

Planning and implementing COVID-19 mass vaccination clinics

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ABSTRACT

Purpose: The COVID-19 pandemic is an unprecedented global public health crisis. Mass vaccination with safe and effective vaccines to achieve herd immunity requires a whole-of-society approach. Primary care has played a key role in those countries that have succeeded in rapidly vaccinating a large proportion of their populations, particularly those most at risk. In this special report we synthesize existing guidelines and peer-reviewed studies to provide family physicians with practical guidance on planning and implementing COVID-19 mass immunization clinics.

Methods: PubMed, Ovid, MEDLINE, Epub Ahead of Print, Embase and Google Scholar were used to search for relevant literature using keywords, including “COVID-19”, “mass vaccination”, “campaign”, “standard” and “best practice”. We also identified and analyzed national and international guidelines.

Results: Forty-six relevant articles, reports and guidelines were identified and synthesized. Key considerations for COVID-19 mass vaccination clinics include establishing a leadership structure and key roles, identifying optional locations, clinic layout and workflow, day-to-day operations including infection prevention and control, and communication strategies. Ongoing data collection is required to evaluate and continuously improve mass vaccination efforts. Primary care can play a key role in organizing clinics and ensuring populations who have been made vulnerable by social and economic policies are being reached.

Conclusions: Planning and implementing a successful COVID-19 mass vaccination campaign requires a number of key steps and considerations. As the COVID-19 vaccine rollout occurs in various countries, research will be required to identify key factors for success in different healthcare systems to inform future pandemic responses.

Key Words: COVID-19, SARS-CoV-2, vaccination, immunization, mass vaccination clinic, Community/public health

INTRODUCTION

In just over a year and a half, the COVID-19 pandemic has resulted in over 150 million confirmed cases, and 3 million deaths and rising.¹ Public health measures have played an important role in reducing the spread of this novel virus but have had enormous social and economic impacts worldwide.² Vaccinating large proportions of the adult population to achieve herd immunity is the only safe pandemic exit strategy.³

To end the pandemic, approximately 55 to 82% of the population will need to be immune, either through vaccination or natural infection.⁴ For COVID-19 disease, which has a case fatality ratio of approximately 1%,⁵ achieving herd immunity through natural infection would result in significant morbidity and mortality. For example, a herd immunity threshold of 55% would translate into ~ 43 million global deaths, and would take years to achieve. During the three major flu pandemics of the 20th century, herd immunity was achieved through multiple waves of natural infections over two to five years.⁶ Mass vaccination provides the safest and fastest way of achieving herd immunity. There are currently over 100 COVID-19 vaccines in clinical trials, including 27 in phase 3 studies, six authorized for early or limited use, and eight that are fully approved.⁷

The rollout of COVID-19 vaccines to the general population represents the largest mass vaccination campaign in history.⁸ Primary care systems have played a key role in the rapid vaccine rollout in Israel^{9,10} and the United Kingdom¹¹, supporting proactive outreach to at-risk individuals, organizing local clinics, and tracking adverse events. Primary care can play an essential role in vaccinating the greatest number of people in the shortest amount of time.

This special report aims to provide easy-to-follow, practical guidance for primary care providers planning and implementing COVID-19 mass immunization clinics.

METHODS

Search criteria for study inclusion and selection

We sought reports, manuals and peer-reviewed papers that addressed the planning of mass immunization clinics in general, and in the context of the COVID-19 pandemic. Only studies that involved human participants and were reported in English were included.

We searched PubMed, Ovid, MEDLINE, Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Embase for citations between January 1, 1947 and November 25, 2020.

We used the COVID-19 filter adapted for search strategies created by Library and Knowledge Services of the National Health Services¹², and used the following keywords: “coronavirus disease 2019”, “COVID-19”, “severe acute respiratory syndrome coronavirus 2”, “Mass vaccination”, “Campaign* or surveillance or best practice* or policy* or Principle* or Standard* or clinic* or strategy* or planning”. We also searched for national and international guidelines on the organization of COVID-19 mass vaccination clinics.

Data collection and analysis

We used the AGREE reporting checklist to guide our assessment of reports and to synthesize what is already known about planning and implementing mass immunization clinics.¹³ A simple analytical framework: Search, Appraisal, Synthesis and Analys (SALSA) was employed¹⁴ and a narrative summary of the results is presented.

