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## COVID-19 and the “Space” Problem of U.S. Hospitals: A Pragmatic Domestic Policy Solution for the Future

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*“Therefore let us not sleep, as others do, but let us watch and be sober. For those who sleep, sleep at night, and those who get drunk are drunk at night. But let us who are of the day be sober, putting on the breastplate of faith and love, and as a helmet the hope of salvation.”*

1 Thessalonians 5:6-8

## Introduction

Pandemics have affected the world since its beginning. Some of those were given names that came to define a period of time as well as the disease, such as the Plague of Justinian (Bubonic Plague) that claimed 25 million lives (541-542); The Black Death (Bubonic Plague) that claimed between 75 and 200 million lives (1346-1353); and the Flu Pandemic of 1918 that claimed between 20 and 50 million lives (1918-1920). Each of these events fundamentally changed the way people live their lives. More recently, the Asian Flu (H2N2), Influenza A (H3N2), and Influenza Apm09 virus (H1N1) have afflicted humanity.

Pandemics continue to alter human life and in 2020, the world was upended by a little-known Coronavirus, reported by the Chinese government to the World Health Organization (WHO) China Country Office after an outbreak in the Wuhan Province of China near the end of December 2019.<sup>1</sup> This strain of Coronavirus was given the designation of COVID-19 because of the year in which it was identified, 2019. Due to its rapid spread and infectious nature, the WHO declared a global pandemic on March 11, 2020.<sup>2</sup>

History will record what impact the Coronavirus/COVID-19 pandemic has on global society. The world of 2020 is more interconnected, more populated—both in numbers and density—and more interdependent than ever, creating difficulties to isolate any widespread and fast-moving infection. The numbers of infections and lives lost in Asia, Europe, and the United States thus far have been significant, where healthcare is readily available, properly equipped, and not lacking in medical expertise. The number of COVID-19 infections is alarming; as of August 13, 2020, Johns Hopkins University reported 20,739,537 infections with 751,910 deaths globally, and 5,242,184 infections with 166,971 deaths in the United States.<sup>3</sup>

Compared to other pandemics, COVID-19 is highly contagious, attacking the body's lower respiratory tract. Most COVID-19 infections may be asymptomatic and can typically be treated at home. COVID-19 appears to be especially lethal to those with compromised immune systems and the elderly, but medical experts and researchers are now seeing serious, lingering, and disturbing side effects of the disease in other age groups. Extreme cases of the COVID-19 infection can progress to hypoxemia, difficulty in breathing, and acute respiratory distress. The patients that reach this stage require medical attention and hospitalization, mechanical ventilation, and most likely an Intensive Care Unit (ICU).<sup>4</sup>

In the United States, COVID-19 was declared a Public Health Emergency (PHE) on March 13, 2020 by the Center for Disease Control and Prevention (CDC).<sup>5</sup> This declaration exposed numerous stresses on the healthcare system, one being the ability of hospitals to handle the surge in numbers of critically ill patients. The term “flattening the curve,” the notion of slowing the rate

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<sup>1</sup> Mahshid Abir et al., *Critical Care Surge Response Strategies for the 2020 COVID-19 Outbreak in the United States*, 2020, p. 5.

<sup>2</sup> Megan L Ranney, Valerie Griffeth, and Ashish K. Jha, “Critical Supply Shortages — The Need for Ventilators and Personal Protective Equipment during the Covid-19 Pandemic,” *New England Journal of Medicine* 382, no. 18 (2020), DOI: 10.1056/NEJMp2006141.

<sup>3</sup> Johns Hopkins, “COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University.” *Johns Hopkins Coronavirus Resource Center*, Accessed June 18, 2020. <https://coronavirus.jhu.edu/map.html>.

<sup>4</sup> Kennan, et al. p. 2007.

<sup>5</sup> CDC, “New ICD-10-CM code for the 2019 Novel Coronavirus (COVID-19), April 1, 2020,” *Centers for Disease Control and Prevention*, March 18, 2020. <https://www.cdc.gov/nchs/data/icd/Announcement-New-ICD-code-for-coronavirus-3-18-2020.pdf>.

of infection to protect scarce healthcare resources, in other words, slowing the rate of infection so the healthcare system would have the capacity to absorb a large influx of critically ill patients at any given time, became part of the lexicon. Fredric Blavin, a principal research associate with the Urban Institute's Health Policy Center wrote, "All indications show if the curve is not flattened, hospitals across the country will not have the capacity to deal with the surge in hospitalizations associated with COVID-19."<sup>6</sup> To achieve this decreased rate of infections, many measures were enacted including quarantines, stay at home orders, masking, and travel bans.

