
Hospital Capacity and Capacity Planning in Washington

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Abstract

Hospital capacity in the State of Washington may be unable to satisfy the number of COVID-19 patients. The adjusted occupancy rate (adjusted for outpatient equivalent days) places many hospitals near capacity prior to the current pandemic. Models of COVID-19 cases and hospital care generate scenarios under which hospital capacity is insufficient. Short-run tactics involve repurposing of hospital units and other facilities. Long-run strategies will require organizational commitment and new policies and incentives to address capacity concerns.

Keywords: COVID-19, hospital, capacity, occupancy

Introduction

Washington State has been the epicenter of the COVID-19 outbreak in the United States. On January 21, 2020, the Centers for Disease Control and Prevention (CDC) and Washington State Department of Health announced the first case of 2019 Novel Coronavirus (COVID-19) in the United States was seen at an urgent care clinic in Snohomish County, Washington (Holshue, et al., 2020). According to the Department of Health, State of Washington, as of March 17, 2020, there were a total of 1,012 confirmed positive cases, and 52 deaths. This infectious disease continues to spread several communities throughout the State. People who are at higher risk include healthcare workers, vulnerable populations such as people with underlying conditions and people more than 60 years of age, and those who come in contact with international travelers.

While the disease started in Washington, with the first person diagnosed with COVID-19 having a travel history to Wuhan, China, the disease has spread to all 50 states in the United States. A public health emergency was declared on January 31, 2020 by the Department of Health and Human Services to assist the nation's healthcare community in aggressively responding to the excessive spread of COVID-19. Additionally, the World Health Organization declared COVID-

19 as a pandemic on March 11, 2020. On March 13, the President of the United States announced a national emergency over this pandemic. The Centers for Disease Control and Prevention, the administration, and state governments have issued relatively strict guidelines regarding social distancing, and home isolation to prevent the spread of the virus. As of March 25, 2020, there were more than 1,000 deaths associated with COVID-19 in the United States, and more than 70,000 positive confirmed cases.

COVID-19 will result in an influx of hospital admissions, creating pressure on hospital capacity to care for sick patients. The Harvard Global Health Institute (2020) forecasts between 10 million to 34 million hospital visits, of which one fifth will require intensive care. In the grimmest situation, U.S. hospitals would fill more than 200% of their capacity if 60% of adults were infected in 6 months. However, in the best situation, where Americans practice social distancing, minimize public interaction, and practice hand hygiene to avoid getting infected, we may have 20% of adults getting infected in 18 months, which would be manageable for hospitals (Waldman, et al., 2020).

According to the Organization for Economic Cooperation and Development, hospital beds per 1,000 inhabitants provides a measure of resources available for delivering services to inpatients in terms of number of beds that are staffed, and available for use. Total hospital beds is inclusive of curative care beds, rehabilitative care beds, long-term care beds, and other beds in the hospital. In the United States, there are 2.8 hospital beds per 1,000 inhabitants, which is less than that at many other countries involved in this global crisis. An estimate from the Physician's Congress suggests that there could be 75-150 million coronavirus cases in the United States (Swan & Treene, 2020). A report by the John Hopkin's School of Public Health, Center for Health Security, indicates that even in a moderate pandemic scenario, there could be 38 million people needing care, with 1 million hospitalizations and 200,000 patients needing intensive care unit (ICU) beds (Toner & Waldhorn, 2020). There are about 46,825 medical ICU beds in the United States (American Hospital Association, 2020).

Washington State

For the Seattle, WA, region there were 4,700 total hospital beds as of 2018, of which there were 650 medical ICU beds, according to data from the American Hospital Association (2020). Intensive care units are equipped to handle the most severe and acute coronavirus cases (Harvard Global Health Institute, 2020). Table 1 shows confirmed cases by age in State of Washington.

As shown in Figure 1, and experience from other countries, such as China confirm, elderly people are at a higher risk of getting infected by COVID-19 and end up being hospitalized, eventually leading to mortality (Guan et al., 2020; Hu et al., 2020). Seattle and other regions in Washington state would need to expand capacity even in a moderate scenario where 40% of the adult population (approximately 200,000 adults) contract the disease over the next year months, and 8% (approx. 16,000) of them would require inpatient care (Harvard Global Health Institute, 2020).

