Incorporating health systems engineering into COVID-19 vaccine planning and administration

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Abstract The COVID-19 pandemic has created unique logistical challenges for vaccine transportation, inventory management, allocation and distribution at multiple levels — the federal government, states and healthcare institutions. Unpredictable weekly vaccine allocation from state health departments, changing population priorities, stringent vaccine requirements for ultracold storage, transportation, reconstitution and 2-dose administration intervals have presented challenges never seen before in the history of mass vaccination programmes, including those at Mayo Clinic. To meet the challenges, an efficient system of allocation and administration for COVID-19 vaccines was developed through collaboration with process engineering. To understand the challenges, ten health systems engineers from the Department of Management Engineering & Consulting at Mayo Clinic facilitated the institution-wide COVID-19 vaccine project, collaborating closely with diverse multidisciplinary teams that included physicians, nurses, pharmacists, administrative services, information technology, human resources, scheduling operations and public affairs. The internal consultants designed tools and solutions based on systems and process engineering methodologies to solve a myriad of complex problems, including identifying priority populations, using resources efficiently and minimising vaccine waste. Tools designed included a vaccine resource playbook; dynamic staffing models based on vaccine allocation, storage, inventory and distribution processes using a hub-and-spoke model; workflows and staffing models for face-to-face and drive-through vaccine administration sites; and end-of-day workflows to reduce vaccine waste. Through the collaboration, modelling and engineering, multiple sites across Mayo Clinic have implemented successful COVID-19 vaccination programmes that are efficient in resource utilisation and have minimal waste. In this paper, we share what we have learned to help other healthcare organisations prepare for future mass vaccination scenarios.

KEYWORDS: collaboration, COVID-19 pandemic, process engineering, staffing model, systems engineering, vaccine allocation, distribution, workflows

BACKGROUND

Mayo Clinic is a large healthcare organisation with clinics and hospitals in Arizona, Florida, Minnesota and Wisconsin. In the fall of 2020, Mayo Clinic began preparing for the arrival of COVID-19 vaccines by creating an institution-wide work group, named COVID-19 Vaccine Allocation and Distribution (COV-VAD), to plan and guide the distribution and administration of the vaccine. The COV-VAD work group was chaired by physicians from occupational medicine and infectious diseases and included subject matter experts and important administrative leaders from the pharmacy, supply chain, nursing, informatics, legal, security, facilities and information technology.[1] The group's primary charge was to create a safe, equitable and efficient infrastructure for distribution and administration of COVID-19 vaccine that complied with local, state and federal guidance and regulations. Planning was complicated by many questions about vaccine candidates, uncertainty in supply and varying and changing local, state and federal guidance.

Mayo Clinic's Department of Management Engineering & Consulting (ME&C) comprises a large team of internal consultants who collaborate with teams across Mayo Clinic and the Mayo Clinic Health System to transform the delivery of healthcare services by providing unique knowledge and solutions that incorporate principles of systems engineering, management science and advanced analytics. ME&C's internal consultants were integrated into the COV-VAD work group to help coordinate the vaccination preparation efforts, aid in solutions and workflow development and support vaccine clinic operations teams. Here we describe Mayo Clinic's COVID-19 vaccination preparation efforts from the perspective of ME&C's internal consulting team with a focus on planning and operations.

PLANNING AND OPERATIONS

As a part of the COV-VAD work group, ME&C's main involvement was to support the following:

- Planning at all Mayo Clinic and Mayo Clinic Health System locations
- Vaccine intake, storage and distribution planning
- Facility planning for administration sites

- Resource planning for administration sites
- Daily operations, that is coordinating supply and demand

The planning and operations described include work at all three Mayo Clinic campuses (Arizona, Florida and Rochester) and Mayo Clinic Health System locations in the Wisconsin and Minnesota regions, although the strategies or processes may have varied on the basis of need at a particular site.

Planning

Internal consultants used a practical and strategic approach to planning by adopting a hub-and-spoke model, which eliminated duplicated efforts among locations yet allowed flexibility for the various locations to meet local and state regulatory guidance. Activities that were common to all locations were allotted to a subgroup of consultants who led the development of foundational elements such as electronic health record (EHR) documentation and administration workflow, pharmacy and supply chain workflow, nursing protocols, nursing and patient education, communication strategy, reporting and analytics. Additionally, this subgroup developed site guidance for facility planning and clinic operations. The spoke sites were responsible for modifying the general guidance to create efficient clinic operations that met local and state requirements. Some of the activities of clinic operations included determining the number of vaccination sites, addressing staffing needs, training, patient scheduling, vaccine logistics and inventory management.

