology specialists. These surge beds were created in medical-surgical (med-surg) units, in procedural areas such as the cardiac catheterization lab and in the operating room (OR) units. As critically ill patients came into the hospital faster than ICU beds opened, a third model evolved: the emergency department ICU (cohorted critical care patients awaiting admission). Use of appropriate OR anesthesia machines capable of providing necessary invasive ventilation allowed us to meaningfully increase our ventilator capacity. However, anesthesiologists and CRNAs are the only clinicians that routinely manage these machines. As such, anesthesia critical care physicians staffed the OR ICUs as ICU oversight, while pulmonary critical care physicians predominantly staffed the med-surg ICUs and ED ICUs.

The pyramid model guided redeployment; a key principle was to preserve ICU-capable physicians for critical care roles. Our success in rapidly deploying teams was based on three main elements:

1. Categorization of faculty, fellows, and residents into levels of the pyramid they could cover outright or with some training. The Columbia Doctors and Weill Cornell Medicine physician organizations created redeployment committees that managed the lists of available faculty, fellows, residents, and advanced practice providers (APPs — nurse practitioners, physician assistants, CRNAs) in partnership with the Graduate Medical Education office and held daily huddles to discuss intra-campus redeployment.

2. Early development of bed expansion plans so physician redeployment was targeted to incremental capacity. Based on the surge plans, *de novo* ICU teams formed and members met via video conference for advanced planning.

3. "Just-in-time" training of teams — including access to regularly updated electronic Covid-19 protocols and guidelines, video didactics, and a buddy system (pairing new ICU leads with seasoned intensivists prior to taking over a unit).

As NYP is an integrated health care system with 10 hospitals located in five counties within the New York metropolitan area, there was a central process to request clinical resources that informed a daily inter-campus redeployment call. We developed a volunteer program to bring physicians (intensivists, hospitalists, and emergency medicine physicians) to assist during the Covid-19 crisis. We have had approximately 250 physicians join our teams including physicians from peer academic centers less affected by Covid-19. It is worth noting, as units filled with Covid-19 patients, treating one disease afforded us the flexibility to create blended teams from across specialties — one of our ICUs teams included a cardiothoracic surgery attending, a cardiology fellow, and residents from orthopedics, pediatrics, and psychiatry.

Clinical Innovation

Within 3 weeks of our first case, Covid-19 patients occupied over 70% of our beds. The hallmark of this period of rapid hospital transformation was the ability to fail fast and continually innovate. Below are some of the key elements we adopted to support our Covid-19 ICU care model. Optimizing Care Teams

As we created teams that were new to the critical care setting, off-loading and centralizing certain elements of care made a large difference. We developed specialized teams and roles that were critical to our ICU team's success:

Procedure teams: Surgical subspecialists and interventional radiologists performed central line, arterial line, and chest tube insertions throughout our ICUs and stepdown units.

Airway teams: Experienced attending anesthesiologists performed all intubations (key aerosol-generating event).

> " *As our experience with Covid-19 grew, the key elements of our success were maintaining a high degree of flexibility, sharing best practices, and rapidly deploying teams across our enterprise."*

Proning teams: Physical therapists trained to assist in proning of patients in units where this critical technique was not routinely performed.

Imaging teams: Radiology faculty and house staff performed bedside imaging for line placement, cardiac function, and lung pathology. Portable imaging requirements surged in response to increased ICU volumes, and the use of alternative imaging modalities, such as ultrasound, provided real-time information to the clinical teams.

Renal replacement therapy teams: Perfusionists trained in continuous renal replacement therapy (CRRT) with existing critical care staff and were supported by nephrology personnel.

Family support liaisons: Dedicated clinicians rounded with the teams and provided updates to families via phone or a video connection. Caring for patients whose families are unable to be in the hospital is unsettling and challenging for care teams. This liaison allowed us to have a consistent team member who updated families.