RESULTS

A total of 46 relevant articles, reports and guidelines were identified and synthesized. The 26 peer-reviewed studies identified (Appendix 1a) were conducted in the USA ($n = 14$), Canada ($n = 6$), Australia ($n = 3$), China ($n = 1$) or involved more than one country ($n = 2$). The 20 guidelines identified were from the World Health Organization, the USA, Canada, the UK, Australia and New Zealand (Appendix 1b).

What are the key initial steps to planning mass vaccination clinics?

The initial step in organizing and implementing a mass vaccination clinic is to establish leadership and coordinate clinic operations. Experienced leadership is an important factor in a vaccine program's effectiveness.¹⁵⁻¹⁷ These clinics require close coordination across all levels of government and among public health agencies, external organization and community partners. An organization and coordination team, in which members represent a wide array of expertise,¹⁸ can help to identify opportunities for collaboration, and to negotiate agreements in advance (e.g. for supplies, clinic sites, human resources).¹⁶

Traditional (e.g. hospitals, long-term care, retirement homes, physicians' offices, pharmacies^{19,20}) and non-traditional settings (e.g. community centres, arenas, stadiums, drive-through clinics^{21,22}) should be used in a coordinated fashion for a defined geographic area to vaccinate the greatest number of people in the shortest period of time.²³ Compared to scheduled doctor's visits, mass vaccination clinics are more cost-effective,²⁴ have shorter wait times, and patients are more likely to receive vaccine information statements.²³

Important considerations for site selection include location, accessibility and amenities.¹⁶ An ideal location is known to the community and allows for large crowds. Consider high-density areas, proximity to populations made vulnerable by social and economic policies, or particularly impacted by COVID-19. The clinic must be accessible by public transport and vehicles, allowing clients and supplies to easily reach the site. Moreover, clinics should accommodate individuals with disabilities.

How should clinic sites be laid out?

A venue must have a large area that allows for physical distancing and lines.²⁵ Spaces can be outdoors (e.g. sports arena, open field), or indoors (e.g. schools, university campuses, shopping malls, conference centres), given the area is well-ventilated. The clinic must have a separate entry and exit for unidirectional clinic flow to prevent infections and improve efficiency.^{16,18,26} The site should also have sufficient equipment and rooms (e.g. for storage, management of medical emergencies).

The clinic layout will vary depending on the site, but should follow a logical, unidirectional flow.^{16,26,27} Key areas include 1) greeting and screening, 2) registration, 3) immunization, 4) after care, 5) exit (Figure 1).^{16,25,28-32}

[Figure 1 here]

At the immunization station, the immunizer assesses and vaccinates patient. The person performing the procedure must obtain consent, pursuant to the relevant legislation. Consent can be implicit (e.g., patient rolls up sleeve) or explicit³³. The same immunizer should prepare and administer the vaccination³³. In the setting of a mass vaccination clinic, syringes

can be pre-loaded for efficiency^{16,33}. Immunizers should preload their own syringes, and ensure they are safely stored until administration.

Some guidelines suggest observing patients for 15 minutes post-vaccination^{16,18,25}. However, adverse events following immunization (AEFIs) are uncommon, and most are minor (e.g., injection site reactions).³⁴ Anaphylaxis is extremely rare, and the majority of cases occur 30 minutes to hours after vaccination.^{35,36} Clients with no history of severe allergic reactions are low risk, and risk is further mitigated if they are accompanied, able to contact emergency services, and able to seek post-vaccination advice, as needed.³⁷ Most clients do not need to be observed post-vaccination³⁸. Furthermore, many clients remain in clinic after the 15-minute observation period, despite experiencing no AEFIs.²⁹ Replacing the clinic's monitoring area with a first aid station is safe, increases the clinic's capacity and efficiency, and reduces the risk of viral transmission.^{29,39} Alternatively, low-risk individuals can be monitored for five minutes to screen for immediate AEFIs.³⁷

What are key considerations for the day-to-day operations of mass vaccination clinics?