To expedite communication and leverage agile decision-making processes among important multidisciplinary teams for the common activities among locations, internal consultants facilitated cross-functional meetings. For example, the consultants brought together nursing, pharmacy, facilities and supply chain to develop actionable guidance based on information from manufacturers[2–4] for administration-site storage, equipment needs and handling and reconstitution of the vaccine. Cross-functional meetings allowed for sharing information, discussing new developments, agile decision-making, updating status, clarifying questions, determining action items and sharing decision tools. Including representatives from all locations allowed efficient coordination and dissemination of information.

To coordinate planning activities of different subgroups and locations and to meet the target go-live vaccination date, ME&C created an integrated dashboard to allow for visual tracking of the progress and status of the hub-and-spoke sites regarding administration-site preparation, clinic operations and staffing, pharmacy, supply chain planning, communications and EHR preparation. The dashboard was used every week to summarise the overall status of seven different milestone tasks: vaccine target population, vaccine administration sites, clinic operations, communications, pharmacy and supply chain, governance and data/electronic EHR, which were added from data spreadsheets. Each area of the dashboard tracked specific tasks to completion. For example, tasks on the clinic operations page included identifying staffing requirements, identifying hours of operation, completing staff training and coordinating with non-clinical staff, such as desk operations specialists, pharmacy and supply chain, information technology, facilities and security (Figure 1). For each task, an internal consultant from each location would populate the status for the week (minor or no roadblocks, some roadblocks or major roadblocks). The dashboard was reviewed at the weekly work group meeting, and any issues or questions from the locations were discussed.

Along with the dashboard, a playbook was developed to communicate specific information related to COVID-19 vaccination preparation efforts and

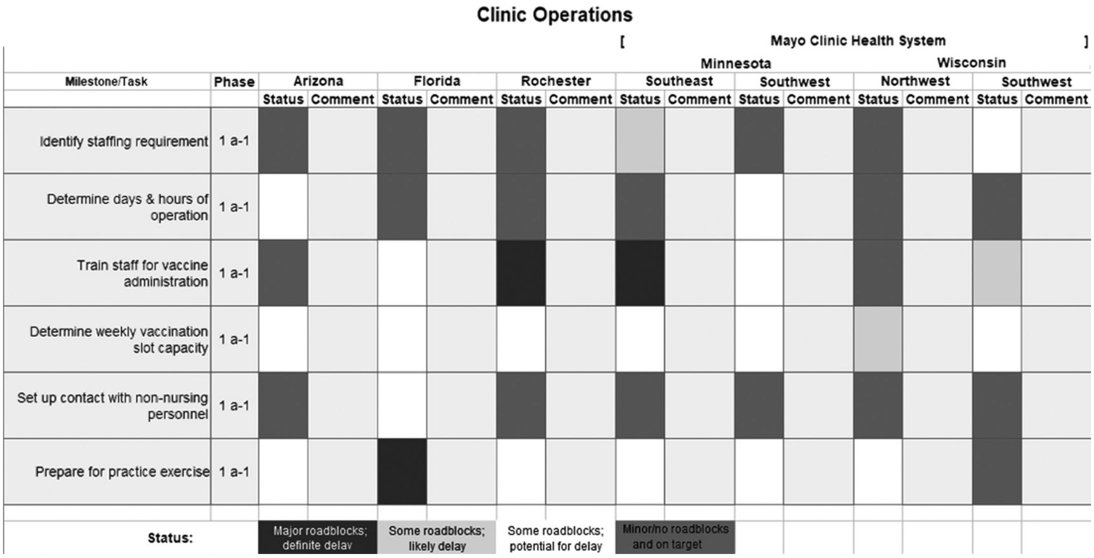

Figure 1: Sample page from the clinic operations tab on the status dashboard. Status shown for the different locations is illustrative only.

general guidance on important areas for consideration. The purpose of the playbook was to outline essential points for each location's leadership to consider as they prepared for vaccine administration. The playbook was split into two sections because some of the vaccination preparation activities were applicable to all locations (communications, pharmacy, data management, reporting and nursing) and others needed to be location specific. With the emphasis on standardising information across all locations, we ensured that patients received the same important messaging, that as much information as possible was unified across all locations, and that reporting and analysis were approached similarly across locations. Location-specific activities included facilities planning and clinic operations, which required a flexible approach because of differences in regulations, vaccine allocations and size and scope of the vaccination efforts. By pooling both sets of preparation activities into a single playbook, the different locations could quickly adapt and adopt best practices.

