COMMENTARY

Piloting a Short-Stay Pathway for Symptomatic Covid-19 Patients

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To care for an increasing number of symptomatic Covid-19 patients who seek care at the Hospital of the University of Pennsylvania (HUP) Emergency Department (ED), the interdisciplinary team at HUP developed a Covid-19 short-stay pathway. This pathway aims to identify and provide protocolized, high-efficiency, high-quality care for patients who are not suitable for discharge directly from the ED due to medical or social needs that can be addressed relatively quickly, within 48 hours. The authors report their experience with the first 51 patients who were cared for via this pathway during its inaugural 5-week period, from December 14, 2020, to January 18, 2021. In that time, the average hospital length of stay for Covid-19 patients through this pathway was approximately 23 hours, leading to more than 1,220 hours of inpatient bed-hours saved, attributable to the Emergency Department Observation Unit disposition instead of inpatient admission.

KEY TAKEAWAYS

» A short-stay pathway can be designed to identify the clinical and psychosocial characteristics of Covid-19 patients who are neither well-suited for immediate discharge from the ED nor sick enough to warrant full inpatient admission.

» Implementation of the Covid-19 short-stay pathway can decrease inpatient admissions of Covid-19 patients and expedite the care of less acute Covid-19 patients in an observation unit environment, thereby preserving inpatient capacity for non-Covid-19 operations, as well as for the more severe Covid-19 cases.
The Challenge

According to the February 17, 2021, forecast from the U.S. Centers for Disease Control and Prevention, over the 4 weeks ending March 13, 2021, there will likely be 206,000 to 699,000 new Covid-19 cases and approximately 2,300 to 7,300 new Covid-19–related hospital admissions daily across the United States. At the beginning of the Covid-19 pandemic in March 2020, hospitals across the nation struggled with increased demand for Covid-19 care, while non–Covid-19 care, such as elective surgery and inpatient oncological care, was paused. This pause occurred for several reasons, including patients’ fear of acquiring a nosocomial Covid-19 infection, delays in routine cancer screening and diagnosis, and hospitals’ needs to rapidly develop infection control policies and increase Covid-19 testing and inpatient care capacity.

In contrast, when the number of Covid-19 infections in several regions of the country rapidly increased around the holiday season at the end of 2020, hospitals were reapproaching full capacity for non–Covid-19 care. This presented a challenge for many hospitals across the nation. They were faced with the need to accommodate a significant yet unpredictable increase in Covid-19 patients while still maintaining their non–Covid-19 care services, often causing hospitals to struggle with optimal capacity management.

From the start of the pandemic through January 2021, the University of Pennsylvania Health System (UPHS) has cared for approximately 2,600 Covid-19 patients in the Emergency Department, of whom 1,650 patients were admitted under inpatient status. During that time, 36% of the ED patients who were admitted to the Covid-19 inpatient service were discharged within 48 hours and 55% were discharged within 72 hours. The average length of stay (LOS) among the Covid-19 patients discharged alive was 7.8 days. The present challenge faced by UPHS is to identify the subset of Covid-19 patients who are not suitable for discharge directly from the ED due to medical or social needs that can be addressed relatively quickly (within 48 hours), and to create a protocolized care pathway and implement it in a high efficiency framework in order to further drive down their length of stay. For such patients, we have found, so far, that approximately 80% of those who go through the short-stay pathway are discharged to home in just under 1 day.

Some specific examples include patients with new ambulatory oxygen needs, patients with advanced age or comorbidities that need closer monitoring, and patients who are immunocompromised or pregnant who require a consulting specialty physician prior to discharge. Operationally, patients who test positive for Covid-19 in the emergency room should be moved to a Covid-19–dedicated unit as soon as possible to reduce exposure to other patients. However, this may not be possible when inpatient admission capacity is strained. Identifying the patient population that could benefit from a short-stay Covid-19 pathway would allow UPHS to provide efficient and quality care while preserving inpatient bed capacity.

The Goal

We aimed to achieve the following goals:

1. Identify the clinical characteristics of Covid-19 patients who have hospital stays ≤72 hours.
2. Build a Covid-19 short-stay pathway based on clinical characteristics of the above-mentioned group to optimize clinical resource use and minimize hospital length of stay.

3. Establish a standardized protocol for the care of Covid-19 patients to increase efficiency and reduce inter-provider variation in care planning.