It is important to note the influenza trends in Washington State, because symptoms of COVID-19 are similar to those of influenza. Historically, Washington State has experienced highly variable rates of infection and death associated with influenza. Figure 2 shows that influenza related deaths

increased significantly from only about 20 deaths in 2011-12 to nearly 300 in 2017-18, and approximately 245 deaths in 2018-2019. There were 245 laboratory-confirmed influenza deaths during the 2018-2019 season: 230 influenza A, 10 influenza B, and 5 type unknown. Most deaths occurred in people with underlying health conditions, or in people with no pre-existing conditions but who were elderly. Two deaths occurred in children. Demographic characteristics of influenza related deaths are similar to those of COVID-19 related deaths, for instance, people with underlying conditions and elderly are more vulnerable (Guan et al., 2020; Hu et al., 2020). For 2019-20, Washington State has already experienced 92 Influenza deaths and 583 COVID-19 deaths.

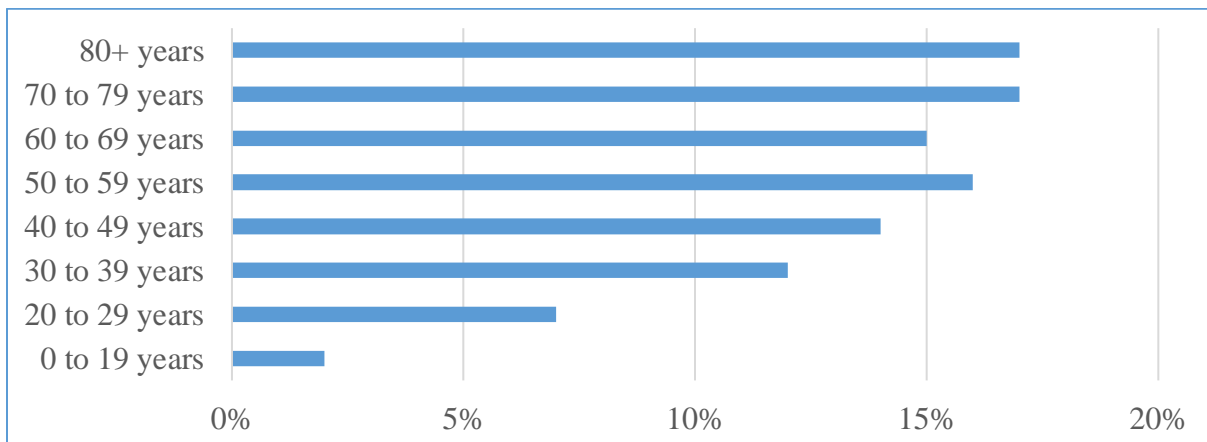


Figure 1. Confirmed COVID-19 Cases in Washington State, By Age, March 19, 2020. Source: Washington Department of Health (2020a).

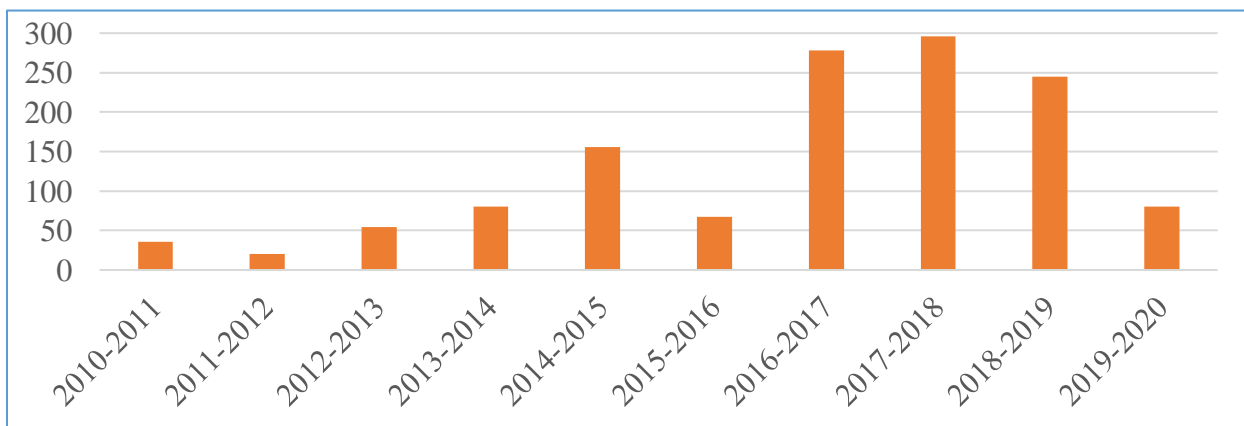


Figure 2. Count of Reported Laboratory-Confirmed Influenza-Associated Deaths by Year, 2010-2020. Source: Washington Department of Health (2020b).