VACCINE ORDERING, INTAKE, STORAGE AND DISTRIBUTION PLANNING

The pharmacy team began planning for intake, storage and delivery processes for the new vaccines as soon as vaccine information was available. The main priority was to incorporate the new vaccines into existing operational structures at all locations and to outline the responsibilities of the hub-and-spoke sites. The hub-and-spoke model distributes 'assets at centralized locations or hubs, and, when asked, pushes them out to preplanned sites within the affected states'.[5] Additional priorities focused on understanding and documenting current pharmacy processes for large vaccine clinics, including identifying storage capabilities at all locations. Pharmacy representatives from all Mayo Clinic locations met to review standard operating procedures, identify and address gaps and implement the refined processes.

Ordering vaccine

The goal was to use existing operational structures for ordering vaccines. Internal consultants and pharmacists identified several tools that could be used for the COVID-19 vaccine, such as processes for ordering and order templates.

Vaccine intake

The pharmacy intake and storage processes for the COVID-19 vaccine are closely aligned with intake and storage methods used for other vaccines. Pharmacy staff receive the vaccine shipments, complete necessary temperature checks, relocate vaccines to the appropriate storage locations and complete documentation. Internal consultants helped to ensure that the documented processes were captured in local standard operating procedures for daily staff reference.

Vaccine storage

Hub locations had to ensure that they could meet the ultracold storage requirements of Pfizer's mRNA vaccine, which has strict storage needs (a −70°C ultracold freezer). When Pfizer vaccine arrives, it must be transported into the ultracold freezer within 5 minutes.[6] Hub locations ordered necessary ultracold storage freezers in advance based on predictions of the number of vaccine doses the locations would receive. Spoke locations also needed proper numbers of storage units that met lesser temperature requirements, allowing flexibility to order fewer storage units initially and to expand storage as needed.

Vaccine distribution

Shipping vaccines from a hub to a spoke location required sensitive and thorough temperature tracking of the vaccine. After evaluating options, we chose a Wi-Fi-enabled data logger and temperature tracker to use during shipping. Because vaccine supply was limited, extra precautions were taken to ensure that all systems were performing as expected before the process was used for actual vaccine. A practice exercise was held to test whether the data logger connected to available Wi-Fi and the temperature tracker worked properly. After the practice exercise, we amended vaccine distribution workflows to reflect changes to the process that both hub-and-spoke locations would use to ensure vaccine temperature stability. Ultimately, the process required spoke locations to perform a temperature check before placing the vaccines into local storage units and to ship the data logger and temperature tracker back to the hub. Internal and external couriers delivered the vaccine. Pharmacy, nursing and internal consultant teams collaborated with couriers to optimise delivery options and timelines for each hub-and-spoke location.

FACILITY PLANNING FOR ADMINISTRATION SITES

Locations to administer the vaccine safely to employees and patients were identified by considering space availability to accommodate social distancing, location, climate, convenience and familiarity for the patient population and sufficient space for flow. Warmer Mayo Clinic locations (Arizona and Florida) had more flexibility to create outdoor drive-through facilities, whereas cold-weather climates (Minnesota and Wisconsin) needed indoor facilities in the winter months. Each location posed a unique set of opportunities and challenges; however, once selected, all mass vaccination sites were operationalised and functioning within 7 business days.

Planning for indoor vaccination clinics

The benefits of indoor vaccination clinics included ease of using existing processes and direct post-injection monitoring capabilities. Challenges to indoor clinics included space constraints that limited capacity and the need to prioritise vaccinations over other clinical activities. For example, multiple sites in various communities were considered to locate the mass vaccination clinic for the Southwest Wisconsin region of the Mayo Clinic Health System. A gymnasium was selected because of its proximity to public transportation, making it easy for patients to access; the flexibility of the space, allowing for quick transformation to a mass vaccination site; and the socioeconomic inclusiveness of the surrounding community, allowing for distribution to a more diverse population. Within 7 days of selection, the gymnasium was transformed — designed to maximise patient flow and ensure staff could efficiently meet the needs of patients (Figure 2).

