


The Adaptation of a Clinic-Adjacent Parking Garage for Drive-In COVID-19 Vaccination

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ABSTRACT

PURPOSE: The distribution and vaccination of COVID-19 vaccines to billions of people worldwide will likely be one of the biggest public health undertakings in history. There has been a large focus on identifying processes to safely, efficiently, and effectively vaccinate large populations. We aimed to describe the development and operationalization of a drive-in COVID-19 vaccine site in a parking garage adjacent to outpatient clinics at University of Florida (UF) Health Physicians and how it was informed by the roll-out of SARS-CoV-2 testing and administration of respiratory vaccinations.

DESIGN/METHODOLOGY/APPROACH: A technical description and analysis of a drive-in COVID-19 vaccine site.

FINDINGS: We incrementally increased the number of vaccines performed per day from 300 in the first 2 weeks to 700 an additional 2 weeks later. By the end of January, we completed nearly 14 000 vaccinations. At this capacity, we estimate the site could performed 5000 vaccinations per week.

PRACTICAL IMPLICATIONS: This manuscript provides step-by-step guidance how to develop, operationalize, and implement a sustainable drive-in COVID-19 vaccination site.

ORIGINALITY/VALUE: To our knowledge, this is the first description of a drive-in approach to COVID-19 vaccination. Our findings can help inform other health entities as they develop or expand vaccination efforts that may serve as a template for other sites to adapt.

KEYWORDS: SARS-CoV-2, COVID-19 vaccinations, drive-in vaccinations

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Introduction

Delivering services while consumers remain in their vehicle is an approach that is widely accepted as a convenient and effective way to increase purchase and volume flow, and thus improving the customer experience in many service areas such as banking and fast-food restaurants (eg, drive-through where services are rendered promptly and products are often consumed later) and outdoor movies and diners (eg, drive-in where services occur more slowly and products are often consumed within the vehicle).

In the healthcare field, both drive-through and drive-in approaches have also been used, though probably not to the same degree as in other consumer areas. Drive-through pickup at community pharmacies delivers a significant increase in convenience, patient satisfaction, and access to care to prescription medications.¹ Drive-in influenza vaccination sites have also expanded access and increased the number of individuals vaccinated.^{2–4}

Drive-through and drive-in services proved to have an even more significant role in the current severe acute respiratory

syndrome coronavirus 2 (SARS-CoV-2) and the COVID-19 pandemic as a means to provide a variety of health services while maintaining physical distancing, thereby reducing exposure risk for patients at increased risk, providing ease of care for patients with mobility issues, and reducing the use of sometimes scarce personal protective equipment. Moreover, drive-in or drive-through services can nicely compliment telemedicine encounters, where services and procedures requiring a physical presence are still needed, such as diagnostic testing (eg, cancer screening) and vaccinations (eg, influenza, childhood vaccinations). Without such an option, clinical care using telemedicine approaches may actually have the unintended consequence of reducing the delivery of indicated services. For example, 1 healthcare utilization survey identified a drop in consumer spending on healthcare of approximately 38% across many sectors of the market during the early part of the coronavirus pandemic.⁵ At least some part of this reduced spending represents a reduction in indicated and important clinical services. For example, from June 2019 to June 2020, cancer screenings were down for breast cancer (94%), colon cancer (86%), and cervical



cancer (84%) for 2020 compared to a 3-year period from 2017 to 2019. Additionally, childhood vaccination rates declined 21.5% between January and April 2020 accompanying the reduced ability for patients to access care at a typical clinical visit.⁶

As COVID-19 vaccines have received emergency use authorization and have been disseminated for vaccination, there has been a large focus on identifying processes to safely, efficiently, and effectively vaccinate large populations as a means to achieve both individual and herd immunity.⁷⁻¹⁰ In this technical paper, we outline and describe the successful evaluation and adaptation of a drive-in approach, along with iterative process and physical structure improvements, using an existing parking garage near a campus of outpatient clinics to serve as a site of SARS-CoV-2 testing, administration of routine vaccinations, and ultimately the administration of COVID-19 vaccines that may serve as a template for other sites to adapt.

