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Implementation of an Inpatient Covid-19 Vaccination Program

Rebecca E. Berger, MD, Daniela C. Diaz, MD, Sharon Chacko, MD, Irene Louh, MD, PhD, Christopher Wheaton, PharmD, Cindy Ipolitti, PharmD, Richard Trepp, MD

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A multidisciplinary team at NewYork-Presbyterian (NYP) was convened to design, implement, and troubleshoot a program to deliver Covid-19 vaccines to hospital inpatients. The program had several key features, including integration with the electronic health record, flexibility in vaccine distribution models, rapid response to changing eligibility, addressing of federal and state mandates, and continuous communication with frontline staff. The team encountered challenges in implementing the vaccination program, including difficulty defining the population of eligible patients in the setting of a decreasing eligibility pool, management of the logistics of a vaccine with limited shelf life and the timing of inpatient orders, patient and clinician hesitancy, and competing priorities for inpatient teams. On the basis of the challenges encountered, as well as the availability of vaccines from state supply, NYP switched from offering the Johnson & Johnson vaccine, given during the initial inpatient vaccination efforts, to the Pfizer/BioNTech vaccine in August 2021.

Program Introduction and Timeline

Soon after the U.S. FDA granted Emergency Use Authorizations (EUAs) for vaccines to prevent Covid-19, NewYork-Presbyterian (NYP) began vaccinating, first frontline health care workers, then the community at a mass vaccination site.¹⁻⁴ In the early spring of 2021, the availability of vaccine appointments in the community remained very limited, and hospital leaders were eager to begin vaccinating hospitalized patients. As soon as the state notified NYP that doses would be allocated for hospital inpatients, we convened a multidisciplinary team led by a physician champion (R.T.) and including Chief Medical Officers, Chief Nursing Officers, Pharmacy Leadership, Talent Development, Nursing Education, IT Leadership, and frontline clinicians; the

FIGURE 1.

Timeline of Inpatient Vaccination Program

Leaders at NewYork-Presbyterian designed and implemented a program to provide Covid-19 vaccines to hospitalized patients within our institution. The program evolved over time on the basis of staffing constraints, changing eligibility requirements, and federally mandated vaccination pauses. The most recent modification reflects our decision to switch to the Pfizer vaccine.

CDC = Centers for Disease Control and Prevention, EUA = Emergency Use Authorization, J&J = Johnson & Johnson.

Source: The authors

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goal was to rapidly design and operationalize an inpatient vaccination program with the aim of increasing uptake by proactively offering the vaccine in a clinical setting rather than waiting for patients to seek inoculation.

We began inpatient vaccinations on March 19, 2021, at NYP's seven New York City campuses, as soon as the vaccine supply from New York State arrived. The state recommended the Johnson & Johnson vaccine for hospital inpatients because of the logistical benefit of requiring only one vaccine. Vaccinations were paused on April 13 because of the investigation by the Centers for Disease Control and Prevention (CDC) and FDA of cerebral venous sinus thrombosis (CVST) and thrombocytopenia after vaccination.⁵ The program resumed on April 26 (Figure 1).

The number of weekly doses administered was highest in the first 4 weeks, but fell to zero during the CDC/FDA pause (Figure 2). Since resumption of the program, weekly vaccination numbers remain low across the NYP campuses.

From the beginning of the program, the number of doses of vaccine delivered to inpatients was lower than predicted. In response, we continuously solicited input from nurses, pharmacists, informaticists, resident and attending physicians, and physician assistants to identify barriers to vaccine uptake and proposed and piloted strategies to attempt to mitigate them.

FIGURE 2.

Doses Administered During the Inpatient Vaccination Program

The rate of vaccines delivered each week at the New York City campuses of NewYork-Presbyterian was highest in the first 4 weeks of the program, fell to zero during the FDA/CDC pause, and has remained low since resumption of the program. CDC = Centers for Disease Control and Prevention.

*Partial week

Source: Internal Hospital Pharmacy Administration Data

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In this article, we share the key features of our inpatient vaccination program, review challenges encountered, and outline our attempts to mitigate these barriers.