To care for patients with influenza, COVID-19 and all other illnesses and injuries, Washington, like most other states, has experienced a slight decline in the supply of available hospital beds

relative to its population. As shown in Figure 3, beds have decreased from 1,963 per 1 million population in 2000, to 1,649 per million in 2019. As a consequence of the reduced bed supply and shifting delivery patterns, the simple inpatient occupancy rate has increased from 50% to 64% over the past two decades. The adjusted occupancy rate (adjusted for outpatient equivalent inpatient days based upon the outpatient/inpatient revenue ratio) has increased from 92% to 129% over the past two decades.

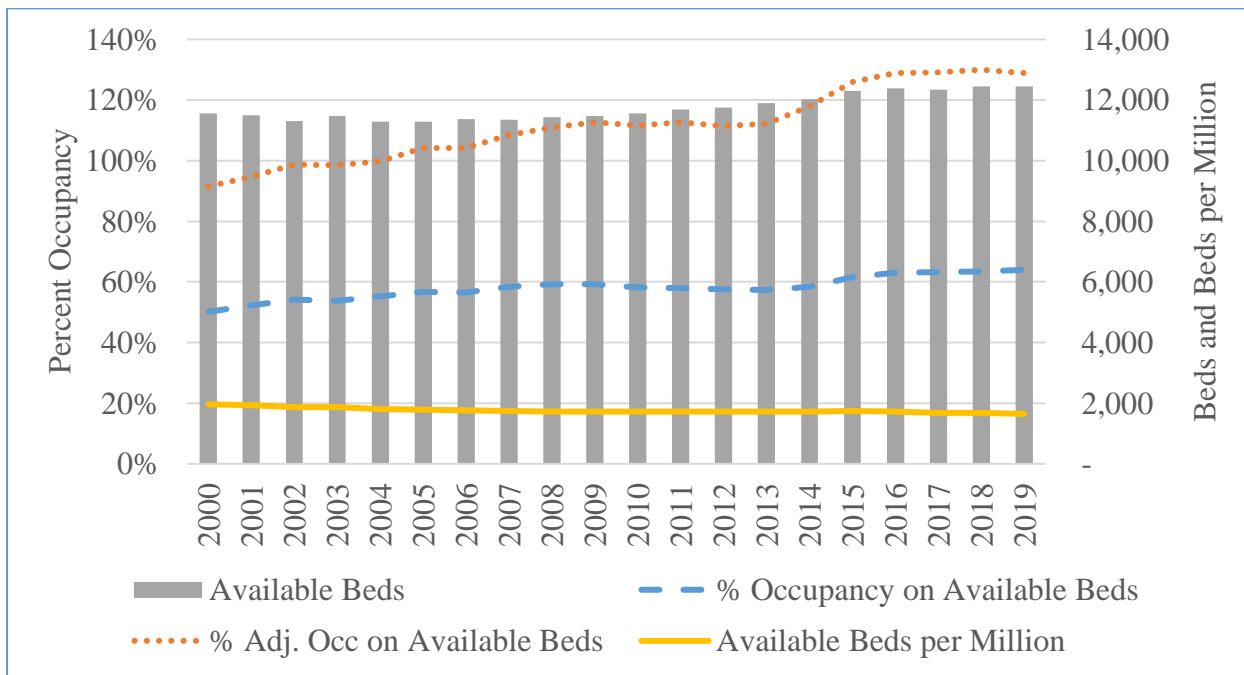


Figure 3. State of Washington Hospital Beds and Occupancy 2000-2019. Source: Washington Department of Health (2020c).

COVID-19 Hospital Requirements

There are several current models of COVID-19 cases and hospitalizations. Covid Act Now is a partnership model with several contributors and is being used by a range of governments, health systems, and other interested parties. Figure 4 presents the current model (April 14, 2020) for Washington State, and Figure 5 presents the model for Snohomish County (Covid Act Now, 2020). The influx of COVID-19 patients would require a significantly higher number of hospital beds than are currently available. It is also expected that ICUs would be especially overwhelmed in Seattle area, and would require additional capacity.