Utilizing Technology

Federal relaxation of telehealth regulations allowed for novel clinical use cases. We moved to an inpatient tele-consult model to allow subspecialists to reach more patients and to decrease staff exposure and personal protective equipment (PPE) utilization. As new critical care and step-down beds were opened, we developed an e-ICU program in some of our hospitals where physicians did twice-daily video enabled ventilator rounds and were available for critical care consultation. We staffed the e-ICU program internally and with colleagues from our peer academic institutions. Finally, we created a large remote patient monitoring program for moderate-risk patients discharged from the emergency department and from our inpatient units to preserve hospital beds for critically ill patients.

Extending Palliative Care Resources

As our Covid-19 patient population grew, embedded palliative care support was essential to assist with goals of care discussions and complex family conversations exacerbated by the no-visitor policy. We also developed dedicated palliative care/hospice units at multiple hospitals in our system. When possible, we embedded a palliative care physician in the emergency department to provide support to our emergency medicine colleagues. Finally, to extend the reach of our palliative care teams, we trained psychiatry faculty and residents to participate in family discussions and developed collaborations with other academic medical centers to enhance our program through e-palliative care consultation.

Rapid deployment of clinicians and innovative care models are critical to success during the Covid-19 pandemic. The cancellation of elective cases and the consolidation of outpatient practices created a large pool of clinicians available for redeployment. Our experience in New York demonstrates that the swift of growth of critically ill patients requires creatively utilizing all clinicians within a medical center.

Lessons Learned

Our Covid-19 journey has taught us the importance of building a dynamic surge and staffing model, the benefit of off-loading tasks from new critical care teams, and the need to use technology to extend our specialists across a larger inpatient census. As our hospitals became focused factories for one disease, newly formed teams quickly felt comfortable caring for critically ill Covid-19 patients. However, the last lesson learned is that timing is important. The first day of caring for a new ICU patient with Covid-19 is challenging. Teams must perform multiple procedures, stabilize shock, and initiate family discussions by phone. Staggering admissions across a variety of units allows for smoothing of this intense work. Additionally, we learned that ICU beds in nontraditional

settings (i.e., OR ICUs) are best populated by patients in the middle of their ARDS course, and we moved patients to traditional ICUs when their needs were escalating. Having an ICU physician as "triage captain" was key to making these determinations and fielding transfer requests.

Yet, after the patients are settled, our ICUs have transformed into something quite different — sometimes eerily quiet settings where we wait day after day for small improvements and hope for recovery. We have learned much in the past month in New York including that Covid-19 is a formidable foe; even the ideal ICU staffing strategy cannot change that fact.

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ARTICLE

The Invisible Patient: Caring for Those without Covid-19

Thomas H. Lee, MD, MSc

Non-Covid patients are suffering health complications due to the essential effort to contain the virus. *NEJM Catalyst Innovations in Care Delivery*'s Editor-in-Chief has two recommendations to protect them.

Like everyone else in health care, I think about Covid-19 all day long. I'm exhausted from reading emails about Covid, but I don't feel like reading anything else. I spend my day on calls and emails about Covid patients, and don't have much bandwidth left for patients without Covid-19.

But, of course, they are out there. They feel like they are invisible — they actually apologize for disturbing us at this terrible time. And even though they don't have the virus, they are being deeply affected by the Covid-19 pandemic. Their care is changing — sometimes for the better, but sometimes not.

As we settle in for the long haul of this pandemic, our care redesign efforts have to accommodate their needs as well as those of Covid patients. Doing so will take a combination of strategic thinking and good management.

This problem became real to me during a 24-hour period beginning the evening of March 26, just as we *thought* we were reaching crisis mode in Boston. On that day, at the hospital where I practice (Brigham and Women's Hospital), we had 24 inpatients with Covid-19, nine of whom were in the ICU — a big presence in a 793-bed hospital. A total of 51 employees had tested positive. Four weeks later, most of those numbers had more than doubled (171 inpatients with Covid-19, 91 in the ICU, and 229 employees who had testing positive).

