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Strategies for responding to the COVID-19 pandemic in a rural health system in New York state

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ABSTRACT

Research and media reports about coronavirus disease 2019 (COVID-19) have largely focused on urban areas due to their high caseloads. However, the COVID-19 pandemic presents distinct and under-recognized challenges to rural areas. This report describes the challenges faced by Bassett Healthcare Network (BHN), a health network in rural upstate New York, and the strategies BHN devised in response. The response to COVID-19 at BHN focused on 4 strategies:

- (1) Expansion of intensive-care capacity.
- (2) Redeployment and retraining of workforce.
- (3) Provision of COVID-19 information, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) viral testing, and appropriate follow-up for a geographically dispersed population.
- (4) Coordination of the response to the pandemic across a large, diverse organization.

Rural health systems and hospitals can take steps to address the specific challenges posed by the COVID-19 pandemic in their communities. We believe that the strategies BHN employed to adapt to COVID-19 may be useful to other rural health systems. More research is needed to determine which strategies have been most effective in responding to the pandemic in other rural settings.

1. Background

While the responses of urban health systems to the coronavirus disease 2019 (COVID-19) pandemic have received global attention,^{1–3} the responses of rural health systems (RHSs) have been discussed far less, despite the unique challenges faced by these systems during the pandemic.^{4,5} Home to 5.6% of America's population and only 1% of intensive care unit (ICU) beds, rural populations and the RHSs that serve them have limited options to prepare for surges of critically ill patients.^{6–8} Compared to their urban counterparts, RHSs rely more heavily on outpatient visits to care for their communities.^{9,10} This model of healthcare delivery has required adjustment during the pandemic in order to increase inpatient capacity and convert many outpatient visits to telemedicine. In addition, rural health systems have less access to clinical trials and experimental treatments.¹¹ Finally, since RHSs are often the only option for healthcare in their service area, they play a

critical role in providing comprehensive services and information to their communities. During the pandemic, RHSs have had to navigate these existing challenges alongside those posed by COVID-19.^{5,12–18}

New York State's first case of COVID-19 was identified on March 1, 2020. By April 15, New York had 222,284 documented cases, the most of any state. Among these cases, 16,604 were diagnosed in "upstate" counties outside the New York City metropolitan area. During the initial weeks of the pandemic, RHSs in upstate counties began developing strategies for responding to COVID-19 that were appropriate to their context and resource limitations. This article describes the approach of one such RHS during the initial phase of the pandemic.

2. Organizational context

Bassett Healthcare Network (BHN) is a network of 5 hospitals, including 3 Critical Access Hospitals, and 24 outpatient clinics. The

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network serves 8 rural counties in the predominately agricultural central region of New York State, centered 75 miles west of Albany and 200 miles northwest of New York City. All 8 counties in BHN’s service area are designated Health Professional Shortage Areas for Medicaid-eligible populations, and BHN is the sole health network in 5 of the 8 counties. These 5 counties have a total population of over 257,000 and a total area of 5371 square miles—a population density similar to that of the states of Maine and Iowa.¹⁹

In addition to its hospitals and outpatient clinics, the network includes home healthcare services, short- and long-term rehabilitation facilities, school-based clinics, and a medical supply company. In 2019, BHN conducted 711,058 outpatient visits and 13,864 inpatient hospitalizations. There are 288 inpatient beds across the network, with 180 located at the network’s largest hospital, Bassett Medical Center (BMC). BMC also houses the network’s only intensive care unit, which has 14 beds. Before March 2020, there were 22 beds in negative pressure rooms across the network. BMC is a teaching hospital, with residency programs in general surgery and internal medicine, and is a clinical campus for medical students from Columbia University.

This report focuses on the initial 5 weeks of SARS-CoV-2 transmission in BHN’s catchment area, during which time case numbers were rising and coordinated action was necessary to adapt to the pandemic.