Key Program Features

Electronic Health Record Integration

As of February 2021, most of the sites used Epic (Epic Systems Corporation), one used Allscripts Sunrise Enterprise (Allscripts Healthcare), and one used Cerner Millennium (Cerner Corporation). For clarity, we will primarily describe the approach we took in Epic, but similar considerations would apply to other electronic health records (EHRs).

“ *We designed a nested order panel that was added to every adult inpatient admission order set and available as a freestanding order. We decided to prompt ordering at the time of admission to facilitate finding enough patients to open a vial without delaying discharge.* ”

In Epic, we designed a nested order panel that was added to every adult inpatient admission order set and available as a freestanding order. We decided to prompt ordering at the time of admission to facilitate finding enough patients to open a vial without delaying discharge (all three authorized vaccines come in multidose vials with a limited shelf life once opened). The panel displayed eligibility criteria (updated multiple times as New York State expanded eligible populations) and contraindications to ensure providers were following rapidly evolving guidelines ([Appendix](#), Section A). The order panel included hyperlinks to the current paper versions of the screener, consent, and attestation forms. Standing orders were not used for this purpose because of the complex and changing eligibility requirements, the need to screen patients for contraindications, and the requirement for signed consent.⁶⁻⁸

Flexibility in Vaccine Distribution

We first piloted a centralized model, in which each site had a dedicated vaccinator. In the initial centralized model, vaccinators monitored Epic for new vaccine orders and notified the pharmacist when there were five orders, prompting the pharmacist to open a vaccine vial. The pharmacist drew up patient-specific doses and filled out the lot number and expiration date on the vaccination cards. The vaccinator administered the vaccine, added the patient’s information to the card, and gave the card to the patient in their hospital room (see [Appendix](#), Section B for Role Descriptions). The vaccinator monitored the patient for vaccine reactions. Immediate nurse availability on the unit and standard nursing hospital rounding protocols fulfilled the requirement for the 15- to 30-minute monitoring period after vaccination.

We began with the centralized model in order to expedite training; it was more efficient to orient a limited number of vaccinators at the outset when the vaccines were still new. However, at the time of program launch, there was concern about the sustainability of providing staffing to multiple campuses, so we planned to eventually transition to a distributed model, in which the patient’s primary nurse, instead of a dedicated vaccinator, delivers the vaccine. We transitioned to the distributed model approximately 2 weeks into the vaccination program, sooner than originally anticipated, because there was a greater need for the dedicated vaccinators to return to the NYP mass vaccination site. In the distributed model, the lead pharmacist at each site is responsible for monitoring the EHR for vaccine orders. The primary nurse now completes the prior responsibilities of the vaccinator (delivering the vaccine, filling out patient information on the vaccine card, and monitoring the patient).

Each site has a nursing site lead and pharmacy site lead. Beginning with the centralized model allowed for rapid identification and resolution of workflow issues and clarification of roles and communication with a limited number of vaccinators. The transition to a distributed model allowed for sustainable staffing. In both models, the primary team was expected to initiate conversations with patients at the time of admission about their vaccination status and willingness to be vaccinated. There was no standardized script for the teams; teams used their existing knowledge and skills to discuss vaccination with patients and their families and encouraged vaccination if appropriate.

Response to Changing Eligibility, State Mandates, and Pause

Development of the interdisciplinary team described above, who communicated via regular emails and phone calls, allowed for rapid pivots in response to updated guidance from state and federal authorities. Our informatics team updated the order panel with every change in patient eligibility. On April 4, the New York State Department of Health issued a mandate requiring that hospitals offer the Covid-19 vaccine to all eligible unvaccinated patients prior to discharge to a long-term care facility, favoring the J&J vaccine to eliminate the need for a second dose.⁹ In response, we added an EHR alert that fired for patients without documented vaccination who were being discharged to skilled nursing facilities. We paused the vaccination program on the same day that the CDC and FDA released guidance about J&J vaccine side effects and resumed the program 3 days after the federal bodies encouraged resumption of vaccination.

Continuous Communication with Frontline Staff

An email was sent to all providers to introduce the inpatient vaccination program and provide information about vaccine eligibility, ordering, and consent. A similar communication was sent to nursing staff. Emails were sent each time New York State expanded eligibility groups for vaccination and at the times of the pause. With the resumption of vaccines after the pause, communications included a summary of the CDC and FDA safety review and a link to the J&J EUA Fact Sheet to be provided to patients as per new CDC guidelines.