Design and Methods Intervention

Setting

We utilized a 2-story parking garage adjacent to University of Florida (UF) Health Physicians Outpatient Clinics, Gainesville, FL December 2020 to January 2021 to develop and implement a drive-in COVID-19 vaccination site

Pre-implementation

To expand the use of COVID-19 vaccines outside of the physical clinic space, we utilized a parking garage adjacent to outpatient clinics (Supplemental Appendix 1). The COVID-19 Vaccination Site was informed by the development and operationalization of a (1) drive-in COVID-19 nasopharyngeal testing site and (2) a drive-in respiratory vaccination site in the same parking garage. Briefly, we operationalized a drive-in COVID-19 nasopharyngeal testing site, which conducted over 18000 tests by August 2020 (Supplemental Appendix 2). Through this process we gained protection from the elements, expanded Wi-Fi services to utilize the electronic health record (EHR) in real-time, created a rotating schedule among clinics to share the staffing burden, and expanded communication with the hospital to ensure adequate supplies. Next, we expanded the drive-in approach to incorporate respiratory (influenza and pneumococcal) vaccinations to be administered within the site (Supplemental Appendix 3). We performed 124 vaccinations and received very positive patient-reported feedback from 29 patients. This process provided a framework to expand our EHR capabilities to create scheduling slots in which patients can self-schedule.

Implementation

Within 1 week of the emergency use authorization, we were able to vaccinate up to 24 patients per hour. First, healthcare

workers deemed high risk were encouraged to sign up for EHR application in advance to reduce the number who needed to be scheduled over the phone, thus emulating the process used for the respiratory vaccines. Standardized templates were developed to schedule patients for follow-up vaccinations within each of the vaccine's follow-up parameters to help prevent scheduling errors. Using Plan-Do-Study-Act processes, we created a systematic workflow from check-in through departure to maximize the use of available personnel. Moving the vaccine prep site to the garage from the clinic space, pairing vaccinators with schedulers, and creating a systematic parking flow were the most impactful changes made throughout the initial process.

Approximately 2 weeks after opening the site for COVID-19 vaccination, COVID-19 testing was moved to another drive-in location, which allowed the parking garage site to be fully dedicated to COVID-19 vaccination. Vaccine schedule capacity was incrementally increased to 8 to 10 vaccines every 10 minutes with the capacity to reach 48 to 60 vaccinations/hour and nearly 800 vaccines administered per day. We maximized the use of the site (47 available slots at any given time; Figure 1) and were limited from further expansion only by the physical space. During a day with maximal capacity, our staff requirements included: 1 operations lead, 2 clinical leads, 7 vaccinators, 7 schedulers, 2 check-in staff, 3 traffic controllers, 6 observers, 2 vaccine drawers, 2 documenters (staff to document within the EHR), and 1 pharmacist. The pharmacist helped with vaccine acquisition and distribution (from the hospital), supply, and vaccine drawer training.

We have drawn staff from our existing outpatient clinics to help assist with this effort. Clinic managers from several clinic groups (eg, family medicine, internal medicine, pediatrics) provide staffing 1 day per week. This allowed a sharing of responsibility throughout our system and prevented overburdening any particular groups. The described workflow is consistent with the current workflow at the site.

Findings

The number of vaccines administered gradually increased from 54 vaccinations on day 1 to approximately 300 vaccinations 6 days later. We reached 700 vaccinations per day an additional 2 weeks later. By the end of January, we completed nearly 14000 vaccinations (Figure 2). At current capacity, we estimate that approximately 5000 vaccinations can be administered per week; however, we have been limited by vaccine supply to reach this capacity. Although it was not formally collected, we estimate the time from entering the parking garage site to leaving it was about 20 to 30 minutes with times longest first thing in the morning.