3. Problem

BHN began preparing for a COVID-19 outbreak in mid-February 2020. At that time, it was unclear how severe the local outbreak would be. BHN tested its first positive COVID-19 patient on March 11. In

the five weeks following, 211 more patients tested positive for the virus, with peak incidence reached on April 3 (Fig. 1). In early meetings, network leaders developed plans for a range of scenarios, from one in which only sporadic cases were diagnosed in the local community to one in which more than one-fifth of BHN employees were infected and unable to work. Due to the novelty of the SARS-CoV-2 virus, epidemiological models were not available to guide the planning effort. However, BHN monitored the healthcare systems in New York City and closer cities such as Albany and Syracuse, both as a way to monitor increasing transmission rates in the state and to identify measures that appeared to be successful in containing the virus in those settings. Within BHN, statistics including the number and rate of positive tests, inpatient admissions in nearby cities, and phone calls to the network’s pandemic triage line were reviewed daily, enabling rapid changes to be made when necessary. In this report, the authors describe 4 strategies that BHN adopted to respond to the COVID-19 pandemic:

1. Expansion of intensive care capacity
2. Redeployment and retraining of workforce
3. Provision of COVID-19 information, SARS-CoV-2 viral testing, and appropriate follow-up to a geographically dispersed population
4. Coordination of the response to the pandemic across a large, diverse organization

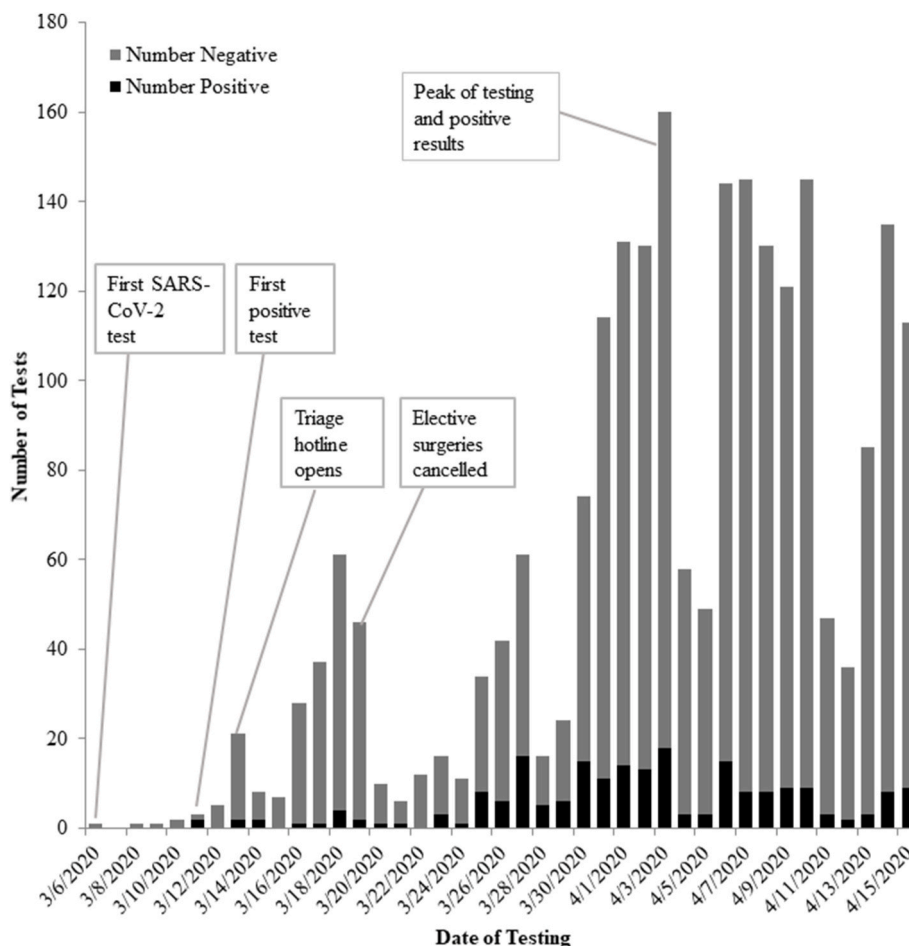


Fig. 1. Timeline of SARS-CoV-2 testing at Bassett Health Network in rural upstate New York. Bars show total daily positive (black) and negative (gray) SARS-CoV-2 tests administered by BHN from March 6 to April 15, 2020. Text boxes highlight important developments in BHN’s pandemic response.

