Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

2.4. Staff morale/health

Protecting healthcare workforce is paramount in fighting COVID-19. The concern for illness, fatigue, low morale, and clinical error is high [4]. It is important to allow for increased flexibility and surge staffing during this time period. We had a number of support resources available, including mental health experts, spiritual care, virtual wellness rounds, and frequent staff huddles. Concerns about exposure risk were high amongst our providers, and an emphasis on PPE and supplies has been paramount.

The COVID-19 pandemic has placed immense burdens on healthcare systems globally. We hope our early experiences in confronting the pandemic will provide valuable information for other EDs and health care systems around the country during this ongoing crisis.

Grant

None.

Meetings

None.

Stefan Flores, MD*
Nicholas Gavin, MD, MBA, MS
Marie-Laure Romney, MD, MBA
Christopher Tedeschi, MD, MHA
Erica Olsen, MD
Anisa Heravian, MD
Liliya Abrukin, MD, MPH
David Kessle,r MD, MSc
Angela M. Mills, MD
Bernard P. Chang, MD, PhD
622 West 168th Street, Department of Emergency Medicine, Columbia University Medical Center, VC 2nd Floor Suite 260, New York, NY 10032, United States of America
*Corresponding author.
E-mail address: sk3283@cucmc.columbia.edu (S. Flores).

14 April 2020
https://doi.org/10.1016/j.ajem.2020.04.056

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Creating a COVID-19 surge clinic to offload the emergency department

The spread of COVID-19 has strained or overwhelmed emergency department (ED) capacity across the world. Facing an emerging COVID-19 outbreak in our city, we feared that the same situation could overwhelm our ED resources [1]. Therefore, we sought to create an area adjacent to our existing ED where patients not requiring emergency level care could be evaluated, tested for COVID-19, and safely discharged home. Here, we describe the creation and operation of a Surge Clinic in our indoor ambulance bay.

Our hospital is a large quaternary-care academic referral center and Level-1 trauma center. Our ED sees approximately 110,000 patients annually. Our ambulance bay normally accommodates seven ambulances and directly connects to the ED. It also contains a decontamination space.

The hospital's Department of Emergency Medicine (EM), Ambulatory Management (AM), the Department of Medicine (DOM), and the Center for Disaster Medicine (CDM) collaborated to develop the COVID-19 Surge Clinic. EM provided the physical space, guidance and infrastructure for triaging appropriate patients to the Clinic, and initial clinician staffing. AM directed much of the overall Clinic planning, identified clinical and administrative directors, and performed scheduling of patient appointments. The DOM provided second phase physician and nursing staff for the Clinic, established a referral system to direct outpatients to the Clinic, and drafted patient care guidelines. CDM provided strategic planning for the Clinic's interface with the COVID-response of the health system and facilitated infection control recommendations.

Transforming the ambulance bay into a functional Clinic required close and rapid collaboration with hospital leadership, the environmental services department, buildings and grounds staff, infection control experts, and a materials management team. Fig. 1 illustrates the resultant physical space and flow.

Patients arrive to the Surge Clinic via one of two pathways. ~75% of patients have appointments scheduled through referrals from primary care offices, triage phone lines, or the hospital's occupational health service. These patients proceed directly to the Clinic on arrival without ED triage evaluation. The second source of patients (25%) are walk-ins to the ED are the second source of patients (25%). All patients arriving to the ED are given masks and evaluated by a greeter nurse who asks about COVID-related symptoms and uses specific criteria (developed collaboratively by the EM, AM, and DOM) based on symptoms and comorbidities to determine who is appropriate for the Clinic versus the ED. Those immediately excluded from clinic consideration include patients with chest pain, shortness of breath, or pre-syncope, as well as those with significant co-morbidities such as immunocompromising illness, significant pulmonary conditions, or any type of end-stage organ disease. Vital signs are obtained only if deemed necessary for assessing stability for the Clinic. All patients triaged to the Clinic receive a medical screening exam consistent with EMTALA requirements.

The Clinic registration desk is located 6 ft from the patient arrival area with a separating physical barrier, protecting registration personnel and limiting their needs for personal protective equipment (PPE). Appropriate PPE must always be worn by staff in all other Clinic areas. Waiting room chairs are separated by 6 ft and cleaned by environmental services staff between patients. The Clinic has four clinical spaces separated by temporary plastic walls and three portable restrooms with a handwashing station for patients. There is also a small discharge area. All patients are discharged with their tests pending and subsequently receive a phone call with results and guidance.