**The Execution**

*Overview*

We worked as a multidisciplinary team to develop a Covid-19 disposition algorithm to be used by ED providers at the Hospital of the University of Pennsylvania. The algorithm was used to determine which Covid-19 patients would be appropriate for admission to a novel Covid-19 short-stay pathway versus the inpatient Covid-19 wards (Figure 1).
Several data sources were used to create the algorithm. Internal Medicine physicians routinely caring for Covid-19 patients on the inpatient ward service at UPHS were surveyed to identify the clinical characteristics and medical needs of those patients who had hospitalizations ≤72 hours. In addition to the survey results, the inpatient admission criteria for our algorithm took into consideration the CURB-65 score for determining inpatient versus outpatient treatment for community-acquired pneumonia. To determine the criteria for Covid-19 short-stay pathway, we...
referenced a recent UPHS study that identified the characteristics of Covid-19 patients who were initially discharged from the emergency department but had a return hospital admission (inpatient or observation) within the 72 hours of initial ED encounter. That study identified that age, abnormal chest X-ray (CXR) findings, and fever or hypoxia on initial presentation were each independently associated with increased rate of return admission. We were also fortunate to have access to data from our health system’s Predictive Analytics group that further helped to define our population. These data demonstrated correlations between clinical features of Covid-19 patients at the time of ED presentation and length of inpatient admission, enabling us to identify characteristics associated with shorter length of stay and longer length of stay.

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After defining the appropriate patient population for the Covid-19 short-stay pathway, we worked with UPHS leadership to establish our short-stay unit within the Emergency Department Observation Unit (EDOU) at the Hospital of the University of Pennsylvania. Three beds were reserved in the EDOU for Covid-19 short-stay patients. The Advanced Practice Provider (APP) team were the frontline providers for these patients, with EDOU attending oversight. The bed number was determined based on the limited availability of negative pressure rooms.

With interdisciplinary collaboration among providers from Internal Medicine, Infectious Disease, Critical Care Pharmacy, and Social Work, we generated a standardized treatment protocol for Covid-19 patients admitted to the Covid-19 short-stay pathway (Figure 2).
Treatment Protocol for Covid-19–Positive Patients in the Short-Stay Pathway

Patients who tested Covid-19–positive in the ED were divided into symptomatic vs. asymptomatic groups. The disposition of symptomatic Covid-19–positive patients (inpatient admission vs. EDOU observation vs. discharge from the ED) was based on clinical features that are associated with longer vs. shorter length of stay, as well as the patient’s psychosocial determinants of health.

The Covid-19–positive short-stay treatment protocol was created based on current UPHS treatment guidelines and incorporated several novel treatment recommendations, including the continuation of steroids after discharge in appropriate patient populations. To assist in discharge planning, our case management colleagues identified home nursing and home oxygen companies that were able to swiftly accept patient referrals. It is worth noting that the EDOU providers at UPHS had not yet participated in the care of Covid-19 patients. Therefore, we trained the EDOU team — including 

Source: The authors

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The development of the treatment protocol and establishment of methods for efficient home care planning were necessary for the success of our project. This was due to the need for rapid turnover of patients within the Covid-19 short-stay pathway, while still maintaining the current standards of care. At the beginning of November, UPHS decided to create Covid-EDOU, and the planning committee had its first meeting on November 6, 2020. After about 5 weeks of multidisciplinary planning and education, the Covid-19 short-stay pathway was piloted on December 14, 2020.

**Hurdles**

During the design and implementation of the Covid-19 short-stay pathway, we overcame several hurdles. First and foremost, there are very few studies investigating the characteristics of Covid-19 patients who are considered safe to discharge from the emergency department versus those who benefit from hospitalization. Moreover, there is little information available regarding the needs of Covid-19 patients who have short hospitalizations versus longer hospitalizations. For our purposes, the combination of surveying frontline physicians and analyzing data from prior Covid-19 patients with short hospital stays provided valuable resources for the foundation of our short-stay pathway.

When creating the treatment algorithm, we were faced with the task of protocolizing care based on guidelines that were frequently evolving. The input of the Pharmacy and Infectious Disease teams was paramount in this process and helped to guarantee that each patient received the current standards of care. To further ensure patient safety, we utilized several robust post-discharge patient monitoring programs available at our institution, such as Covid Watch, Covid Pulse, and Penn Medicine at Home. When creating the treatment algorithm, we were faced with the task of protocolizing care based on guidelines that were frequently evolving.

Another significant challenge was finding the space to host the patients in the short-stay Covid-19 pathway. A key limitation was the availability of negative pressure rooms, which our institution has determined to be optimal to ensure safety of the providers caring for the Covid-19 patients. Fortunately, our Facilities Management team was able to reengineer three rooms in the existing EDOU into negative pressure rooms. This illustrates the importance of flexibility and resourcefulness when faced with technical challenges.

Admittedly, these three beds had a high occupancy rate with qualified patients through this pathway. To minimize patients’ boarding time in the ED, a small portion of patients who were appropriate for the short-stay pathway were admitted to the inpatient service when there were not enough Covid EDOU beds to meet demand. Depending on robust quantification of unmet demand
for short-stay Covid-19 care, as well as Covid-19 incidence trends in the community, the institution could adjust the number of beds dedicated to Covid-19 short-stay care.

As mentioned, the providers caring for our short-stay pathway patients had minimal prior experience caring for Covid-19 patients. The importance of rigorously standardized PPE use and understanding of current Covid-19 treatment guidelines cannot be overstated. For this reason, providing dedicated in-person and video trainings to the providers was essential to the successful and safe implementation of the short-stay pathway.