Although formal feedback was not collected, anecdotally (both verbally to vaccinators and through local social media), patients were extremely satisfied with the smooth process, from scheduling their initial appointment through the completion of their second dose. Moreover, through iterative process evaluation

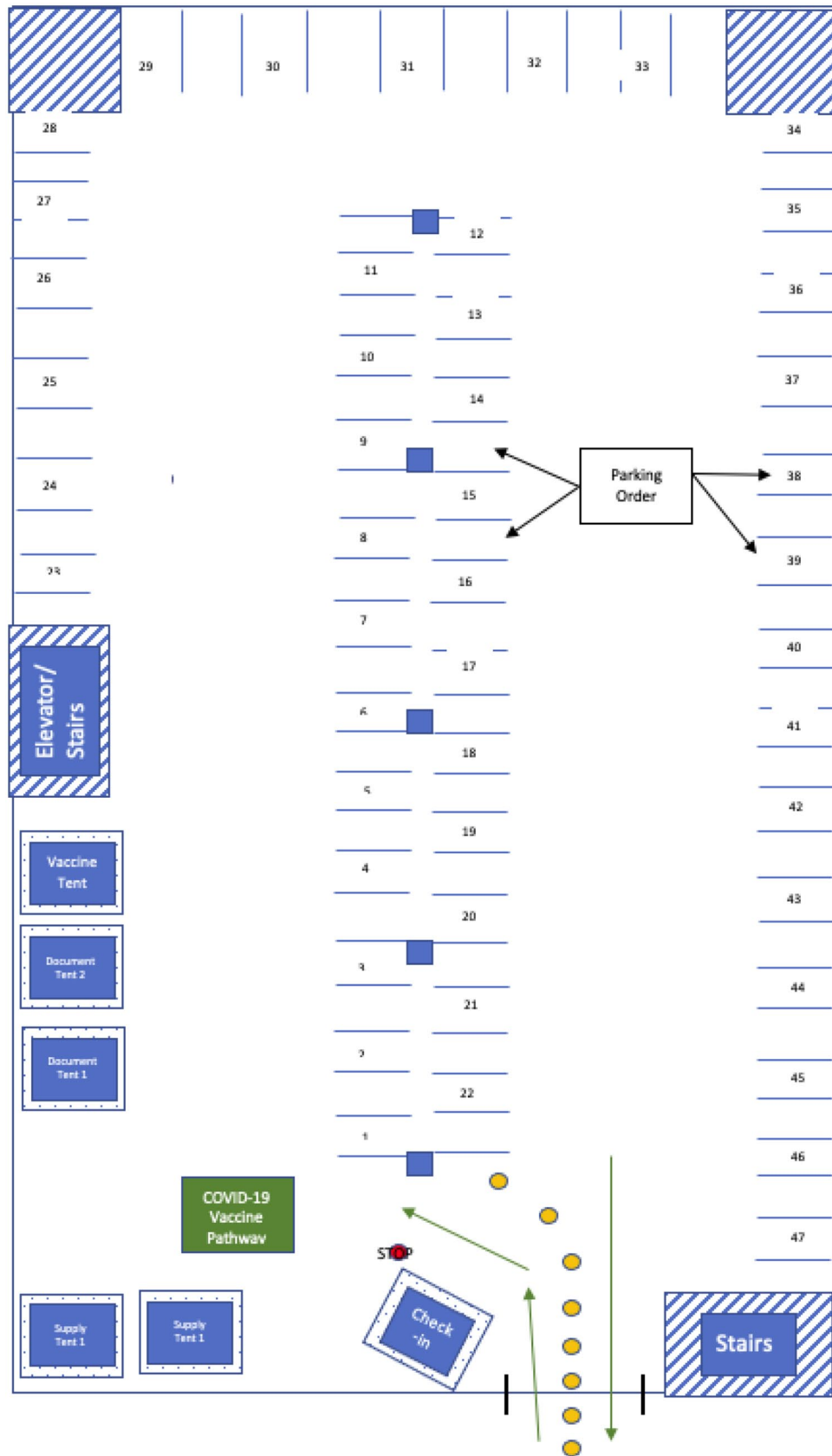


Figure 1. Final drive-in COVID-19 vaccination workflow.