The waiting area and patient flow are monitored by a nurse. The evaluation spaces use a two-clinician model, generally a physician and advanced practice provider. One clinician performs the history and physical, including vital signs. The other documents the encounter and orders any needed laboratory testing while standing at a computer 6 ft away to minimize cross-contamination of surfaces and reduce unnecessary clinician exposure. The only tests available in the Clinic are Influenza/RSV, Strep, and COVID-19; a nurse collects specimens as ordered, and the patient is sent to the discharge area. The clinicians then clean their clinical area, doff their PPE, and re-don PPE in preparation for the next patient. This workflow minimizes the amount of PPE used per patient. In the discharge area, a nurse or nurse case manager provides education on in-home self-isolation and the plan of care, and provides the patient with a discharge packet including a mask for travel

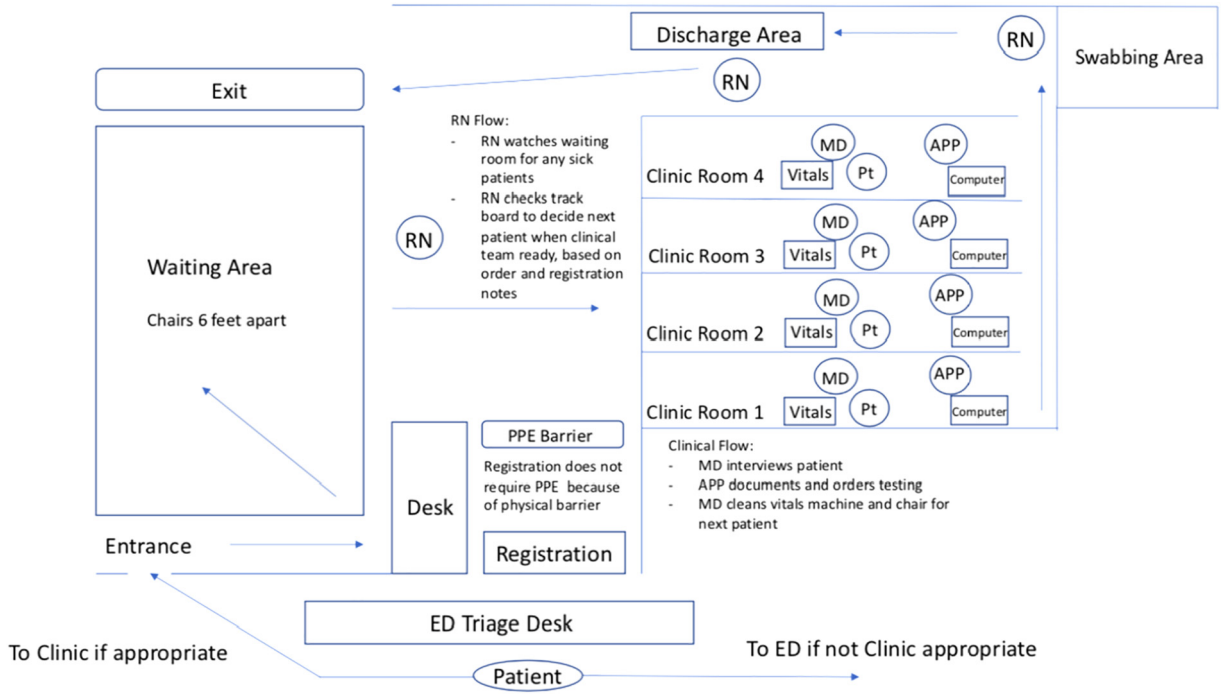

Fig. 1. The physical set-up of the clinic with patent flow indicated by arrows. RN = Registered Nurse. APP = Advanced Practice Provider. MD = Medical Doctor. Pt = Patient.

home and an additional mask in case the patient needs to return for further evaluation.

Over the first three weeks of operation, the Clinic saw a total of 2667 patients (average = 160 daily). Slightly more than 1% of patients required transfer to the ED for further testing or treatment (e.g., chest X-ray, nebulized medications, or intravenous fluids). The Clinic has become an essential component of our hospital's strategy to manage the volume of COVID-related cases our ED and physician practices are now seeing.

Prior presentations

None.