Challenges and Mitigation Strategies

Difficulty Defining Population of Eligible Patients, Decreasing Eligibility Pool

While we could easily identify eligibility on the basis of age, residency, and comorbidities, we initially had difficulty determining which patients had already been vaccinated outside of our system. Additionally, as access to appointments improved in the community, a smaller percentage of inpatients were unvaccinated at the time of admission. Clinicians had access to the New York State and Citywide Immunization Registries through the EHR, but this initially required manually entering the registry and reconciling the information; therefore, clinicians had to ask patients about their vaccination history or to show their vaccination cards. The team updated the Epic settings to automatically import vaccination data from city and state registries, removing the need for manual reconciliation. We created a report in Epic that generates a list of potentially unvaccinated patients to be used by the teams to proactively engage patients and encourage

vaccination. We are piloting expansion of the program to patients in the ED to identify other eligible patients.

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Limited Shelf Life of Multidose Vials

After opening a J&J vaccine vial, all five doses must be used within 6 hours if refrigerated, 2 hours if at room temperature. To reduce waste, vaccinators and pharmacists were initially instructed to wait until there were five orders for vaccines at a single site before opening a vial. It was sometimes not possible to simultaneously identify five eligible consenting patients, especially at smaller sites. We observed a vicious cycle in which a declining pool of eligible patients led to fewer orders; having fewer active orders decreased the likelihood of opening a vial; and teams and patients were frustrated with delays, which discouraged vaccine ordering. As the vaccine supply improved and federal and New York State regulators revised guidance to allow for “responsible wastage,”^{10,11} pharmacists now open a vial when needed to vaccinate an eligible and interested patient before discharge. Remaining doses from the open vial are offered to patients in the ED.

Timing of Ordering

The nested order panel was included in all admission order sets for the reasons discussed above. However, teams cannot always determine patient eligibility at the time of admission, especially if the family needs to be contacted to confirm vaccination status. Many patients have temporary contraindications (such as critical illness) that may resolve during the admission. Therefore, we added an alert in the EHR to remind teams 48 hours after admission to reassess eligibility for vaccination if not ordered or previously administered and no contraindication is documented. The same alert fires again at the time of discharge for patients being discharged to a skilled nursing facility, a subacute rehabilitation facility, or a long-term care facility to comply with the New York State mandate.

Patient Hesitancy

Many of the patients most eager to be vaccinated had already been vaccinated outside the hospital, especially after appointments became more readily available in New York City and state. Remaining inpatients were, overall, more hesitant and less eager to be vaccinated than those who had sought vaccination prior to admission. Patients expressed concerns about the efficacy, safety, and novelty of the vaccines; others expressed hesitation that it would exacerbate the symptoms that brought them into the hospital.

Patient hesitancy was perceived to have increased further after the pause on J&J vaccination. Because of the distributed nature of the program, the responsibility to provide information about the safety and efficacy of the vaccine lies with the primary team. This patient hesitancy was one factor that catalyzed the decision to transition to the Pfizer vaccine for the inpatient program in August. Discussions about this switch were accelerated by the approval of the Pfizer vaccine for patients age 12–15 and by patient and clinician concerns about the relatively lower efficacy of the J&J vaccine. We anticipate that switching to the Pfizer vaccine could address some concerns about patient and provider hesitancy. However, it has created a new logistical challenge in needing to ensure second doses are scheduled. We have engaged our colleagues in the outpatient administrative departments to create new workflows for scheduling and documenting the second doses in a patient’s discharge paperwork.

Clinician Hesitancy

Some clinicians perceive the J&J vaccine to be less effective or less safe than the messenger RNA (mRNA) vaccines produced by Pfizer and Moderna. For example, some physicians initially had significant enthusiasm about increasing access to vaccination for inpatients on antepartum, labor and delivery, and postpartum units, but hesitancy rose after the pause, given that young women appear to be at a higher risk of the rare complication of CVST. Some physicians expressed a preference to wait until these patients could be vaccinated with an mRNA vaccine in the outpatient setting as vaccine appointments became more accessible.