and improvement through the development of a COVID-19 Nasopharyngeal Testing and Drive-In Respiratory Vaccinations (as noted in Supplemental Appendices 1-3), especially in regards

to information technology, personnel, workflow used to minimize wasted efforts, and interesting “one-offs,” like the need for a battery charger, we were able to develop guidance for the

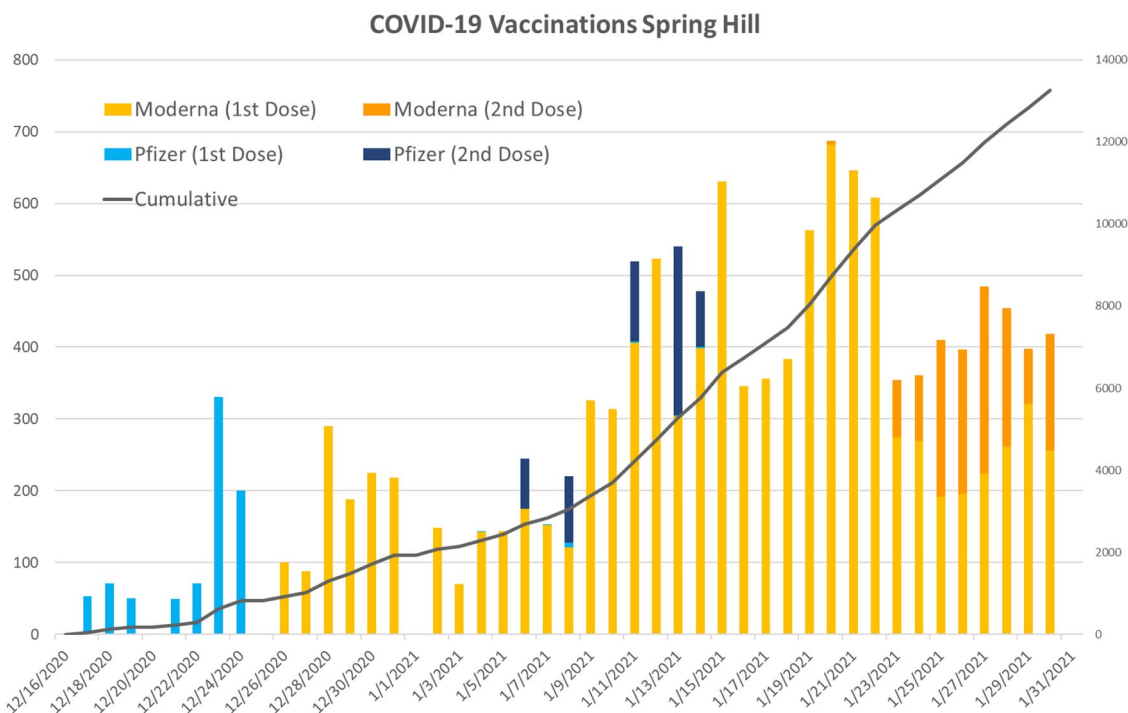


Figure 2. COVID-19 vaccinations completed at the drive-in site.

incorporation of Drive-In COVID-19 vaccinations (as noted below) that can be emulated at other sites.

Incorporation of drive-in COVID-19 vaccinations into the parking garage site

As the initial COVID-19 vaccines were being submitted for emergency use authorization (EUA), we began collaborating with the affiliated hospital to develop processes to roll out COVID-19 vaccinations jointly on behalf of our larger enterprise. Highest risk healthcare workers were identified by hospital and clinic administration as the top-priority for vaccination. These individuals were identified and registered into the EHR (if they were not already a patient). High risk individuals were encouraged to sign-up for “MyChart” in advance to reduce the number of healthcare workers to be scheduled over the phone. The process for scheduling and sending “MyChart” invites directly emulated the process used for the respiratory vaccines. Additionally, the EHR team developed standardized templates to schedule patients for follow-up vaccinations within each of the vaccine’s follow-up parameters. Initially, 4 slots were made available for vaccinations every 10 minutes (24 vaccines per hour) with the goal of expanding over time.