ME&C completed time-study observations to understand throughput impact on the space to inform the facility layout. Each step in the pathway was designed to maximise throughput of the space and minimise waiting time. The final plan had patients screened at the door for recent contact with anyone having COVID-19 and for COVID-19 symptoms. Patients can check-in either electronically at a kiosk or by asking registration staff to help them. They are directed through flexible stanchion lines that are marked for the first or second dose of vaccine. The ability to adjust the lines has helped to delineate by manufacturer or dose when multiple vaccines are available. Nurses step out of their vaccination stations when they are ready to take the next patient in line. Patients are directed to an observation area and the exit once their observation time is complete. A walking space along the back wall of the gymnasium allows a supply runner[7] to keep the process flowing smoothly by handling tasks as needed, such as resupplying nursing stations with vaccine throughout the day. A lead registered nurse and registration team member monitors the flow and pace of the clinic overall to verify that all doses are used timely and all appointment slots are as full as possible. This design has minimised waiting time, allowed for social distancing and created a single line for patient flow through the building, with a separate entrance and exit.

Planning for the outdoor (drive-through) vaccination clinics

The benefits of drive-through locations include convenience for the patient, ease of social distancing, high capacity and limiting impact on normal clinic operations. Challenges to outdoor operations include severe weather closures, constrained access to electricity and supply storage, ability to monitor multiple patients simultaneously after they receive their injection, and patients' unfamiliarity with receiving healthcare in a drive-through setting.[8,9]

To transform an outdoor parking lot into a functioning vaccination clinic, a construction trailer was used for temporary vaccine storage (the daily appointment allocation), administration staff, office supply storage, a staff break area and a reprieve from harsh weather (Table 1). Wi-Fi extenders were placed on light and locator poles. Extension cords and surge protectors were connected to existing power outlets in security light posts. Construction cones and signs were used to direct traffic.

Doses of vaccine were stored overnight according to medication safety guidelines inside a secure building and moved to the outdoor trailer during hours of operation. Vehicles were directed into two lanes and through three large outdoor tents:

1. Check-in tent where patients were checked in for their appointment; this area had space to divert patients who did not have a scheduled appointment
2. Vaccination tent that accommodated four cars with pull-off space for after-injection observation
3. Check-out tent where patients scheduled their second vaccine appointment