But during the 24 hours that began that night of March 26, three of my long-time patients had serious non-Covid events that required hospital admission. Every practicing clinician knows what these days are like — you go weeks when nothing seems to happen to any of your patients, and then suddenly, multiple terrible things happen.

One was an 82-year-old man who had a stroke. Another was an 86-year-old man who broke his wrist after falling while getting up to use the bathroom at night, and then proved too unsteady and confused in the emergency department to go home. A third was a 61-year-old man who had had a recent hip replacement, and who takes an immunosuppressant for a connective tissue disease, and now had developed an abscess that reached into the joint.

Clinicians will recognize all three as serious problems. So did the patients themselves. So did their wives. But none of their wives could accompany their husbands beyond the emergency departments. There's really only one way of describing the experiences of these patients and their families — they were in agony. As it turned out, in the days that followed, I spent much more time talking and texting with those wives than I did with the patients themselves.

From my own panel of patients and those of my friends, I could tell you about the patient with debilitating back pain for whom surgery has been put off until . . . who knows when? Or multiple patients with problems for whom emergency department or urgent care visits would ordinarily be recommended, but who are now deciding to hope for the best at home.

I know these cases are not unusual. After all, even though Covid-19 patients are filling our ICUs, ambulances, and emergency departments, life has gone on for everyone else — and with it, life-threatening medical problems have been occurring at their usual rate. And many of these non-Covid patients are suffering complications in their care due to the pandemic.

I think we can and will learn from these challenges, and we'll figure out how to prevent some of this suffering next time around — and maybe even during this pandemic. To support that progress, I have two recommendations: one that is strategic and one that is related to management.

The strategic recommendation is that we have to segment our patients as early as possible in their care journeys and keep them separate. In some instances, this concept is already active — emergency departments and ambulatory practices are making phone calls and taking other steps to keep Covid-19 patients from walking in the door with everyone else. They are steering patients with possible Covid-19 to special tents outside the emergency department. My own practice is closed, and every patient is seen virtually or, if they must be seen in person, they will go to one of two clinics — one for respiratory patients, one for everyone else.

While this is a good practice, we should go *much* further with this strategic step. Ideally, we would have some hospitals and emergency departments for Covid-19 patients, and other hospitals for everyone else — so that my three patients could have gone to a facility where their families could visit them. This kind of separation is in fact emerging in some cities where the pandemic is forcing collaboration among competitors. Acute and non-acute facilities are being designated or created for Covid patients only or for non-Covid patients only, particularly within some large delivery systems.

The management recommendation follows from the strategic step of segmentation. That recommendation is to manage the care for the different segments separately. One shouldn't do the same thing the same way for all patients — and if there was ever a time when one size does

not fit all, this is it. So, in Covid and non-Covid patients during this period of radical redesign, we should be measuring thoroughly and relentlessly what is happening to patients and what they are experiencing.

And then, we should organize to improve care, segment by segment. In short, the principles of good management matter more than ever in a crisis.

The Covid-19 crisis is like nothing in history. It *is* an all-hands-on-deck moment, except that it isn't simply a moment. A Florida health care CEO told me recently that he and his colleagues are telling themselves that they are beginning to live through a 100-day hurricane.

As we take on this challenge, we should remember that there are patients who are at risk of being temporarily invisible — the ones without Covid-19. Their suffering is real, as is that of their families. They don't have to be casualties of war. If we are strategic in how we organize our care and work relentlessly to understand and improve care in both Covid and non-Covid segments, we will have fewer moments of anguish like the ones I have witnessed.

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CONVERSATION

Looking to the Future to Prepare for Covid-19's Second Wave

Ewelina Biskup, MD, MPH, Edward Prewitt, MPP

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China's strict and interrelated clinical and social protocols played a key role in its dealing with the first phase of the Covid-19 pandemic. While many now are looking to colleagues for lessons as the novel coronavirus spreads globally, unanswered questions remain regarding long-term side effects, prospects for organ or tissue damage, identification of prognostic biomarkers, and development of therapeutics. Ewelina Biskup, MD, MPH, calls for robust data recording and the creation of a big data set to support analysis to improve care for the next waves.