On December 17th, 2020, 6 days after the EUA for the Pfizer-BioNTech COVID-19 Vaccine, and 1 day after the hospital began administering vaccine on-site, the first COVID-19 vaccine was administered at the parking garage site. Similar to the processes for COVID-19 testing and respiratory vaccine administration (Supplemental Figure 5), patients would arrive at the check-in tent and have a placard placed on their windshield, indicating they were to receive a COVID-19 vaccine (as

opposed to one of the other services offered at the garage), along with a CDC COVID-19 vaccine card. The patient would then be directed by traffic control to a parking spot and told to turn off their engine. Vehicles were parked in every other spot to ensure adequate space between vehicles for vaccinators and schedulers to work. A scheduler would approach the patient’s vehicle and again confirm the patient’s identity and schedule them for their second dose vaccine appointment. Next, a vaccinator would approach the vehicle with a vaccine cart and administer the vaccine while the patient remained in their vehicle. The vaccinator would inform the patient of potential adverse events to monitor for and notify the patient to honk their horn if any allergy-related adverse events occurred. The vaccinator would then place a sticky note on the vehicle with the time of vaccination, as well as the time of expiration of the 15- or 30-minute observation period. Observers would walk around the garage and check on patients by verbally communicating with them to make sure they were fine. Once the observation time period elapsed, the observer would make 1 final check and, if the patient had no adverse reactions, allow the patient to pull through and exit the parking garage. After the observation time was completed, the documenter was prompted to note the vaccine administration and any adverse events (if necessary) into the system. The EHR would then automatically submit the vaccination record to the state department of health.

COVID-19 vaccine was stored in a continuously monitored refrigerator in the adjacent clinic building in a provider workroom that was not currently in use. A pharmacist would reconstitute the COVID-19 Vaccine (Pfizer-BioNTech), draw doses into syringes, and label the syringes. An adequate number of

doses would be prepared to supply the next 2 hours, which were then transported to the garage vaccine site, and placed in a hospital-grade refrigerator. Vaccinators in the garage would place enough vaccine on their cart to last the next hour.

Using the schedule built in the EHR, and communication with operational leads in the parking garage site, the number of vials of vaccines being prepared was adjusted (especially since patients were making same day appointments using their “MyChart” tickets). The pharmacist would regularly coordinate supplies with the hospital pharmacy staff, who oversaw vaccine supplies in the freezers which were located approximately a 20-minute drive from the parking garage site, and facilitated transporting an adequate amount of vaccine to supply the next 1 to 2 days to the garage site in Styrofoam coolers and ice packs.

Additionally, several “Emergency Kits” (Supplemental Box 3) were prepared for the garage site to be used in case of an adverse reaction (including allergic reactions). Patients who experienced an adverse reaction were evaluated by a clinical lead (RN or physician). A protocol guided the use of medications and supplies from the emergency kit. Emergency medical services (ambulances) were located within 1 mile of the site and could transport patients to the emergency department in the event of severe adverse reactions (after any initial medications were administered from the “Emergency Kit”). An emergency room facility is located within ¼ mile of the garage vaccine location.

Following EUA approval of the Moderna COVID-19 Vaccine, the parking garage site was converted to a “Moderna site” given its ease of preparation (no dilution needed) and less strict storage needs (stable for up to 30 days in the refrigerator). At this time, the parking garage site only utilized Moderna COVID-19 Vaccine for first doses, while the first doses of Pfizer-BioNTech COVID-19 Vaccine were administered at the hospital location. Patients scheduled to receive their second dose of Pfizer-BioNTech COVID-19 Vaccine at the parking garage site were called and either rescheduled to the hospital location (if it was convenient) or scheduled to the parking garage site (separated into 1 of 5 days to minimize the complexity of administering both COVID vaccines in the garage site). The first 2 days (1/6/21 and 1/8/21) were demarcated in whether the Pfizer-BioNTech COVID-19 Vaccine would be given in the morning. After a brief time-out, the garage site was transitioned to administering Moderna COVID-19 Vaccine only. However, this process underutilized available vaccine and vaccinators. The following week (1/11/21, 1/13/21, and 1/14/21), both first Moderna COVID-19 Vaccine doses and second Pfizer-BioNTech COVID-19 Vaccine doses could be given during the same time. After 2 days of planning with the leadership team, it was decided to (1) use different colored windshield placards associated with each vaccine, (2) separate the vaccine prep stations to opposite ends of the garage, and (3) pair schedulers with vaccinators, with each pair only vaccinating with 1 vaccine type. This revised process allowed us to