4. Solution

4.1. Expansion of intensive care capacity

As is the case in many RHSs, inpatient and critical care capacity in BHN is limited in comparison to urban health systems. Nationwide, metropolitan and micropolitan areas house 94% and 5% of intensive care unit (ICU) beds, respectively.^{7,8} Rural areas, which are home to 5.6% of the US population, house only 1% of ICU beds.^{7,8} BHN anticipated a need to increase intensive care capacity to prepare for a possible surge of critically ill and infectious COVID-19 patients. In response, four plans were enacted: (1) increasing the number of negative-pressure rooms suitable for COVID-19 patients, (2) creating flexible intensive care teams that could be scaled up to care for large volumes of patients, (3) protecting residents in skilled nursing facilities, and (4) conserving PPE for healthcare workers.

Preparing rooms for COVID-19 patients. Before the pandemic, BHN had 22 beds in negative pressure rooms across its 5 hospitals; only 2 were in the network's sole ICU, located at BMC. The 12 remaining ICU rooms could not be converted to negative pressure due to mechanical issues with the ventilation system. In preparation for the arrival of COVID-19 patients at BMC, 9 rooms with a total of 16 beds in the special care unit (SCU) and 6 rooms with a total of 12 beds on an inpatient medicine floor were converted to negative pressure. Four of the converted SCU rooms, each "semi-private" with 2 beds, were grouped together and separated from the rest of the floor to create a new "COVID-19 ward," with negative pressure extending to the hallway and storeroom. The creation of this ward reduced the number of times practitioners and nurses had to don and doff protective equipment, saving both PPE and time. To allow ICU-level care to be provided in the new negative pressure rooms, experienced intensive care nurses were deployed to work alongside the existing staff in the SCU and inpatient medicine services.

Increasing the capacity of intensive care teams. BHN employs 4.4 full-time equivalent intensivists to care for patients in its 14-bed ICU. BHN anticipated a surge of COVID-19 patients in need of intensive care and prepared to increase capacity to care for as many as 40 such patients. New teams were created, each one consisting of a medical hospitalist or surgeon supervising 1–2 residents, with direction from an intensivist. For teams with a hospitalist, a surgeon was also available to support procedural needs. Additionally, a critical airway team (CAT) consisting of anesthesia providers assisted in airway management for other teams. BHN cancelled elective surgeries on March 19, which freed many anesthesiologists and surgeons for reassignment. Fortunately, volumes of hospitalized COVID-19 patients remained low, and these teams were never fully deployed to their designed potential. At the peak volume of critically ill patients on April 10, there were 14 patients receiving intensive care, including 9 who were intubated.

Protecting residents in skilled nursing facilities (SNF). BHN has two SNFs within its network. The network initially considered transferring medically stable COVID-19 patients to these facilities, as had been done elsewhere in the state. Ultimately, BHN decided against this proposal, as it was unclear how long an individual who previously tested positive would be infectious, and the patients in SNFs were known to be at high risk of morbidity and mortality from COVID-19.

Conserving PPE and managing its use. Like many other health networks, BHN was faced with PPE shortages within the first few weeks of caring for patients with COVID-19.²⁰ To extend supplies, infection control policies were changed so that N95 masks could be reused. Touchscreen tablets were deployed to the rooms of patients on infection control precautions so these patients could contact their care teams without anyone needing to enter the room. Other PPE management strategies included sign-out sheets for inventory tracking and access control, continued employee education on proper use of PPE, and monitoring of daily use rates. The cancellation of elective surgeries further helped in the conservation of PPE.

4.2. Redeployment and retraining of workforce

BHN sought to continue as many outpatient services as possible to maintain continuity of care for patients; however, it was also necessary to decrease outpatient visits in order to both mobilize personnel to care for COVID-19 patients and minimize unnecessary person-to-person contact. The network adapted by (1) redeploying staff to new roles with appropriate retraining and (2) significantly expanding capacity for telemedicine appointments.

Redeploying practitioners. Many outpatient appointments and all elective surgeries were canceled early in the pandemic to reduce COVID-19 transmission and conserve PPE. This enabled the deployment of physicians and advanced practice clinicians (APCs) to new roles. Of 677 practitioners in the network, 227 volunteered for redeployment. Of these individuals, 85 were ultimately redeployed to new roles. Sixty practitioners were redeployed to enroll existing BHN patients in the online patient portal ("MyBassett") using a standardized script in order to facilitate communication and establish an integrated platform for video telemedicine visits. Between March 13 and April 17, 5372 patients were added to MyBassett. Other redeployment locations included: comfort care (6 practitioners), employee health (5), telephone triage (5), ICU (3), temperature checks at employee sign-in (3), hospitalist teams (2), and emergency department/urgent care (1). Training sessions were organized for redeployed practitioners, such as: intubation tutorials led by anesthesiologists and emergency physicians, sessions focused on end-of-life care, online tutorials explaining inpatient applications of the electronic health record, and demonstrations of effective PPE donning and doffing led by infection control.