Given these data, clearly, there is a limited surge capacity to handle a public health emergency crisis that COVID-19 is expected to become. Besides, occupancy issues, there are other issues that are putting a strain on Washington hospitals, while stretching the hospitals to capacity. There are limited numbers of radiology rooms, masks, ventilators and staffing.

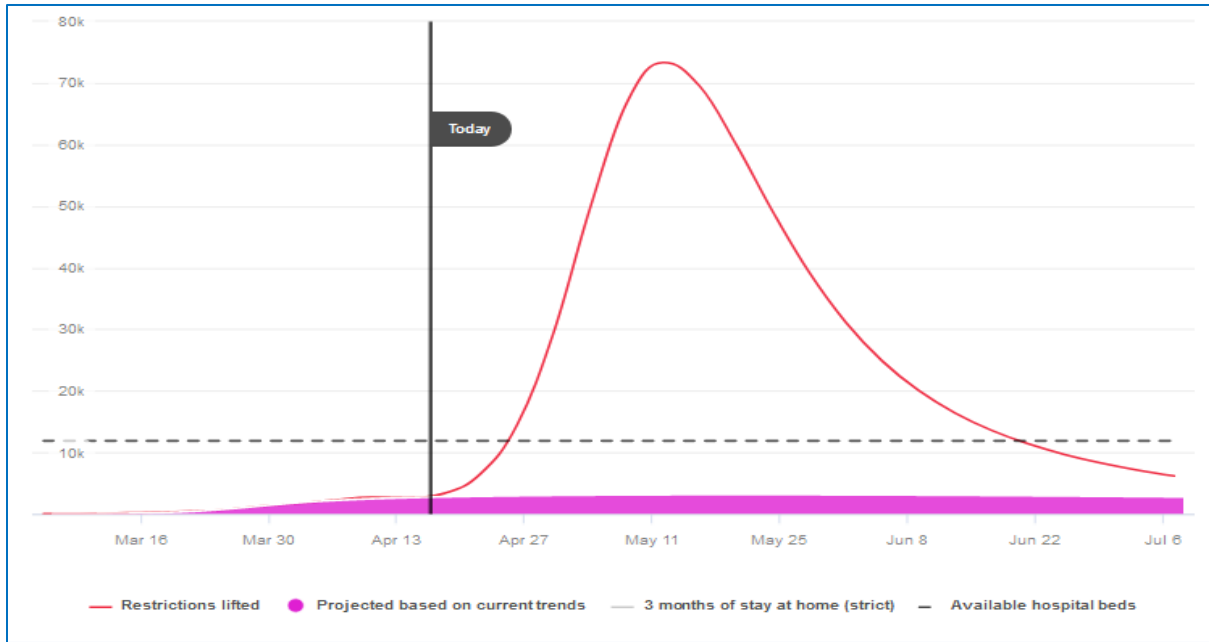


Figure 4. Projected Hospitalization, State of Washington, 2020. Source: Covid Act Now (2020).