Author contributions

JJB developed the paper concept and drafted the manuscript. JJB, BJY, ES, AC, JB, KL, LH, MML, ASR, ITL, and PDB were all instrumental in the creation and operation of the Surge Clinic. PDB, ES, ITL, JB, and ASR provided critical revisions of the manuscript for important intellectual content.

Financial support

None.

Conflict of interest disclosure

JJB, BJY, ES, AC, JB, KL, LH, MML, ASR, ITL, and PDB report no conflicts of interest.

Acknowledgments

None.

Joshua J. Baugh MPP*
Brian J. Yun MD, MBA, MPH
Michelle M. L'Heureux MD
Ali S. Raja MD, MBA, MPH
Department of Emergency Medicine, Massachusetts General Hospital, Boston, MA, United States of America
Harvard Medical School, Boston, MA, United States of America
*Corresponding author at: Department of Emergency Medicine, Massachusetts General Hospital, Boston, MA, United States of America.
E-mail addresses: jbaugh@partners.org (J.J. Baugh), byun@mgh.harvard.edu (B.J. Yun), mmlheureux@mgh.harvard.edu, araja@mgh.harvard.edu.

Eileen Searle PhD, RN
Division of Emergency Preparedness, Massachusetts General Hospital, Boston, MA, United States of America
E-mail addresses: eileen.searle@mgh.harvard.edu.

Angela Chyn MS, RN
Department of Medicine, Massachusetts General Hospital, Boston, MA, United States of America
E-mail addresses: achyn@mghip.edu.

Jean M. Bernhardt PhD, CNP
Department of Medicine, Massachusetts General Hospital, Boston, MA, United States of America
E-mail addresses: jbernhardt@partners.org.

Kaitlyn LeClair MBA
Lara Henshaw-Archer MBA, MS
Department of Ambulatory Management, Massachusetts General Hospital, Boston, MA, United States of America
E-mail addresses: kleclair@mgh.harvard.edu (K. LeClair), lhenshawarcher@mgh.harvard.edu (L. Henshaw-Archer)

Inga T. Lennes MD, MBA, MPH
Department of Ambulatory Management, Massachusetts General Hospital, Boston, MA, United States of America
Harvard Medical School, Boston, MA, United States of America
E-mail addresses: ilennes@partners.org.

Paul D. Biddinger MD
Department of Emergency Medicine, Massachusetts General Hospital, Boston, MA, United States of America
Division of Emergency Preparedness, Massachusetts General Hospital, Boston, MA, United States of America
Harvard Medical School, Boston, MA, United States of America
E-mail addresses: pbiddinger@partners.org.