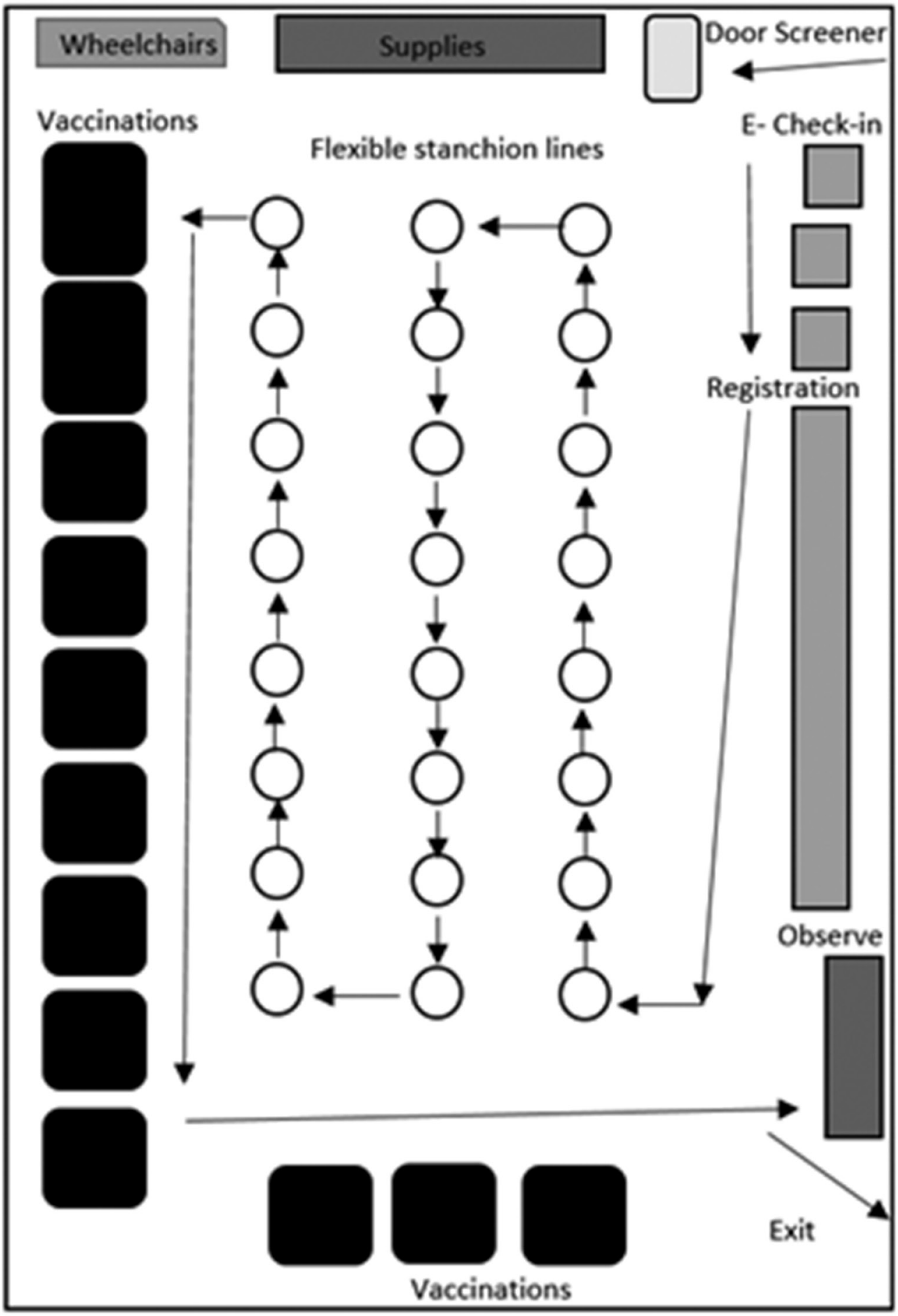

Figure 2: Patient flow at a mass vaccination clinic in Wisconsin. 'E' indicates electronic

Resource planning for administration sites

Staffing analysis and resource planning began in parallel with facility needs assessments for each of the vaccine clinics. First, employees who were qualified to administer the vaccine were confirmed, and considerations were made for the impact on existing operations

Table 1: Considerations for outdoor drive-through vaccination clinics

Supply needs
Supply cabinets
Locked sharps storage containers
Secured refrigeration storage (with temperature tracking)
Backup generators
Computers with EHR access
Wi-Fi capabilities
Medication access management
Space needs
Space access management
Signage for patient flow
Queueing area
Check-in/registration desk
Vaccination stations
Second appointment/check-out desk
Observation/recovery area
Abbreviation: EHR, electronic health record.

or services in order to meet the needs of the new vaccination clinics. Some locations had enough volunteer staff to work in shifts in the vaccine clinics, whereas others did not; therefore, some recruitment was needed. Solutions were both creative, in that retired nurses and pharmacists were asked to assist with the vaccination clinics, and traditional, in that new employees were hired to staff the clinics.

Each location approached staffing resources differently on the basis of community scale and role availability. For example, at the smaller Mayo Clinic Health System locations with lower vaccination volumes, the registration desk staff also did door screening, check-in, and scheduling of subsequent doses at check-out. At another location, the vaccinator scheduled second-dose appointments after giving the vaccination. Customising the staffing model framework to suit individual location needs was important to developing efficiencies while considering resource constraints.

Experience from past mass influenza clinics informed throughput times and clinic designs in the staffing models created. Because of the nature of social distancing and storage and handling requirements for the COVID-19 vaccines, decisions were made to have scheduled appointments at all sites.

Internal consultants developed a staffing calculator that required minimal amounts of throughput data (input by leaders at each site) to calculate the number of vaccination stations needed to run the clinics at each location. The number of full-time equivalent employees (FTEs) needed was calculated from the resources required each day, clinic hours of operation and a 40-hour (1 FTE) week (Table 2):

- Number of vaccines administered per nurse per hour
- Number of schedulable hours per day
- Number of vaccines needed to be administered for the week

Vaccine dose capacity and staffing models

At the Southwest Wisconsin location, scheduling of throughput timing and staffing projections were modelled to determine the number of vaccinators, registration staff, hours of operation and overall capacity available for the mass vaccination clinic. The simple calculator (Figure 3), which was built in Excel (Microsoft), provided multiple scenarios so that capacity could be adjusted up or down to align staffing with vaccine availability.