Edward Prewitt, MPP, interviews Ewelina Biskup, MD, MPH, Associate Professor, Shanghai University of Medicine & Health Sciences, and Jiaotong University School of Medicine in Shanghai, China, and researcher, University Hospital in Basel, Switzerland.

Ed Prewitt: Hello, this is Ed Prewitt, Editorial Director of NEJM Catalyst. I'm speaking with Ewelina Biskup, MD, MPH, who is Associate Professor at Shanghai University of Medicine & Health Sciences and Jiaotong University School of Medicine, and is also in a research position at University Hospital in Basel, Switzerland. Ewelina is in Shanghai right now and has a lot of interesting observations about living in China amidst the Covid-19 outbreak, as well as advice for other countries. Ewelina, thanks for joining us.

Ewelina Biskup: Thank you for inviting me. I'm happy to connect.

Prewitt: Would you please begin by describing your experiences with Covid-19 in Shanghai, as well as your observations about the outbreak within the quarantine zone of Hubei?

Biskup: As a medical doctor in China, I have to say that I have been fortunate to be here in Shanghai during the outbreak. First of all, the number of cases in Shanghai is comparably low. We only have about [500] cases overall and few fatalities, luckily, which is different in Hubei where the numbers have reached over 60,000 and many more deaths.* The curve is now flattening, and I have observed a lot of measures that the Chinese government and Chinese health care system applied and implied, and they have turned out to be effective and efficient. Especially now, looking at what's happening in Europe and the USA, many lessons can be learned from China and I hope that they can still be translated into reality in many countries. The observations experienced in Shanghai were sobering. I arrived shortly before the peak of the cases, shortly before the so-called clinical diagnostic criteria had been released and the peak of the numbers had been announced by government. It gave us doctors a lot of comfort to know that there is not that much anxiety to get infected from the patient. Even if they were suspected, they were immediately transferred to Covid-designated clinics. I had seen, upon landing here, everybody under quarantine and a strict social distancing applied. The observation in daily life has been interesting. There has been a triage, not only of patients, but also of normal people, like society. For example, every compound, every building had guards at the entrance who were measuring temperature when entering and exiting the building. No nonresident was allowed to enter the building. And [in] similar strategies, strict triaging was applied for the hospital. What is important to know is that physicians who were not at the front line, physicians who were not designated to treat Covid patients barely had any contact with patients that were suspected even with the infection. There were designated clinics in the town, and they were well announced; every potential patient, every citizen, knew which clinics were those designated ones. All the other clinics were working pretty much in the routine way. However, even if a patient arrived at the clinic there were several gatekeepers — literally — so even at the gate there was, again, a check of temperature and some basic symptoms. Further, the patient went for the triage with a nurse who was doing a more intensive epidemiological and symptomatical analysis, and only when everything was negative did the patient arrive to see the doctor. It gave us doctors a lot of comfort to know that there is not that much anxiety to get infected from the patient. Even if they were suspected, they were immediately transferred to

Covid-designated clinics. Similar things were done in Hubei where super-hospitals were built in 10 days, which was phenomenal. The infrastructure was there and all the doctors were protected with [personal protective equipment] PPE and masks and special guards and garments.

Prewitt: What was the clinical response and the social response, and the interplay of these factors?