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Additionally, physicians expressed hesitation about vaccinating certain patients, such as patients in the immediate perioperative period, patients with acute infection, or patients who are immunosuppressed, because of concerns about either vaccine efficacy or interpretation of vaccine side effects, such as fever, especially in specific populations such as postoperative patients. To address these concerns, with every communication about the inpatient vaccination program sent to providers, we include information about vaccine safety and efficacy. As noted before, the planned transition to the Pfizer vaccine may decrease clinician hesitancy. Multiple recorded town halls for the hospital and academic partners discussed the most recent vaccine safety and efficacy data.

Competing Priorities for Inpatient Teams

Inpatient teams are often busy managing multiple complex medical problems and may not prioritize asking about their patient’s Covid-19 vaccination status. To address this, we developed a report in Epic that identifies potentially eligible unvaccinated patients. We have piloted using

this report to identify patients and proactively reach out to inpatient teams to inquire about patients' interest in vaccination; limited anecdotal reports suggest these activities lead to about five new vaccines for every 40 patients reviewed.

Despite some early challenges, we find the program to be worthwhile. Now fully under way, the overall cost is low; the work has now been absorbed into existing job descriptions, including those for hospital pharmacists, bedside nurses, doctors, and administrators, and has required no additional personnel costs. In return, the program enhances our ability to expand vaccine access for our patients, delivering vital protection in the face of the continuing coronavirus pandemic.

Looking Ahead

Work during the Covid-19 pandemic has shown that our hospitals are able to design, implement, and troubleshoot new operational programs over a matter of weeks, dealing with both internal and external factors. Implementation of the inpatient Covid-19 vaccination program has met with several informatics, logistical, and clinical challenges that have required our team to be flexible and creative. Our goal is to continue to revise and refine the program to enable patients to be vaccinated against Covid-19 during hospital admission and to engage with patients who have been unable or unwilling to get vaccinated outside the hospital to take advantage of the opportunity to be vaccinated.

Leaders at NewYork-Presbyterian designed and implemented a program to provide Covid-19 vaccines to hospitalized patients within our institution. The program evolved over time on the basis of staffing constraints, changing eligibility requirements, and federally mandated vaccination pauses. The most recent modification reflects our decision to switch to the Pfizer vaccine. CDC = Centers for Disease Control and Prevention, EUA = Emergency Use Authorization, J&J = Johnson & Johnson.

Rebecca E. Berger, MD

Assistant Professor of Medicine, Section of Hospital Medicine, Weill Department of Medicine, Weill Cornell Medicine, New York, New York, USA

Daniela C. Diaz, MD

Assistant Professor of Medicine, Center for Family and Community Medicine, Columbia University Vagelos College of Physicians and Surgeons, New York, New York, USA

Medical Director, Armory COVID-19 Vaccination Center, NewYork-Presbyterian, New York, New York, USA

Sharon Chacko, MD

Assistant Professor of Medicine, Center for Family and Community Medicine, Columbia University Vagelos College of Physicians and Surgeons, New York, New York, USA

Medical Director, Armory COVID-19 Vaccination Center, NewYork-Presbyterian, New York, New York, USA

Irene Louh, MD, PhD

Assistant Professor of Clinical Medicine, Columbia University Vagelos College of Physicians and Surgeons, New York, New York, USA

Chief Medical Officer, Data & Analytics, NewYork-Presbyterian, New York, New York, USA

Christopher Wheaton, PharmD

Technical Architect, EpicTogether, NewYork-Presbyterian, New York, New York, USA

Cindy Ipolitti, PharmD

Director, Clinical Pharmacy Services, NewYork-Presbyterian, New York, New York, USA

Richard Trepp, MD

Assistant Professor of Emergency Medicine, Department of Emergency Medicine, Columbia University Vagelos College of Physicians and Surgeons, New York, New York, USA

Associate Chief Medical Information Officer, NewYork-Presbyterian, New York, New York, USA

Appendix

Insights from the Implementation of an Inpatient Covid-19 Vaccination Program

Disclosures: Rebecca E. Berger, Daniela C. Diaz, Sharon Chacko, Irene Louh, Christopher Wheaton, Cindy Ipolitti, and Richard Trepp have nothing to disclose.

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