Separate from this redeployment scheme, an "on-call" schedule was created for outpatient physicians and APCs, designed to be used if patient volumes surged. Practitioners on this on-call schedule would be asked to assist inpatient teams if called in. This schedule contained nearly 300 practitioners, including some of those who volunteered for redeployment and others who continued to practice in their previous capacities. Again, due to the low volume of hospitalized COVID-19 patients, no practitioners from the on-call schedule were ultimately called in.

Expanding telemedicine capacity. BHN rapidly scaled up telemedicine services as the pandemic forced many patients to stay home. Previously, 2.3% of BHN's 750,000 annual visits took place using telehealth. Five weeks after BHN collected its first SARS-CoV-2 positive test, 66% of outpatient visits in the network were conducted over video or telephone, often from the patient's home. When including telemedicine visits, primary care practices and outpatient specialty clinics averaged 67% and 61% of their expected patient volumes, respectively, between March 11 and April 15. Specialties less suitable for telemedicine, including ophthalmology, optometry, audiology, physical therapy, and dental health, handled only emergency services. The percentage of telemedicine visits conducted by video, rather than by telephone, also increased from 25% to 70% during the same period; this was driven primarily by increasing provider familiarity with the video technology as well as the addition of an easier-to-use video conferencing platform. As the pandemic progressed, staff began to contact patients to verify connectivity before visits, patients received coaching on how to configure their devices and use their cameras and microphones, and providers received targeted training aimed at streamlining their telehealth encounters. Most, but not all, patients were able to obtain sufficient internet connectivity for a video visit through either home internet or cellular service. Network leadership worked with local cable companies, municipalities, and government agencies to expand internet access for those with insufficient broadband, and upgraded local guest internet coverage in the network's parking areas, allowing patients to connect to telehealth from their cars.

4.3. Provision of COVID-19 information, SARS-CoV-2 viral testing, and appropriate follow-up to a geographically dispersed population

As the dominant healthcare provider in its region, BHN sought to create systems that could ensure rapid access to care and reliable follow-up. This was accomplished by (1) creating a 24-h telephone triage service, (2) establishing COVID-19 screening tents, and (3) establishing new telehealth follow-up programs.

Establishing a telephone triage line. A telephone triage line was announced to the public on March 13 via local media outlets. This line was the only such service in BHN's catchment area. Available 24 h a day, 7 days a week, the line offered pre-recorded information on COVID-19 for those with general concerns, or connection to an operator if the caller had symptoms. Operators gathered initial information, found patients' charts in the EHR (or created a new chart for those who were not yet in the system), and forwarded callers to an initial "Triage Pool" staffed by registered nurses (RNs). Patients with appropriate symptoms were forwarded via secure messaging to an "Escalation Pool" staffed by physicians and APCs. These practitioners evaluated the patient via phone and assigned them one of three dispositions: self-monitoring at home, evaluation at a screening tent, or evaluation in an emergency department. At its peak, 15 RNs and 20 practitioners fielded over 600 calls per day on the triage line. By April 15, the triage line had answered 7335 calls, of which 5864 (79.9%) were forwarded to the "Triage Pool," 2626 (35.8%) were further forwarded to the "Escalation Pool," and 2615 (35.6%) were further escalated to the screening tent or emergency department (ED). Of note, the RNs and practitioners who staffed the triage line came from many areas of practice. Each underwent a training program based on a standardized triage algorithm before starting work.