Biskup: This is an important question. The clinical response and the social response were very much interrelated and there was a balance between those, and even a slight disturbance would probably lead to subtle outcomes. On the one hand, clinically, there was a massive response from the physicians. There were teams mobilized to Hubei Province from all the provinces of China, and not only physicians were going to Hubei to help out, but they also went together with their equipment. The radiologists were working day and night because radiological findings, the CT scan, was and is one of those criteria that can define a patient even before a serological test is being done. This was helpful at the beginning, but we have to remember that all the things that we know now we didn't know then, back in January and February. Clinically, doctors were well informed, and the communication from the government down to the physicians and to potential patients and to society was effective. There were clinical guidelines that were developed and updated constantly. I recall that we have received through social media and through our channels — specific medical channels on WeChat —updates almost every day. She immediately took [a mask] out of her pocket — although it was such a valuable piece of important prevention — and she gave it to me. Socially, people were supporting each other very much. We were advised that in case we have any symptoms, fever, whatsoever, we are supposed to stay home; we are not allowed to go to the hospital. This was definitely one of the important clinical responses. Nobody was forced to go to Wuhan to help out, or to help out in the designated clinics [for] Covid patients — the patients with Covid were never [mixed] with normal patients, comorbid patients, and so on. On the social side, what I have observed, which was extremely interesting, was that the society responded very well. Communication was at the level of health literacy, which cannot be assumed is at a very high level. A big part of society is older people, and even they were stringent with the social distancing, were wearing masks. We were not allowed to leave our homes without a mask, not even to mention going to a show or any public space without a mask. Every entrance to every public space and even the residential houses always had protection with temperature checking, with registration, and so on. Even until now, everybody has an electronic QR code1 that we have to update every week, and this QR code is allowing us to go to specific places, and there's a whole algorithm behind it. Although there was a shortage of masks, to give an example of social response, I forgot my mask once in the elevator and I was there with an older Chinese lady. She said to me, "You have to wear a mask for your own protection." And I said, "I just forgot. I don't have it." She probably understood that I do not possess one. She immediately took one out of her pocket — although it was such a valuable piece of important prevention — and she gave it to me. Socially, people were supporting each other very much.

Prewitt: That's fascinating and very stringent. When we were speaking before, you mentioned that you had conducted a survey of Chinese physicians. Could you please tell us about that, what were the goals of the survey and the respondents and your findings?

Biskup: We were curious about those physicians who are not at the front line, but those who are supporting the entire rest of the population medically, helping with the situation, with the quarantine, with treating patients under the constant fear of potentially being infected, and we had about 450 responses. I will highlight the most interesting findings, which I found impressive. About 20% of the responders stated that they needed psychological support during that time, and I was happy to see that 18% answered that they actually used them. While the outpatient number was reduced by about 50%, the inpatient number was pretty stable. And while about 50% of all the responders stated that they were afraid that they could be infected by their patients, they still continued working, and — this might be an interesting point applicable for Europe and the U.S. — there were available psychological support sites specifically for medical workers, among those physicians. About 20% of the responders stated that they needed psychological support during that time, and I was happy to see that 18% answered that they actually used them. Those were really in demand. They used the resources and the resources were in place, something we learned from the SARS and MERS epidemics and that was translated into reality very quickly — there were many options to get support. What we were also interested in was to see if those physicians here in China considered leaving the medical profession or if they considered switching into being a medical professional but not in clinical settings, switching for example to industry. Consistently about 11% to 15% of physicians stated that they had those thoughts; they were hesitant. But at the end of the day, they did not make any steps toward it. Last but not least, we asked the physicians how much did they use digital medicine and telemedicine during that time. Many of the follow-ups and consultations were immediately transferred into digital tele-bases, which were available and are used usually [at normal times] but were much more exploited during the crisis. Many of the doctors, 45%, said that they see telemedicine as a good alternative in the future, so this is a positive development.

Prewitt: One takeaway from this survey is that the care of physicians and medical professionals during this outbreak has been high, has been strong. There have been measures implemented to assure their health and protection. Do you think it's been sufficient?

Biskup: I think it has been sufficient. All the physicians were well prepared. They have been briefed about the disease. They have been constantly updated with novel [coronavirus] updates, whatever there was in terms of research, in terms of guidelines, in terms of measures from the government. And they have been prepared and even [given] the free choice if they would like to help at the front line or not. Many of them did, so we saw huge solidarity and unification during that time. The panic and the mass hysteria that is being observed all around the world was not very present here in China and this has helped health care professionals to proceed systematically and consistently, to really succeed in terms of focusing on patient care.