Lastly, the initial algorithm needed several adjustments based on feedback from the emergency department providers and the short-stay pathway providers. Effective communication was essential; therefore, our team met frequently and regularly to discuss challenges, brainstorm solutions, clarify the treatment protocol, and ultimately edit the pathway based on feedback from the frontline providers. Specifically, the algorithm was altered based on feedback from Covid-19 short-stay providers who cited the difficulty in quickly weaning oxygen in patients requiring supplemental oxygen at rest. The resulting change was that patients who required any amount of supplemental oxygen at rest were deemed inappropriate for the Covid-19 short-stay pathway. In contrast, patients who required supplemental oxygen only with ambulation were frequently able to be discharged home without supplemental oxygen. Therefore, the population of Covid-19 patients experiencing hypoxia only with ambulation was considered appropriate for the short-stay pathway. This streamlined, interprofessional collaboration helped to provide the high-quality and high-efficiency care necessitated by the Covid-19 short-stay pathway.

The Team

Our team comprised approximately 15 interdisciplinary care providers including attending physicians, resident physicians, advanced practice providers, nurses, case managers, pharmacists, and social workers. There was significant cross-departmental representation, with team members from various departments including:

- Emergency Department (Medical Director)
- Emergency Department Observation Unit (Medical Director, Advanced Practice Provider Manager)
- Internal Medicine (attending hospitalist and Education Lead Physician, house staff)
- Predictive Analytics (data scientist)
- Infectious Disease (attending physician and Associate Director of Microbial Stewardship)
- Infection Control (Director of Infection Prevention, Associate Hospital Epidemiologist)
- Critical Care Pharmacy (Clinical Care Specialist in Medical Critical Care)
Governance of this team was shared across the Emergency Department, Emergency Department Observation Unit, and the Center for Health Care Innovation team.

**Metrics**

Since the initiation of the Covid-19 short-stay pathway (December 14, 2020 – January 18, 2021), a total of 51 patients have been treated with the Covid-19 short-stay pathway. This includes both patients dispositioned directly from the ED into the EDOU short-stay pathway, as well as EDOU patients who converted to Covid-19–positive and were then transitioned into the short-stay pathway. Out of the 51 patients, 42 patients (82.3%) were discharged directly from the EDOU (EDOU discharge group) and 9 patients (17.6%) were converted from EDOU admissions to inpatient admission (inpatient discharge group). The conversion rate of 17.6% seen in the Covid-19 short-stay patients is slightly less than other non–Covid-19 patients in our EDOU, of whom approximately 20% convert to inpatient status. The average LOS of Covid-19 short-stay pathway patients discharged from EDOU was only 23.5 EDOU hours.

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By placing patients in the Covid-19 short-stay pathway in the Emergency Department Observation Unit rather than admitting these patients to inpatient beds, there were approximately 1,220 inpatient bed-hours saved. This includes the bed-hours saved from the EDOU discharge group (986 hours) and the hours that the inpatient discharge group spent in the EDOU (234 hours). One could argue that the actual inpatient bed-hours saved is greater than 1,220 hours, given that the highly protocol-driven and standardized care of the EDOU often offers shorter LOS as compared to inpatient admissions. This decreased average LOS generally reduces costs for hospitals and the health care system as a whole.7,8

Moving forward, we will continue to collect data on the Covid-19 short-stay patient population, to further identify characteristics that predict hospital LOS. Such data will include the total number of patients admitted under the Covid-19 short-stay pathway, the percentage of patients who were later converted to a full inpatient admission, and the average length of stay of patients in the pathway. Finally, a more rigorous analysis of outcomes data from this pathway will be conducted in the coming months.
Where to Start

For hospitals that may consider adopting this short-stay pathway for use in their own health system, we would like to stress that implementation of this initiative will require interdisciplinary and cross-departmental collaboration, which was crucial to our success. We recommend identifying an existing framework in which to implement this pathway. For example, our ability to house the Covid-19 short-stay pathway within the existing EDOU at UPHS was incredibly helpful. Additionally, it is imperative to ensure adequate training is provided to the clinical team that will be caring for the Covid-19 patients in the short-stay pathway. Lastly, support from ancillary staff that assist with discharge planning, such as social workers and case managers, is needed to arrange for home oxygen and/or home services if needed.

Looking Ahead

We recognize that this initiative, while quite promising, has limitations. First, the virus itself is a novel coronavirus that has presented a learning curve for health care delivery since its discovery more than 1 year ago, especially as it continues to spread and develop variations. It is difficult to predict how vaccination, new variants of the virus, and ever-changing policies around masks and indoor social activities will impact the demand for this type of care.

Second, both the sample size and the time frame for this initiative are limited. However, as noted, we will continue to review data, integrate feedback, watch for any unintended consequences, and, as appropriate, refine the algorithm and revise the short-stay model to improve patient outcomes and care delivery effectiveness and efficiency. Our experience over the last 11 months makes it clear that agility and dynamic adjustments to care delivery models are critical to optimize hospital operations through this pandemic.

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