Establishing tents for COVID-19 screening. To relieve ED congestion, minimize the risk of transmission in hospitals, and maximize population access to screening, BHN evaluated patients with possible COVID-19 at 5 outdoor screening tents throughout the network's catchment area. Evaluations included vital signs, oxygen saturation, lung auscultation, observation for respiratory distress, and a focused history. Patients who were suspected to have COVID-19 based on symptoms or exposure received a SARS-CoV-2 reverse transcription polymerase chain reaction (RT-PCR) diagnostic test. Transmission risk was minimized by limiting direct patient contact to one staff member per encounter and allowing only one patient in the tent at a time. Each worker donned a face shield, an N95 covered by a surgical mask, gloves, and a reusable gown. By April 10, the tents were testing an average of over 130 patients per day (Fig. 1). This effort was initially limited by shortages of test kits and viral media, and testing was restricted to those with fever, concerning symptoms, or significant contact with someone who tested positive for SARS-CoV-2. Those who did not meet these testing criteria but for whom there was still a clinical suspicion of COVID-19 were followed closely via telemedicine. Over 95% of SARS-CoV-2 testing at BHN was performed outside the ED, and ED volume was reduced by 50% between March 11 and April 15 (2705 budgeted visits vs 1350 actual visits). As of the time of writing, no screening tent workers have tested positive for SARS-CoV-2 due to exposure at the tent, a testament to the efficacy of the PPE measures that were used.

Maintaining at-home follow-up care. BHN offered at-home management of symptoms to as many patients with suspected or confirmed COVID-19 as was safe and feasible. Patients with an established BHN primary care provider (PCP) received follow-up with their PCP via video conference or telephone. For patients without a PCP in network or whose PCP had been redeployed, 2 telehealth phone clinics were created. The Pandemic Follow-up Clinic (PFC) was established to monitor the medical recovery of patients with respiratory symptoms.²¹ This clinic comprised 10 medical students and an internal medicine attending who followed up with patients via phone at regular intervals. Between March 18 and April 10, the PFC completed 2176 calls to 1009 unique patients. Additionally, a "Supporting All Patients" (SAP) phone line was established to follow patients experiencing anxiety and mental

health concerns exacerbated by the pandemic. The SAP line was staffed by 10 clinicians redeployed from BHN's school-based health centers. All SAP clinicians were credentialed as Licensed Clinical Social Workers or Licensed Mental Health Counselors. Patients could be referred for SAP follow-up by any provider in the network.

4.4. Coordination of the response to the pandemic across a large, diverse organization

A major concern during the initial preparation for the pandemic was the difficulty of coordinating communication and decision-making across the network while maintaining social distancing. It was initially difficult to establish a common understanding of the new situation and its demands, especially as many characteristics of the pandemic remained unclear in the initial weeks. Addressing this challenge required (1) creating clear channels of communication among network leaders and (2) communicating with employees and other health professionals.

Creating channels of communication among leaders. In the weeks before COVID-19 reached Bassett's catchment area, the network began to hold meetings to plan for a potential outbreak. The network organized an Incident Command Center that included BHN's Chief Executive Officer (CEO) and network leaders, the leadership team from each facility in the network, and leadership of the physicians' organization. Decisions were time-sensitive and needed to be made in a quick, calculated, system-wide manner to adapt to the near-daily challenges and evolutions of the pandemic. Coordination of decision-making was achieved primarily through twice-daily videoconferences. These included senior network administrators and designated leaders for the various inpatient and outpatient services throughout the network. Standardized agendas and widely disseminated meeting minutes served to minimize ambiguity and confusion. Morning conferences focused on reviewing overnight issues, setting daily goals, and rearranging workforce deployments according to the demands of the day. Afternoon conferences reviewed the day's challenges, shared and reviewed data, and revised plans for the following day. Key data were shared, including the daily volume of triage calls, SARS-CoV-2 tests administered, positive tests results, admitted patients, and intubated patients, as well as updates on PPE inventory. Creating clear, delineated roles for each member of the leadership team minimized conflict and allowed for efficient division of labor, despite the rapidly evolving conditions during the pandemic.

Communicating with employees and other health professionals. Organization-wide coordination was achieved primarily through "Town Halls," which were streamed online once per week and were accessible to all employees. These weekly updates allowed leaders to share new ideas and policies quickly. It also provided a forum for BHN employees to raise any implementation issues or other concerns to network leadership. Beyond addressing the most pressing issues of the day, these town halls allowed the organization to discuss and plan for future possibilities such as PPE shortages or, later, resumption of routine care. It was also important for coordinating the pandemic response that BHN leadership maintained regular communication with other groups of health professionals involved in the care of BHN patients, including home nurse organizations, residential facilities, and local health departments.