At the Rochester campus, multiple large vaccination clinics ran concurrently, which required load levelling based on vaccine availability and available staffing. The Vaccine Allocation and Staffing tool that was created allowed for this levelling across multiple vaccination sites, and the main pharmacy acted as a hub site to distribute vaccines appropriately.

Table 2: Staffing roles for vaccine administration

Role	Function	Average time
Door screener	Non-medical staff, ask COVID-19 screening questions	20 seconds per patient
Usher	Non-medical staff, direct patient flow, wheelchair aid	10 minutes per patient needing wheelchair aid
Reconstitution	Pharmacy/nursing staff, reconstitute vaccine vials with diluent and fill syringes	3 minutes per vial
Supply runner	Non-medical staff, move containers with reconstituted vials from pharmacy to vaccinator station, take empty containers back to pharmacy for refill	Varies
Vaccination	Medical staff, ask vaccine protocol questions, answer patient questions, supply vaccine information sheet and follow-up information, administer vaccine, perform post-vaccine evaluation	8–12 patients per hour per vaccinator
Check-in desk/kiosk	Non-medical staff, check in patient for appointment	1 minute at desk or 30–45 seconds at kiosk
Check-out desk	Non-medical staff, schedule return dose appointment	3 minutes per patient

The vaccine dose capacity and staffing model was developed to 1) apportion the initial and return vaccine doses among clinics; 2) apportion the doses among days of the week, taking into consideration the varying hours of operation; 3) determine nurse stations and nurse hours for each day; 4) ascertain that centre capacity was not exceeded for the appropriate number of vaccine doses administered. This Vaccine Allocation and Staffing tool (Figures 4a and 4b) can adjust the proportional allocation of initial and return doses and determine optimal allocation to guide efficient vaccine distribution during peak patient loads. It also ensured that capacity limits were not exceeded and that staffing levels could be adjusted to meet current needs. Each of the locations had information from the algorithm that allowed them to plan for the upcoming week.

Scheduling Throughput and Staffing Projections

	4–7 hour days, 1–11 hour day, 1–6 hour weekend.	4–9 hour days, 1–11 hour day, 1–6 hour weekend.	5–8 hour days
	Scheduling Capacity per week	Scheduling Capacity per week	Scheduling Capacity per week
Vaccinators	5	10	13
Schedulable hours per day	9	9	8
Vaccines given per **hour**	8	8	8
Vaccines per vaccinator per **day**	72	72	64
Vaccines per **day** for all vaccinators	360	720	832
Registration staff per **day** per 100	3.6	7.2	8.32
Schedulable hours per **week**	45	53	40
Vaccines per **week** for all vaccinators	1800	4240	4160

Figure 3: Staffing throughput and projection calculator used at a Mayo Clinic Health System location in Southwest Wisconsin. Calculations can be adjusted to align staffing with vaccine availability (capacity).

CENTER NAME: Clinic A

PARAMETERS

Nurse Stations:	23

CENTER STATS

Weekly Capacity (Schedulable Hours)	1280.3	Load Split	Note: For computing max capacity only
Vaccine 1 max capacity (doses)	4801	0.5	
Vaccine 2 max capacity (doses)	4801	0.5	
Total maximum capacity (doses)	9602	1	

Weekly Target

	Dose 1	**Dose 2**	TOTAL
Pfizer	735	2325	3059.75
Moderna	0	0	0
TOTAL	735	2324.75	

Load (% of Peak Capacity)	28%

	M	**T**	**W**	**TR**	**F**	**S**	**S**	**Weekly Totals**
Clinic Hours	14	14	14	14	10.5	0	0	66.5
Max schedulable hours	11.833	11.833	11.833	11.833	8.333	0	0	55.665

Override Vacc_1 doses								
Reccomended Vacc_1 Doses	156	156	156	156	110	0	0	734
Schedulable Hours Required	26.0	26.0	26.0	26.0	18.3	0.0	0.0	122.333
Max full day nurse stations required for Vacc1	2	2	2	2	2	0	0	
Min part day nurse stations required for Vacc1	1	1	1	1	1	0	0	
Part day station hours (per min. req., NVC incl.)	2.67	2.67	2.67	2.67	1.83	0.00	0.00	

Override Vacc_2 doses								
Total Vacc_2 Doses	494	494	494	494	348	0	0	2324
Schedulable Hours Required	49.4	49.4	49.4	49.4	34.8	0	0	232.4
Max full day nurse stations required	4	4	4	4	4	0	0	
Min part day nurse stations required	1	1	1	1	1	0	0	
Part day station hours (per min. req., NVC incl.)	2.33	2.33	2.33	2.33	1.50	0.00	0.00	

Figure 4: Vaccine Allocation and Staffing tool used at the Rochester Campus. (a) Data (vaccine quantity by manufacturer and existing appointments) entered into the tool generates the result output seen in this figure for each of the vaccination centres.