Refining clinic operations during and after each mass vaccination event maximizes efficiency,³⁰ and may reduce staffing and hours required.²⁶ Planning and assessing clinic functioning can be aided and improved by the use of simulation analysis.^{21,22,28,40,41} Use of a reservation system is crucial in controlling crowds, and ensuring appropriate clinic volume.^{18,30} Patients may prefer to reserve their appointment by phone or online.³⁰

Traffic guides improve operations by directing patients through the one-way flow, to the appropriate line or station, and out of the clinic through the designated exit.^{18,30} Vests or uniforms allow staff to be easily identified.²⁶ Individuals with disabilities and families with

children should be directed to their designated vaccination line.^{16,18,30} Registration and immunization time may vary by age and special needs (e.g., adults and seniors take 32 and 45 seconds longer to register than children, respectively, presumably due to their more complex medical histories)⁴⁰. Consider express lanes as appropriate (e.g., for healthcare workers).¹⁶

Infection Prevention and Control

COVID-19 transmission is expected to occur in mass vaccination clinics, and required control measures.^{28,42} The following infection control measures are recommended during the COVID-19 pandemic:^{15,16,18}

- Use online processes for registration and screening
- Provide specific appointment times
- Perform screening prior to admittance
- Ensure traffic guides for management of crowds and ensuring unidirectional patient flow
- Limit the overall number of individuals in the clinic at any given time
- Arrange separate hours or areas for individuals at increased risk of COVID-19 complications
- Select large clinics that allow physical distancing
- Use outdoor spaces where possible
- Use well-ventilated areas
- Disinfect clinic areas frequently
- Ensure availability of hand sanitizer and hand washing stations with soap and water at entrances, and in vaccination stations
- Maintain one to two meters between patients
- Require that all individuals entering the facility to wear face coverings

- Require that staff wear a mask throughout their vaccination shift.
- Train staff on appropriate hand hygiene. Gloves are not necessary for vaccine injections, including COVID-19 vaccinations.

Training

All immunizers should be trained on performing CPR, and managing emergent medical issues (e.g., anaphylaxis).^{27,43} Staff must also be trained on vaccination protocol. Receiving sufficient and clear training is important to immunizers working in pandemic mass vaccination clinics.⁴⁴ Ensuring that all staff members receive standardized training before working in the clinic may also reduce the number of staff members and hours required.²⁶

Consider online videos, which allow convenient access and training standardization.¹⁸ For example, the CDC's web-based training course, *You Call the Shots*, covers the most recent guidelines in vaccine practice.⁴⁵ Just-in-time training on the day of the clinic has been shown to be useful in mass vaccination clinics.^{17,30}

Staff should be informed of their clinic shifts and roles in a timely manner to enable them to prepare for and feel competent in their roles.⁴⁴ Communications may include meetings before each clinic day, briefings before and after shifts, team huddles, bulletin boards and teleconferences.¹⁶

Staffing

Studies vary on the roles and quantity of staff. However, staff often include immunizers (e.g., nurses, physicians, paramedics, pharmacists), community health workers, volunteers, administrators, security personnel, and IT specialists.^{16,18,30} Specialized or additional staff

may be needed for certain populations (e.g., interpreters). Additional staffing will likely be required for mass immunization efforts, and may be sourced from external agencies and redirection of staff from other programs.¹⁶ Clinics may be more successful with experienced and knowledgeable immunizers who can clearly and confidently articulate the safety and benefits of vaccination.¹⁷ To reduce the burden on healthcare during the pandemic, volunteers can effectively replace health staff for all non-clinical roles.²⁹

Adverse Events Following Immunization

Urgent medical issues following immunization include anaphylaxis and syncope. Although rare, anaphylaxis can be fatal. Clinic staff must be able to access the emergency kits readily, and must be trained in the management of AEFIs.^{15,16,18} Clinics should have procedures in place to manage anaphylaxis, including medical directives for delivering the medication and transport to a health facility. Adverse events must be reported, as per jurisdictional protocols.

Documentation

Vaccination must be documented on the patient's legal health record: product, lot number, dose, route of administration, site, provider name, and date. In mass vaccination clinics, electronic systems are superior to paper-based systems due to their cost-effectiveness, rapidly available data, and resulting improvement in clinic efficiency and accuracy.^{46,47}

Immunizers also must record the vaccination on the patients' permanent personal immunization record,⁴⁸ and may encourage patients to keep track of their vaccinations digitally.⁴⁹

Supplies and Waste

Many guidelines offer checklists of suggested supplies.^{16,18,50,51} Supplies include but are not limited to surgical masks, face shields, face coverings for patients, emergency medical kits, infection control supplies (e.g., biohazard containers, hand hygiene stations), syringes, needles, individually packed alcohol swabs, and vaccine information statements. Sharps should be disposed in containers that are closable, puncture-resistant, leak-proof and labeled.⁵¹ Ensure that sharps disposal plan is prepared in advance, and that disposal is monitored on a daily basis.