### The Space Problem

The healthcare system in the United States, operating near capacity on a daily basis, struggles to withstand any dramatic surge of critically ill or injured patients that may come about from an unexpected event, such as a large-scale terrorist attack (911) or a no-notice natural disaster such as COVID-19. For such events, Vice Admiral Richard H. Carmona, M.D., M.P.H., F.A.C.S. Former Surgeon General, U.S. Public Health Service, listed what was needed to manage the surge as "space, staff, and stuff."<sup>7</sup> "Space" refers to the structures to stage and care for patients; "staff" refers to critical care doctors and nurses, respiratory therapists, and other support personnel; and "stuff" refers to equipment, pharmaceuticals, and other supplies. In short, "In a medical and public health event in which patient care needs exceed existing resources, the focus should be on increasing patient-care capacity."<sup>8</sup> Willem G. Odendaal of Virginia Tech University wrote, "When the COVID-19 pandemic broke out, it soon became clear that the healthcare systems in possibly every country in the world would be crippled by an overwhelming need for hospitalization exceeding the available resources and supply chains."<sup>9</sup>

In conjunction with efforts to "flatten the curve", the creation of "space" to provide for increased numbers of patients were undertaken. For example, at the University of Virginia (UVA) in Charlottesville, a large expansion, which began six years ago and was scheduled to open in June 2020, was put into service early. The new section of the hospital was designed to include floors for special units such as orthopedics, solid organ transplants, and cardiac intensive care. Once the potential needs of surrounding the COVID-19 pandemic were determined for Central Virginia, the design team, construction crews, and a team of staff from across the UVA Health system converted the three cardiac intensive care floors into a COVID-19 ward with 56 of the 84 patient rooms specially retrofitted as negative airflow rooms. A negative airflow room is designed to pull air in rather than pushing the air out and is "ideal for treating patients with airborne infectious diseases like COVID-19 because they keep the virus from spreading into public spaces and allow staff to conserve valuable personal protective equipment."<sup>10</sup>

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<sup>6</sup> Dennis Thompson, "U.S. Hospital Beds Were Already Maxed Out Before Coronavirus Pandemic," *U.S. Health News*, March 26, 2020, <https://www.usnews.com/news/health-news/articles/2020-03-26/us-hospital-beds-were-already-maxed-out-before-coronavirus-pandemic>.

<sup>7</sup> Richard H. Carmona, "The Science of Surge: An All-Hazard Approach Is Critical to Improving Public Health Preparedness," *Academic Emergency Medicine* 13, No. 11, (November 2006): 1097, DOI: 10.1197/j.aem.2006.06.039.

<sup>8</sup> Amy Kaji, Kristi L. Loenig, and Tareg Bey, "Surge Capacity for Healthcare Systems: A Conceptual Framework," *Academic Emergency Medicine*, 2006, <https://onlinelibrary.wiley.com/doi/epdf/10.1197/j.aem.2006.06.032>.

<sup>9</sup> Willem G. Odendaal, "Method for Active Pandemic Curve Management (MAPCM)," *Preprint Server for Health Sciences*, 2020, <https://doi.org/10.1101/2020.04.06.20055699>.

<sup>10</sup> Caroline Newman, "Can We Really Do This? How UVA Health Transformed Its New Tower to Fight COVID," *UVA Today*, May 7, 2020.

As the COVID-19 pandemic took hold in New York City, with the rapidly rising rates of infection, it was determined that available hospital beds would not be sufficient. The Jacob Javits Center, a 1,800,000-square-foot convention complex was converted, along with the necessary infrastructure installed, to house more than 2,000 non-COVID-19 patients.<sup>11</sup> The United States Navy deployed a hospital ship, the United States Navy Ship (USNS) *Comfort*, to provide additional hospital beds for overwhelmed hospitals. On the nonprofit organizational front, Samaritan's Purse International Relief established a field hospital in New York's Central Park to receive patients. Governor Andrew Cuomo (D-NY) wrote, "States cannot build more hospitals, acquire ventilators or modify facilities quickly enough. At this point, our best hope is to utilize the Army Corps of Engineers to leverage its expertise, equipment, and people power to retrofit and equip existing facilities--like military bases or college dormitories – to serve as temporary medical centers. Then we can designate existing hospital beds for the acutely ill."<sup>12</sup>

The United States is fortunate to have the human and physical resources capable of being marshalled and mobilized to assist during an emergency. In the past decade, the nation has been witness to numerous infectious disease PHEs such as Middle East Respiratory Syndrome (MERS), Severe Acute Respiratory Syndrome (SARS), the H1N1 Influenza, and Ebola, none of which developed to the scale of the COVID-19 pandemic. Further, PHEs can develop as a result of natural disasters, such as hurricanes, tornadoes, earthquakes, and others. Each could have stressed the healthcare system's capacity had they not been contained. There are ample examples of emergency preparedness that may give direction for a future PHE in the United States.