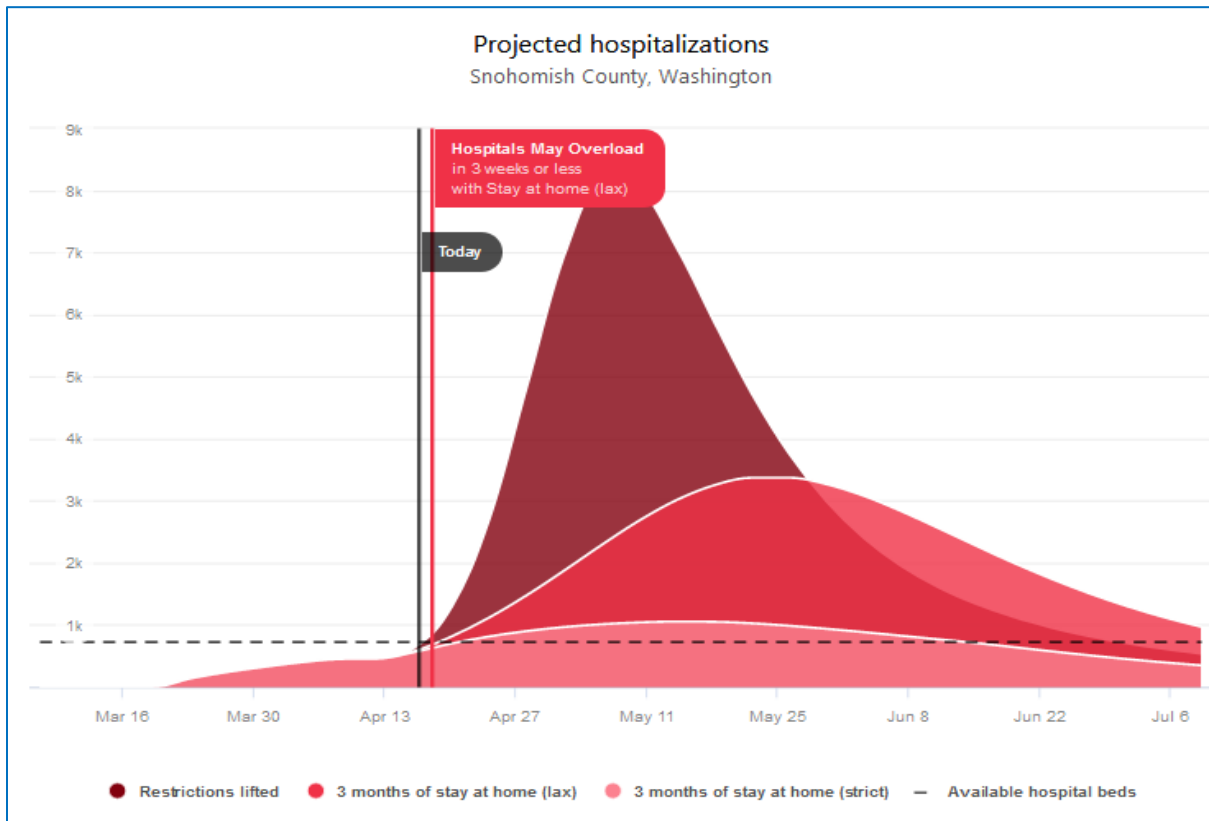


Figure 5. Projected Hospitalization, Snohomish Count Washington. Source: Covid Act Now (2020).

Capacity Planning

To immediately increase capacity, hospitals in Washington State have been setting up triage tents in parking lots, soccer fields, or other open areas (Black, 2020, Moreno, 2020). Healthcare leaders in Washington State are reported to have prepared a triage strategy whereby certain patients may be denied complete medical care if the health system becomes overwhelmed in the upcoming weeks or months (Weise & Baker, 2020). Factors like age, health status, and likelihood of survival would determine who will get access to full care and who would be provided only comfort care.

The possibility that the COVID-19 pandemic may require use of a triage strategy, or follow the pattern of the 1918 flu, with repeat outbreaks, suggests that hospital administrators should be conducting short-run capacity planning. The models of Covid Act Now (2020) presented here, are conceptually similar to models made available online at the University of Pennsylvania and partners (<https://penn-chime.phl.io/>, Weissman, et al., 2020) and Stanford University's Schools of Engineering and Medicine, and partners (<https://surf.stanford.edu/covid-19-tools/covid-19-hospital-projections/>, Zhang, et al., 2020). These models all employ current data and simulate capacity requirements based on assumptions about epidemiology curves, as discussed by Straif-Bourgeois & Robinson (2020) for Louisiana.

Beyond the immediate crisis, the possibility of future epidemics suggests that hospital administrators should undertake more a comprehensive approach to capacity planning than has been written about in recent years. Shifting resources among units (Larsson & Fredriksson, 2019), optimizing hospital beds with queueing models (Pardede, et al., 2019) or relative to reimbursement incentives (Barnes & Harp, 2018) may result in greater efficiency during normal times. For unusual times, broader thinking may be required.

AcademyHealth's recent report on the top five questions and information needs of for health systems include: Did past pressures to increase health system efficiency lead to a lack of resilience and lack of surge capacity? What policies and incentives would be necessary to increase health system resiliency and surge capacity in the future? (DeCosta, D., S 2020). While the short answer to the first question is almost certainly "yes", identification of specific pressures and estimation of the magnitude of pressures are not simple tasks. An even greater task is the development of new policies and incentives to address capacity concerns. Perhaps the readers and contributors to the *Journal of Healthcare Finance* can be involved with answering these questions.

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