Prewitt: What is your advice for hospitals and health care professionals in other countries?

Biskup: I am looking at Europe and the U.S., and I'm receiving a lot of questions from my peers, from colleagues, and even from doctors I do not know asking about clinical advice. My advice would be a maximum of protection, but I know this is difficult. Another [piece of] advice would be to look more into radiological testing, while in several countries there is not a sufficient amount of tests that can be performed in the clinic. But overall my main message — because all the other

messages are out there and I know that it is difficult for many reasons to achieve what China has done — what we should do is to look into the future, because at this moment we do not know what will be the long-term side effects of this virus. We do not know what type of further organ tissue damage this virus might cause. We assume that there will be permanent lung damage and it's possible, but we cannot predict yet what might be next. This is why I would definitely appeal that we should record as much data as possible, even if it's just clinical cases, because if we can create a big data set, then we can translate those data into health trajectory and can react faster in the future. Some of the questions are very important right now. For example, I have been asked if there is any good biomarker for prognosis and prevention and for checking the disease. At this moment we do not have it. We are using the basic markers that we have, markers of inflammation, which are not really very useful. We do not have a biomarker of severity, so we do not even have a strategy for personalized treatment. I would say this would be the highest priority, collecting as much data as possible. From the personal point of view, I know it's difficult, but I suggest to stay as calm as possible. The panic and the mass hysteria that is being observed all around the world was not very present here in China and this has helped health care professionals to proceed systematically and consistently, to really succeed in terms of focusing on patient care. We were also not as much overwhelmed with a lot of information that is the case right now. On the one hand, it is very good that there are so many clinical trials and so much information coming from different sources. On the other hand, it's very difficult to filter them. We should record as much data as possible, even if it's just clinical cases, because if we can create a big data set, then we can translate those data into health trajectory and can react faster in the future. So, keeping focused on the medical care and thinking about the future would be my core advice.

Prewitt: Based on what you are seeing and hearing around the world, are you optimistic or pessimistic about the course of Covid-19 over the next few months?

Biskup: I am reluctantly pessimistic about how the cases of fatalities will develop. Any loss of life is tragic, so I would be hesitant in saying that everything will be fine. But there will be an end to it. From the Chinese perspective I can say in Shanghai, life is getting back to normal — although there are still stringent policies in place in order to protect us all here, and in terms of the global perspective, from the second wave. There are still strict rules, for example, about the quarantine of people who are returning to China. They're extremely strict, beginning with quarantine at the airport. Over 3 months this has been a constant learning process. We have been learning about the test, we have been applying the test first in the centralized lab and moving them into the clinics. The same of them for the triage. Now, the returnees are not being quarantined in their homes, which had been done for the last 3 weeks, but only in designated places in the hospitals. That's important. It is also important to look at the positive in order to be a little optimistic. This epidemic has taught us a lot and put more emphasis on health care in general, and at the end of the day we realize how important the medical profession is. I hope that doctors will regain their confidence in the choice of their profession. We see a lot of collaboration and coming together of biomedical research, and this is important as a resource for the future. We have seen that many research funds have been released quickly and there has been a lot of facilitating of processes in terms of trials, initiations, and so on. We have seen that China has leveled to the West, or in terms of preparedness perhaps even overrun the West in some terms. What has received a big push through this crisis is personalized medicine and the use of big data and artificial medicine in order to target hypotheses

and rapidly discover drugs or even create molecules toward new treatments. This will allow us in the future to quickly repurpose the possibilities, and in this sense, China is at the forefront.

Prewitt: Ewelina, thank you so much. This has been fascinating, really informative. The readers and listeners of NEJM Catalyst around the world will benefit.

Biskup: Thank you very much for having me. It was a pleasure.

*Editors' note: This podcast was recorded on March 24, 2020.

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