### **Increasing Capacity, Military Style**

Preparedness for wide-scale emergencies have been considered and implemented by the U.S. military since the beginning of the Republic. President George Washington once told a joint session of Congress, "To be prepared for war is one of the most effectual means of preserving the peace."<sup>13</sup> However, as the nation matured, the nature of national emergencies evolved. Today, the Federal Emergency Management Agency (FEMA), created in 1979, has the statutory "responsibility for coordinating government-wide relief efforts."<sup>14</sup> Presidential Policy Directive (PPD)-8 on National Preparedness, defines the term "preparedness" as "actions taken to plan, organize, equip, train, and exercise to build and sustain the capabilities necessary to prevent, protect against, mitigate the effects of, respond to, and recover from those threats that pose the greatest risk to the security of the Nation."<sup>15</sup> In short, not all emergencies involve national security or a military solution' however, the military has a long history of preparedness planning.

At the end of World War II (WWII), the United States had thousands of airplanes, tanks,

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<sup>11</sup> Javits Center, "About," *Javits Center*, 2020, <https://www.javitscenter.com/about/>.

<sup>12</sup> Andrew Cuomo, "Andrew Cuomo to President Trump: Mobilize the Military to Help Fight Coronavirus," *The New York Times*, March 15, 2020. <https://www.nytimes.com/2020/03/15/opinion/andrew-cuomo-coronavirus-trump.html>.

<sup>13</sup> Daniel Madsen, *Forgotten Fleet: The Mothball Navy*, (Annapolis, MD: Naval Institute Press, 1999), 220.

<sup>14</sup> FEMA. "About Us." *FEMA*, 2020. <https://www.fema.gov/about-agency>.

<sup>15</sup> FEMA, "Building Cultures of Preparedness: A report for the emergency management higher education community," Washington, DC: FEMA, 2019, 5, [https://training.fema.gov/hiedu/docs/latest/2019\\_cultures\\_of\\_preparedness\\_report\\_10.22.18%20final.pdf](https://training.fema.gov/hiedu/docs/latest/2019_cultures_of_preparedness_report_10.22.18%20final.pdf).

ships, vehicles, and other weapons that were no longer needed for a world at peace. Military leaders of the time were concerned about repeating the same mistakes of the pre- WWII years when the nation was unprepared for a major conflict. Consequently, the U.S. Navy, the U.S. Army, and the U.S. Air Force established facilities and bases throughout the United States to “store” equipment that could quickly put back into service with minimal effort.

In 1945, the U.S. Navy had the largest fleet of ships ever assembled in history.<sup>16</sup> The Navy created the U.S. Navy Reserve Fleet, more commonly known as the “Mothball Fleet.” The plan was to preserve certain ships in a *ready* state to be reactivated and put into service quickly in times of need. Each ship selected “to be placed ‘out of commission, in reserve,’ was to receive a careful overhaul so that its machinery, specifically its propulsion plant was in good working order. Stores and spare parts would be inventoried...so that a complete record would exist on each ship.”<sup>17</sup> After overhaul, the ships were sealed and climate controlled to slow or prevent deterioration in anticipation of the day they would be called back to service.

In the ensuing years, from time to time certain ships were put back into service with the fleet. As the nature of naval warfare changed with technology and weaponry, many ships were eventually sold or scrapped, but some remain in reserve today. Daniel Madsen, author of *Forgotten Fleet* wrote, “Was the mothball fleet a success? Most certainly it was. As an insurance policy alone it was an enormous bargain... That was what the postwar mothball fleet was all about.”<sup>18</sup> The U.S. Army retains stockpiles of weaponry, in excess of 2,000 M1 Abrams main battle tanks, at the 36,000-acre Sierra Army Depot in California.<sup>19</sup> The U.S. Air Force maintains a similar facility for aircraft at Davis-Monthan Airforce Base in Tucson, Arizona. Each of the services storage facilities have a similar mission, to be ever ready.

