

VIEWPOINT

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Viewpoint

From Containment to Mitigation of COVID-19 in the US

Coronavirus disease 2019 (COVID-19) is a respiratory illness that results from severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection.¹ Following initial reports of disease outbreak in China, COVID-19 has spread worldwide with cases identified in at least 67 countries across 6 continents.² On March 2, California Governor Gavin Newsom announced \$20 million in funding and mobilization of the state's emergency management system to counteract COVID-19. In addition, 171 patients with SARS-CoV-2 infection were evacuated on February 5 to a US Air Force base in California following exposure on a cruise ship. These patients, who were asymptomatic or only mildly symptomatic, were transferred to local hospitals using a containment strategy.³ When a small number of infected patients are in concentrated locales, containment strategies (ie, quarantine) can halt the spread of infection by isolating infected or exposed individuals from the general population.⁴ However, disease containment requires the use of airborne isolation rooms, personal protective and other disposable equipment, and significant numbers of health care personnel. As COVID-19 spreads both in the US and around the world, it may not be possible to care for all patients in this manner.

The advent of multiple new COVID-19-positive cases in the US who lack identifiable travel history or exposure signals that community transmission of SARS-CoV-2 has started and is occurring outside the containment zones of hospitals.¹ Because these patients were not preemptively identified as persons under investigation, multiple community members and health care workers were exposed to SARS-CoV-2. As a result, hospital personnel have been furloughed under quarantine while they are evaluated for symptom onset and evidence of infection. These events not only affect the hospitals providing patient care to suspected and confirmed COVID-19 cases but also limit the personnel for adjacent emergency departments (EDs), intensive care units, and inpatient wards. It is critically important that the strategy for slowing the spread of the COVID-19 pandemic change from containment to mitigation. Mitigation approaches seek to: (1) slow the further spread of the virus, (2) reduce the anticipated surge in health care use, (3) provide patients with the right level of care to maximize the likelihood that the majority of patients will only require time-limited home isolation, (4) expand testing capability to increase available hospital capacity, and (5) tailor isolation to minimize transmission of SARS-CoV-2. Without rapid uptake of these approaches across hospitals, COVID-19 will pose a critical risk to an already strained health care system.

Emerging data indicate that SARS-CoV-2 is primarily spread by droplets, is likely to be more easily transmitted than seasonal influenza based on an R_0 of 2.0 to 2.5, and can spread through asymptomatic or minimally symptomatic individuals who would not normally seek medi-

cal care or evaluation.^{1,5} Eighty percent of patients infected with SARS-CoV-2 have minimal or mild symptoms.² Combining these characteristics and the emergence of community transmission, it is likely that silent spread has already occurred in multiple US locales. As a result, COVID-19 containment is no longer realistic and further emphasis on containment strategies may have the unintended consequence of hampering effective health care delivery for patients infected with COVID-19 and others who require general hospital care. At Kaiser Permanente, emergency management and preparedness teams are focused on developing a COVID-19 mitigation program (Table) based on good clinical practice, available evidence, and past experience. Whether this program will effectively achieve mitigation remains unknown.

Within acute care settings, the focus will be on minimizing disease transmission. Because SARS-CoV-2 is transmitted primarily by droplets, the proposed plan will focus on ensuring that reliable droplet precautions are used. Personal protective equipment will include the use of a surgical mask, disposable gowns, gloves, and protective eyewear. This approach is intended to simplify the workflow and preserve the use of enhanced airborne transmission precaution equipment like N95 masks and controlled or powered air-purifying respirators for patients with diseases like tuberculosis. Full airborne isolation precautions will continue to be in place for high-risk procedures including endotracheal intubation and bronchoscopy. All single rooms in the hospital would be available to accommodate droplet isolation, preserving the limited number of negative-pressure rooms for patients requiring true airborne isolation. Patient transport, including via emergency medical services, should similarly use droplet precautions. COVID-19 mitigation also requires that patients who are asymptomatic or who only have mild symptoms of viral respiratory infection will be asked to stay in isolation at home until they are well (ie, resolution of fever, improvements in cough). Household family members will be advised to avoid close contact while the patient is symptomatic. Patients isolated in the home may still receive specific SARS-CoV-2 testing based on clinical or epidemiological considerations. Similar to the approach used for an influenzalike illness, patients would be advised not to attend work or school until symptoms are resolved.

If patients' symptoms progress, the proposed plan suggests that remote care could be delivered through telephone or video conferencing and treatment protocols to ensure social distancing when appropriate. For patients with progressive or more severe symptoms, designating specific sites for outpatient evaluation, such as clearly identified ambulatory clinic sites, free-standing structures (eg, tents), or mobile testing units could minimize exposure to health care workers and other individuals. Patients would be able to initiate self-transport or

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Table. Key Elements of a Proposed Plan for Coronavirus Disease 2019 Community Spread Mitigation in Kaiser Permanente Northern California