Vaccine Storage

Vaccine supply and storage problems are common.¹⁷ Vaccine coordinators may be required to ensure that vaccines are stored and handled correctly.⁵² Vaccines must be stored at the correct temperature in a safe and secure location. Guidelines recommend that vaccines be shipped directly to the clinic site, or transported using portable refrigerated containers.^{27,43} Protocols for delays in vaccine deliveries or compromised vaccinations should be in place.³¹ Upon arrival, the cold chain must be maintained. Temperature should be documented at least twice during each clinic shift. The Pfizer-BioNTech COVID-19 vaccine must be stored between -80°C to -60°C⁵³. The Moderna COVID-19 Vaccine is stored between -25° to -15°C, but can be refrigerated between 2° to 8°C (36° to 46°F) for 30 days prior to first use.⁵⁴ Both vaccines must be stored in original carton to protect from light. The product monograph can be referenced for more detail regarding vaccine storage, stability and handling.^{53,54}

What are key communication considerations?

Vaccine hesitancy is a significant barrier to vaccine uptake.^{55,56} Ensuring COVID-19 vaccine confidence is crucial.⁵⁵⁻⁵⁷ Education campaigns highlighting vaccines' safety and efficacy should begin before and during the program rollout.⁵⁵ Primary care providers need to address

the uncertainties and mixed public messaging regarding the duration of immunity to the virus, risk of re-infection and appropriate dose scheduling. Public concerns and new information will continue to emerge rapidly throughout the vaccine rollout. In response, communications should be coordinated, timely, and transparent.⁵⁸ Transparency about what is known and what is not known improves trust.⁵⁹ Social media can be used to quickly address misinformation, and to respond to concerns in real-time.⁵⁵

Primary care physicians are crucial in countering vaccine hesitancy.^{60,61} Patients concerns should be explored and discussed. Concerns about COVID-19 vaccine safety may drive hesitancy or refusal among patients due to the new vaccine technology, the rapidity of development and testing in clinical trials, along with possible side effects.⁵⁵ However, many studies show improved vaccine uptake and confidence when physicians and nurses strongly recommend vaccination, share personal anecdotes, and speak confidently about its safety and benefits.^{17,55}

Promotion of the clinic should be targeted, and scaled up to the number of vaccines available.³¹ Key messages include eligibility and clarity (e.g., priority groups, requiring appointment or pre-screening), clinic logistics (e.g., location, hours) and vaccination information (e.g., benefits, safety, myths).^{16,31} Patients should be asked to wear appropriate clothing (e.g., short sleeve shirts) to improve clinic efficiency, and to eat prior to arrival to reduce fainting.¹⁶ Marketing strategies and materials will vary depending on the targeted group (see examples in Table 1). For example, vaccine programs targeting university students used e-mails, coffee cups, sidewalk chalk messages and newspaper articles.^{62,63}

Vaccine acceptance and uptake in previous pandemics varied by community and race.⁶⁴

Barriers included mistrust of the healthcare system, and community-level informal messaging that ran counter to public health campaigns.^{55,64} To ensure health equity, campaigns must involve community leaders, and include linguistically and culturally sensitive materials.⁵⁵

DISCUSSION

Many countries around the world are accelerating their efforts to vaccinate the masses against SARS-CoV-2, especially with the surge of new variants-of-concern in recent weeks. There is an urgent need to vaccinate priority groups and to expand vaccine access to younger people in the shortest possible time. As of spring 2021, more than a billion doses had been administered worldwide.⁶⁵ Several countries—including Israel, the United Kingdom, Bahrain, UAE, and the United States—have made significant progress in immunizing their citizens, but the majority have vaccinated only small fractions of their populations.⁶⁶

In this special report, we synthesized 46 peer-reviewed studies and guidelines on COVID-19 mass vaccination clinics to provide practical guidance for primary care providers as they plan, implement and expand efforts. Key considerations include management, logistics, infection control, human resources, adverse events following immunization, documentation, supplies and waste, vaccine storage and handling, and communications. This report provides steps and suggestions to consider regarding anticipated challenges (e.g. vaccine supply, population density, vaccine hesitancy). Limitations of this report include omitting non-English articles and guidelines.

As the COVID-19 vaccine rollout occurs around the world in diverse settings further research will be required to identify key factors for success in different healthcare systems to inform future pandemic responses.

Conflict of interest statement

None to declare

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