maximize the number of vaccines while minimizing the risk for errors. An updated description of staff/personnel, supplies, and materials needed are described in Supplemental Box 3.

Growth and expansion of COVID-19 vaccinations at the parking garage site

Although many workflow and worksite enhancements were made in the initial 3 weeks, we continuously identified new issues, addressed problems, and improved processes to enhance the efficiency and experience of the parking garage site for COVID-19 vaccinations. For example, we experienced several patients with dead car batteries who turned off their engine but still left their ignition on (eg, to listen to the radio). Having access to a battery charger and/or jumper cables on-site therefore became extremely handy. Additionally, a laptop charging station was purchased, which minimized the need to transport laptops back to the clinic each night to charge. We also created a streamlined process for converting from 1 vaccine lot number to the next to assist with accurate documentation of what vaccine was given. Here, a new lot was prepped by a second vaccine drawer and sequestered away from the other doses. Once all old lot vaccines were on the vaccinators’ carts, the new lot of vaccine was brought out with new lot stickers and red stickers. The red stickers would be placed on the face sheet after vaccination to signal to the documenters which lot was being documented. This helped prevent work stoppages, which were initially required when switching lots. Finally, Google Sheets was utilized to schedule leadership slots and staff member slots. This document was evaluated to assess the number of slots occupied by vaccine recipients to ensure that the number of staff members were sufficient. It was monitored by administration daily to ensure adequate staffing each day. Additionally, an email address was created so staff could email if they needed to cancel a shift. This email box was checked daily to update the Google document and obtain additional staff when necessary.

Beyond anticipated adverse events associated with COVID-19 vaccines, there was only 1 error to note. Over the 3 days in which both Moderna COVID-19 Vaccine and second dose Pfizer-BioNTech COVID-19 Vaccine were administered in parallel ($n = 1530$), there was only 1 instance in which a patient received the incorrect vaccine (error rate of 0.65 per 1000 vaccines administered). A root cause analysis identified that the vaccinator did not properly follow protocols in confirming the vaccine was correct for the patient. Subsequently, the vaccinator was re-educated and additional steps were taken to make the placards on the vehicle clearer and have the vaccinators ask open-ended questions (eg, “which vaccine are you here for?” and “is this your first or second dose?” instead of “are you here for your second dose of the Pfizer vaccine?”).

Discussion

Although there are a variety of approaches to COVID-19 vaccinations, to our knowledge, this is the first description of the

operationalization of a drive-in vaccine site using an existing parking garage in an otherwise outdoor space. There were many advantages to this approach, as noted, including the ability to provide care to patients receiving a vaccination in the convenience of their vehicle. Although the optimal approach used may be dictated by weather, population density, and access to a health system, we found a number of benefits to the drive-through approach. Patients with mobility issues or disability can remain in their vehicle, helping mitigate the added stress of walking through a new space and receiving the vaccination. Patients with compromised immune function and others focused on risk-avoidance may also benefit from this approach as it avoids the clinical (indoor) setting and minimizes contact with people outside of ones' own bubble. The use of the enclosed garage also offered flexible protection from the weather, a place to apply air-conditioning in the summer, heat in the winter, and a rain covering in all seasons. Moreover, the drive-in approach may also be useful in concert with telemedicine visits as a means to provide access to non-COVID-19 services and procedures (eg, diagnostic screening and vaccinations).