The military example of preparedness provides a model to follow by creating emergency hospital capacity out of existing structures—vacant buildings. In fact, the retrofit of these types of buildings for government work is already being done. In 2003 in Austin, Texas, when the Travis County government needed space for expansion, it purchased an abandoned 100,000-square-foot-plus building that had once housed a Builders Square home improvement store. Builders Square was a Home Depot and Lowe’s-style big box home improvement chain that grew to more than 150 locations across the United States. After 26 years the company went out of business, leaving behind multiple empty locations. Today, the building on Airport Boulevard in Austin houses numerous high-traffic offices, including the Travis County Tax Office (main office), the Travis County Clerk (Elections and Recording Divisions), the Sheriff’s Central Command, the County Fire Marshal, Emergency Services, Counseling and Education Services, and the District Clerk Passport and Jury offices.<sup>20</sup>

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<sup>16</sup> Madsen, 11.

<sup>17</sup> Ibid, 12.

<sup>18</sup> Ibid, 220.

<sup>19</sup> Scott Gourley, “Sierra Army Depot (SIAD): The Home Base Providing a Second Life for Army Equipment,” *Defense Media Network*, 2011, <https://www.defensemianetwork.com/stories/the-home-base-providing-a-second-life-for-army-equipment/>.

<sup>20</sup> Travis County Government, “Facilities Management,” *Travis County Texas Gov*, 2020, <https://www.traviscountytexas.gov/facilities>.

## The Solution

To manage a large-scale health crisis, communities, states, and the Federal Government must be prepared to solve the “space” problem. Additional emergency hospital capacity should be established using existing available buildings, big box stores, shopping malls, closed hospitals, and other buildings that could be repurposed to become emergency treatment and storage facilities. Almost all these buildings have many features in common, such as sturdy construction, large open spaces, adequate infrastructure, limited access points, and security readiness.

These large open space buildings, many on a single level, lend themselves to redesign and adaptable partitioning. This allows the creation for patient rooms or wards, nursing stations, procedure rooms, physician work rooms, offices, laboratories, storage rooms, and even morgues – instead of the indignity of stacking bodies in refrigerated trailers. Since many of these buildings housed commercial enterprises, most have loading docks and areas designated for storing large quantities of supplies. In the past, these buildings supported many people; consequently, they already have large capacity systems for resources such as water, sewer, electricity (including generators in case of power loss), and telecommunications.

On the outside, these facilities typically have large parking areas that once supported employees and customers. These would be used for staff parking and easily adaptable to create helicopter pads and staging areas. Many are on high ground to mitigate damage from flooding, are typically near good roads, necessary for entrance and egress. Finally, they typically are fenced and have a limited number of entrances to the buildings themselves, providing security for patients and staff.

The implementation of this plan should be delegated to FEMA. The agency is divided into ten FEMA Regions that cover all 50 states and U.S. territories. Each FEMA region, in conjunction with state and local governments, should study and assess the potential need of emergency hospital space based on population to determine the correct number of emergency treatment facilities that should be established in each region. For example, an appropriate number of facilities should be established in and near major population centers and in central locations in more rural areas.

The buildings and properties should be purchased at fair market prices and due to the many facilities available, FEMA could be selective of the most appropriate buildings. After selection, each would be remodeled and equipped to be an emergency hospital, heavily equipped towards intensive care wards, and in accordance with Emergency Support Function 8, under the National Response Framework, then sterilized, sealed, and maintained in a state of readiness to stand up in short order. Much like the military’s reserve fleets, these facilities would be ready for hurricanes, tornadoes, earthquakes, terrorist attacks, pandemics, and any other PHE that may arise.

Though the healthcare system can function properly in a PHE, preparation requires more than space, it also requires staff and stuff. A plan for staff is already in place and known as the Medical Reserve Corps (MRC), consisting of first responders, providers, nurses, and other necessary personnel.<sup>21</sup> And, the necessary stuff (materials) is managed by the Department of Health and Human Services through Emergency Support Function #8 – Public Health and Medical Services (ESF 8).

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<sup>21</sup> Medical Reserve Corps (MRC), “About MRC,” *MRC*, 2020. <https://mrc.hhs.gov/HomePage>.

## **Conclusion**

The coming months and years will provide ample time and opportunity to review, analyze, critique, and determine what the various state and federal governments did and did not do well during the COVID-19 pandemic. This is not intended to be an analysis of pandemic response; rather, this article proposes a solution for the future. Following on the theme of "space, staff, and stuff", this article proposes a solution for the "space" element of the equation. This solution utilizes and repurposes existing structures that could easily be stood-up in times of emergency. By providing additional emergency hospital capacity in and near the larger concentrated population centers, emergency beds would be readily available. Let us prepare and take a realistic and proactive approach, with eyes open and clarity of thought, to preparation for the future.



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