14 April 2020
https://doi.org/10.1016/j.ajem.2020.04.057

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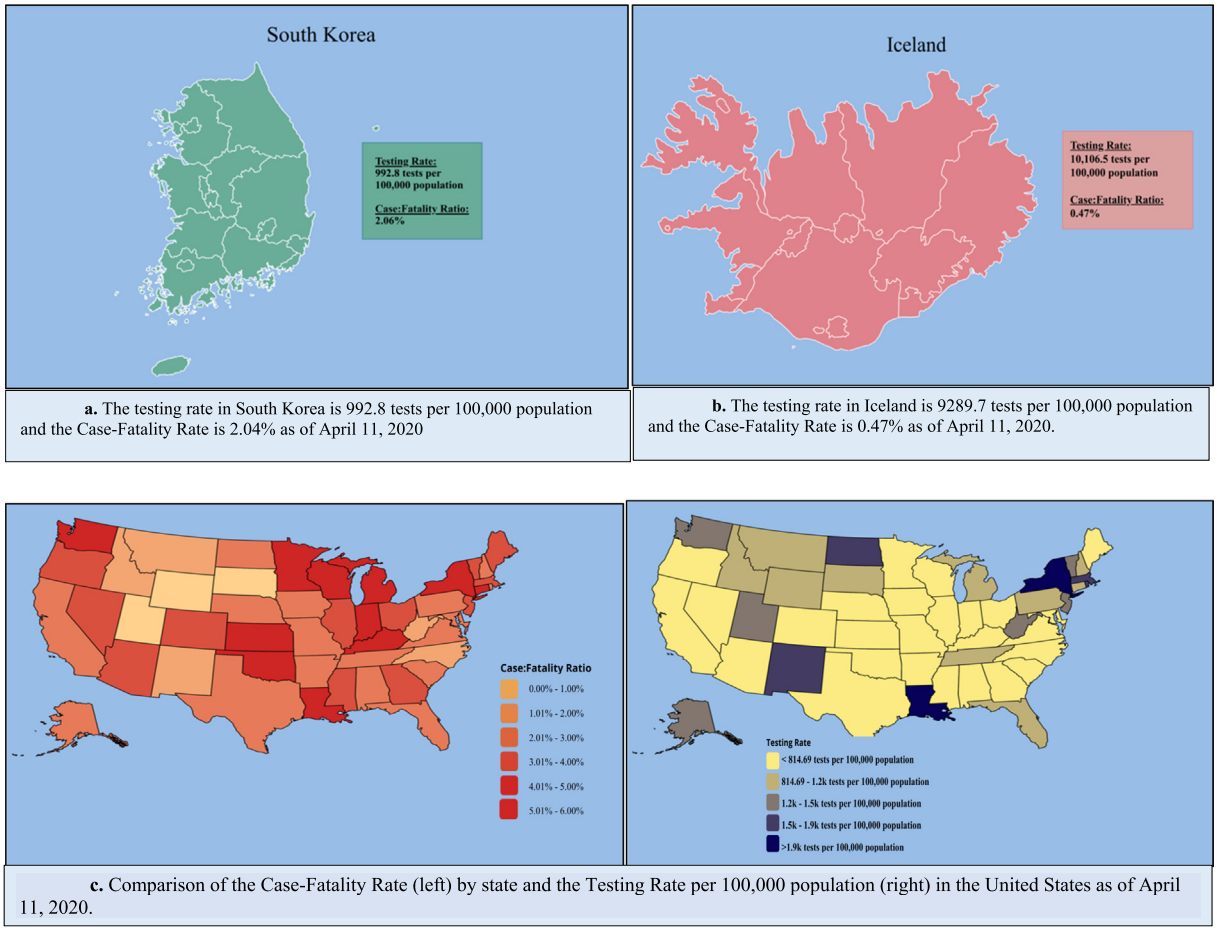
COVID-19 response and containment strategies in the US, South Korea, and Iceland: Lessons learned and future directions

COVID-19 confirmed fatalities in the United States (US) now lead the world [1]. One reason for the pandemics rapid spread is the virus has the ability to spread infection from asymptomatic individuals [2]. To counter this, we must have a better understanding of who is currently infected and needs isolating. Mass testing, with or without symptoms, offers a method of controlling the spread of infection and provides epidemiologists with valuable information about viral hot spots.

In Iceland, the focus centered on testing [3]. Iceland tested 14.8% of their population and reports a 0.4% fatality rate [4]. The low fatality rate observed is presumably due to random screening before their first confirmed case [3]. (Figs. 1 & 2B) Random sampling is effective for building an infection rate picture, allowing, healthcare officials to take action. However, major differences exist between the US, South Korea and Iceland that makes mass testing an impracticable solution for countries with large population densities [5-7]. Rapid testing of ~15% of the US population is less feasible and comes at an exponentially higher cost. Still, actions are being taken to expand the diagnostic supplies needed to improve overall testing in the US [8].

COVID-19 arrived to the US and South Korea on January 20th [1,9], Korea reports a fatality rate of 2% (April 10th, 2020), compared to 3.6% in the US [1]. The differences may be due to early testing, starting before their first outbreak [10]. The US did not start testing until a month after the first reported case [11,12]. The delay may play a role in the even higher fatality rate observed in Washington state (4.7%), as the outbreak in late February could have been detected via testing [12] (Figs. 1 & 2B).

A delay in testing could be compounded by increased spread and skyrocketing healthcare demand. New York increased their testing capacity [13]. But as the percentage of individuals testing positive continues to increase (Fig. 2A), the case-fatality rate is increasing, suggesting that additional fatalities are persisting. This could be due in



a. The testing rate in South Korea is 992.8 tests per 100,000 population and the Case-Fatality Rate is 2.04% as of April 11, 2020

b. The testing rate in Iceland is 9289.7 tests per 100,000 population and the Case-Fatality Rate is 0.47% as of April 11, 2020.

c. Comparison of the Case-Fatality Rate (left) by state and the Testing Rate per 100,000 population (right) in the United States as of April 11, 2020.

Fig. 1. Comparison of the testing rate and case-fatality rate in South Korea, Iceland, and the United States.