Despite no published studies reporting real-world results of a drive-in clinic for COVID vaccination, variations on the approach have been made by other groups. Asgary et al.¹ developed a simulation tool to assist in the development and operationalization of drive-through mass vaccination facilities most commonly utilized in large, densely populated urban areas. This tool allows users to estimate volume of vaccination and staff needed to run such facilities efficiently under different configurations. In the base case analysis, where 10 lanes with 4 staff members per lane, 3 shifts per day, and multiple passengers in 1 car are allowed, a total of 1771 cars used the drive-through with an average time spent between 80 and 90 minutes under 100% pre-registration. The layout of the setups for the tool consists of a screening booth, registration stations, vaccination stations, and recovery area.¹ This layout differs from the set-up of our site, which did not separate vaccination and recovery sites (ie, patients were not required to drive immediately after vaccination) especially since immediate vasovagal dizziness is a known adverse event. Additionally, this site does not allow for overhead coverage and therefore may be impacted by weather both in temperature and precipitation. Asgary's stimulation tool aimed to assess the drive-through approach for a mass vaccination provides hypothetical guidance based on several inputs like amount of vaccine available, staff requirements, and physical size of the site; however, our description provides further guidance on "how-to" develop operationalize a vaccination site within a parking garage.

Our approach also aligns with other findings in the literature on other vaccinations. In fall 2019, a fixed-external Drive-Thru Employee Flu Point of Distribution (POD) was organized and executed at the Veterans Affairs (VA) Medical Center at Northport, New York. This event was established for employees to receive the influenza vaccine. Over a 90-minute interval, 290 employees were vaccinated.² Additionally, 2 no-cost drive-in influenza vaccination clinics at the university of New Mexico

Hospital system in Albuquerque were established. This site completed a total of 2174 vaccinations resulting in a median process time was 5 minutes per vehicle, 3 minutes per vaccination.⁴ Our rate of vaccination (60 per hour) may be difficult to directly compare to a site delivering influenza vaccine as it does not require a 15-minute observation period as does the COVID-19 vaccination. Additionally, short-term influenza vaccination sites may be easier to staff over the course of 1- or 2-day events relative to the COVID-19 vaccine which, as in our site, is opened 76 hours per week for the foreseeable future.

In addition, a survey was conducted for the participants of the drive-through flu vaccination clinic at the University of New Mexico Hospital System in Albuquerque.³ The survey aimed to determine the important characteristics of the participants in the study. One significant finding of the survey was that 20% to 30% of the respondents chose the answer "I would probably not [otherwise] get a flu shot" under the question "What are your other options for receiving a flu shot?" Although it is unknown whether or not a patient would forego COVID-19 vaccination if offered only in a drive-through setting, we may hypothesize that delays in vaccination may occur, especially in patients with issues with mobility and those who avoid visiting clinics. We found a high-level of patient satisfaction with the drive-through approach among patients who completed a survey as a respiratory vaccination. Based on these initial findings, we were confident that patients would be at least equally receptive to receiving a COVID-19 vaccine using a similar process.

There are a few limitations to note. First, our findings may not be generalizable to all health systems as they may not have access to covered parking garages within proximity of clinics. Second, some health systems may not have EHR systems that have available processes to self-schedule their vaccine; therefore, requiring additional staff and staffing hours.

Conclusion

The use of a parking garage site adjacent to outpatient clinics served as an ideal location to provide several clinical services and procedures, specifically SARS-CoV-2 testing, administration of routine vaccinations, and the administration of COVID-19 vaccines. Through months of sequential iterations for each of the processes and physical surrounding adaptations, we find our current process for COVID-19 vaccinations to be safe, effective, and efficient. Other vaccination sites may be able to draw from our successes when considering COVID-19 vaccine administration in an outdoor setting.

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Author Contributions

The authors RR, SU, LG, NP, TG, and LW were responsible for operationalizing the program. RR, and SU were responsible for data collection. YH was responsible for data analysis. JG, RR, and SU was responsible for interpretation of the data. All authors contributed to drafting the final version of the manuscript. All authors read and approved the final version of the manuscript.

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Supplemental material

Supplemental material for this article is available online.

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