Category	Key elements
Precautions	<ul style="list-style-type: none"> • Droplet precautions (including surgical mask, disposable gown, gloves, and protective eyewear) are used for COVID-19-like illnesses • Airborne precautions (ie, N95 masks, electrified respirators) to be used during high-risk procedures (eg, bronchoscopy, endotracheal intubation) • All single rooms available for patients who require droplet precautions • Negative-pressure rooms are reserved for patients who require full airborne precautions
Population management	<ul style="list-style-type: none"> • Asymptomatic or mildly symptomatic patients recommended to stay home until symptoms improve; no SARS-CoV-2 testing recommended • For mild increase in symptoms during home isolation, remote care delivered via telephone or video conferencing • Highly symptomatic or progressively symptomatic patients to be evaluated at designated sites, including mobile testing units, prespecified ambulatory office locations, or other freestanding structures (ie, medical tents) • SARS-CoV-2 testing to be made available to inpatients and outpatients with significant symptoms to evaluate the extent of community spread and treatment and based on particular epidemiological and clinical factors
Personnel	<ul style="list-style-type: none"> • Health care personnel with workplace exposure to suspected or confirmed COVID-19-like illnesses to self-monitor for symptom onset and possible testing • Health care personnel with COVID-19-like illness symptoms but test negative remain off work until resolution of fever or improvement in other symptoms • Health care personnel with confirmed COVID-19 remain off work as per US Centers for Disease Control and Prevention guidelines
Patient placement	<ul style="list-style-type: none"> • Emergency department patients or inpatients with COVID-19-like illness to be placed in single room with droplet precautions • If significant increases in health care use strain inpatient resources, known patients positive for COVID-19 may be placed in a shared room • In the event of critical inpatient shortage, mobile hospital facilities may need to be initiated • Medical staffing protocols to follow emergency management guidelines • Patient visitor precautions in place with symptomatic visitors discouraged
Products	<ul style="list-style-type: none"> • Careful allocation and use of personal protective equipment in line with standard droplet precaution protocols • Ongoing communication and coordination of federal, state, and local health authorities with respect to potential for medical supply shortages

Abbreviations: COVID-19, coronavirus disease 2019; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

emergency medical service–based transport to EDs as needed. SARS-CoV-2 testing must be made available for inpatients and outpatients, similar to current rapid testing protocols for influenza, to establish the extent of community spread and ensure the optimal use of single room isolation for EDs and hospital units. According to the proposed plan, hospitalized patients with infectious symptoms would be cared for within single rooms following existing protocols for droplet precautions. In the case of a surge in the number of affected inpatients, placing multiple patients within a single room could occur if all are known to be positive for SARS-CoV-2. Through ongoing monitoring of hospital capacity, dynamic assessments will determine if additional sites such as mobile hospital units will be necessary. Restrictions to patient visitation would be similar to those that were in place for the H1N1 influenza pandemic, in which symptomatic and nonfamily members were asked to avoid hospital visitation. Patients who experience a resolution of their symptoms at home could return to work or school as is the practice for seasonal influenza. Hospital-based isolation would continue until discharge or based on testing recommendations issued by the US Centers for Disease Control and Prevention (CDC).

Even though health care worker furlough policies are effective during a containment phase, they are ineffective in the presence of ongoing community spread during which staff may be as likely to be exposed to infection outside the health care setting as within it. The proposed plan will follow similar protocols to those in place for influenza exposure. Personnel with workplace exposures to pa-

tients with suspected or confirmed COVID-19 should self-monitor for fever, cough, and other symptoms. If they become ill and are confirmed not to have COVID-19, personnel would remain off work until the resolution of fever and until their other symptoms begin to improve. Health care personnel with confirmed COVID-19 should be off work as per CDC guidelines.

Health product vendors are notifying hospitals that medical supplies may become limited for both COVID-19–specific and other general supplies. Personal protective equipment may become severely limited, underscoring the importance of following isolation protocols consistent with the mechanism of spread of the virus to maintain availability. Communication and coordination between the private hospital system and federal, state, and local authorities will be of the utmost importance. COVID-19 is undergoing community transmission in California and elsewhere in the US and has critical implications for the health care system. Shifting from a containment strategy to a mitigation approach, as suggested in the proposed plan, could allow optimization of health care delivery under the expectation of personnel and supply shortfalls in an already strained health care system. Clear guidelines shared across hospitals and states could help improve the ability to maintain a capable and sustainable approach for all patients. Pandemics bring much uncertainty. But what is certain is that the ingenuity of the public health authorities in partnership with hospital systems will be critically important to shift the strategy to meet the requirements of this evolving epidemic.

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REFERENCES

1. US Centers for Disease Control and Prevention. Coronavirus disease 2019 (COVID-19): situation

summary. Accessed March 2, 2020. <https://www.cdc.gov/coronavirus/2019-ncov/summary.html>

2. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China. *JAMA*. Published online February 24, 2020. doi:10.1001/jama.2020.2648

3. Jernigan DB; CDC COVID-19 Response Team. Update: public health response to the coronavirus disease 2019 outbreak—United States, February 24, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(8):216-219. doi:10.15585/mmwr.mm6908e1

4. Hellewell J, Abbott S, Gimma A, et al. Feasibility of controlling COVID-19 outbreaks by isolation of cases and contacts. *Lancet Glob Health*. 2020; S2214-109X(20)30074-7. Published online February 28, 2020.

5. Bai Y, Yao L, Wei T, et al. Presumed asymptomatic carrier transmission of COVID-19. *JAMA*. Published online February 21, 2020. doi:10.1001/jama.2020.2565