5. Unresolved questions and lessons for the field

Health systems, whether rural or urban, must prepare for future COVID-19 outbreaks. Due to the unique challenges of delivering care in rural settings, different steps to prepare for future outbreaks may be necessary for RHSs compared to their urban counterparts. Our report describes solutions employed during the first weeks of the pandemic by one RHS in upstate New York. These strategies aimed to (1) increase critical care capacity, (2) effectively redeploy workforces to meet the needs of the pandemic, (3) provide accessible viral testing and other

pandemic-related services to patients, and (4) maintain efficient and effective communication within the organization. Some elements of these strategies, such as the expanded use of telehealth and the construction of outdoor screening sites, have been employed by other RHCs.^{5,14–16} Other elements, such as the at-home follow-up services for COVID-19 patients and the emphasis on maintaining clear channels of communication, are novel.

BHN acted early on these strategies and was able to implement many of them successfully. BHN may have benefitted in this regard from its geographical position; while close enough to New York City to cause early alarm and thus aggressive preparation, it was far enough away to be insulated from the widespread community transmission seen there. The most effective strategies included the construction of screening tents, which allowed the network to test high volumes of patients from across the network's large geographic area. The PPE conservation measures also appear to have been highly successful, as BHN employees were able to adequately protect themselves from contracting COVID-19 without exhausting PPE supplies. Some of the changes made during the pandemic may prove beneficial in the long term. For one, telehealth services have been popular with providers and patients, and may continue to be used at a higher rate than they were before the pandemic. Additionally, the decision-making and communication structures that were put in place to adapt to the pandemic may prove useful if the network is affected by another unexpected challenge. The overarching, integrated structure of BHN—with hospitals, clinics, rehabilitation facilities, and home services all directed by the same organization—may have also aided in creating an organized, comprehensive response to the pandemic.

5.1. Unanticipated outcomes

Adapting a large health care organization to any major change, let alone an unexpected and unprecedented pandemic, is rarely straightforward. In some cases, BHN's decision making was influenced by outside factors. For example, New York State policy mandated the cessation of elective procedures at the beginning of the outbreak and exercised final say in when they could be restarted. The state also controlled the allocation of testing resources; for example, early in the pandemic the state restricted which patients could be tested through the single state lab authorized to perform tests.

The pandemic had a major financial impact on the organization due to lost revenue and spending on new measures such as those described in this report. Federal emergency funds, allocated as part of the CARES act, reduced but did not overcome this deficit for many hospitals in the network. The payer mix at BHN includes a high proportion of patients with government insurance. While this presents some financial challenges for the organization, it did not affect the planning or implementation of BHN's pandemic response. While financial shortfalls are never desirable, BHN chose to accept this outcome rather than compromise on patient care. As RHCs around the country adapt to the "new normal" of the ongoing pandemic, research and innovation will be needed to identify financially desirable models of care.

While the COVID-19 pandemic has presented many challenges to health systems, it presents opportunities for change, too. For many, the pandemic has engendered a sense of urgency and flexibility that is often absent in health systems. This is an opportunity to correct ineffective workflows, increase efficiency, and address barriers to care. As an example, the pandemic brought about a massive acceleration in the use of telemedicine at BHN, a change which may increase access to care even after the pandemic has subsided.

5.2. Limitations

This report has several limitations. It is not a controlled trial, and there is no way of knowing what would have happened had BHN not implemented the measures described here. Further, the data cover the

first 5 weeks of COVID-19 cases among BHN patients, and long-term outcomes are yet to be assessed. As the case numbers in the local community remained relatively low, many of the strategies described here were never fully implemented. Finally, the population served by BHN is older and whiter than the national average¹⁹; demographic differences may need to be considered by other rural health networks if they seek to reproduce elements of BHN's response to the pandemic.

5.3. Future research

Additional research is needed on strategies employed by other rural health systems during the COVID-19 crisis, as well as research comparing the efficacies of such strategies. For strategies that are shown to be effective, future research should identify ways that these strategies can be incorporated into hospital workflow for the remainder of the pandemic and beyond. Finally, further reports should identify specific solutions to protect vulnerable populations living in rural areas, such as migrant farm workers and isolated older adults. We hope this report and others like it will prove useful to providers, hospitals, and health systems as they strive to keep their communities safe.

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Declaration of competing interest

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