Daily operations: coordinating supply and demand

One of the important challenges in efficiently operating the vaccine clinics has been the mismatch between the supply of and demand for the vaccine. The Centers for Disease Control and Prevention initially recommended how the vaccine roll-out should be prioritised.[10] State governments, however, made the final decisions on distributing the available vaccine and prioritising persons eligible beyond phase 1a. For phase 1a, Mayo Clinic prioritised all employees into seven waves by evaluating occupational exposure risk.[1] Wave 1 was for employees at the highest risk, and wave 7 was for those at the lowest risk (Table 3). Phase 1a focuses on healthcare workers with high occupational risk acted as a pilot to test and refine workflows and to prepare for public vaccination clinics.

Although vaccine supply increased at the onset of phase 1b, it could not meet the demand. Mayo Clinic locations followed state and local guidelines to identify and prioritise patients for each roll-out phase. Sub-prioritisation based on state, local and clinical guidelines within each phase was performed to match the weekly supply with demand for the vaccine. Gallup's research showed that approximately 58 per cent of the population wanted to be vaccinated, so it was anticipated that a substantial proportion of the population would opt-in if offered a vaccine appointment.[11] Internal consultants developed a predictive model to anticipate the approximate opt-out rate and current vaccine allocation and to calculate the weekly demand for the site. Once the prioritised patient segment was identified for the current eligibility phase, a process was created to place orders in bulk and to notify patients and invite them to self-schedule or call to make an appointment. Along with staffing considerations, vaccine inventory and demand for appointments drove the days and hours of clinic operation. The vaccine clinics were designed with flexible staffing and operation plans that allowed for efficient use of resources and quick ramp up and ramp down of the operation.

Administering the vaccine is a relatively straightforward process; however, coordinating everything required to support vaccination proved to be challenging. Vaccine stability, facility security, resource staffing, scheduling patient appointments and vaccine distribution were just a few of the complexities. To navigate administrative challenges, daily huddles were held every morning at each Mayo Clinic location. Information shared at the huddles allowed the operational teams to begin executing their workload. Important information conveyed included a pharmacy update with the number of vaccine doses available for the following 2 days, any expected deliveries and updated information about distribution and eligibility guidelines. Engaged teams huddled daily to monitor current situations and to modify the strategy as needed on the basis of the information discussed.

In addition to administrative huddles, several other work groups met daily, weekly or biweekly, including pharmacy, scheduling, supply chain, nursing, information technology, communications and internal consulting. The scheduling team met after daily administrative huddles to review calendars. Depending on the number of unfilled vaccination slots, the team called patients from the waiting list or alerted the administration that more scheduling messages needed to be

Table 3: Initial employee waves of COVID-19 vaccine program eligibility for Mayo Clinic locations[a]

Wave	Occupational risk factor
Wave 1	Designated COVID-19 units (intensive care unit and general medical) Emergency and urgent care Emergency medical services Long-term care Morgue
Wave 2	Outpatient COVID-19 care Present during aerosol-generating procedures on COVID-19 patients
Wave 3	Remaining inpatient units
Wave 4	Outpatient clinics Procedural areas Home care
Wave 5	Clinical support staff present on campus without direct patient contact
Wave 6	All staff present on campus but not in direct patient support
Wave 7	Teleworkers

[a] Excluding Arizona and Florida campuses.

sent to patients. The internal consulting team met weekly to share information across locations, to share new tools being developed, and to ask for feedback for new opportunities or obstacles their respective locations faced. These opportunities were used to generate ideas and to strategise about how to define, perfect and execute processes. The internal consultants kept each other updated with local status and, more importantly, shared methodologies and technology-enabled solutions across all Mayo Clinic locations.

CONCLUSION

The internal ME&C consulting team has supported Mayo Clinic's COVID-19 vaccination effort from initial planning, coordination and design to modelling, implementation and operationalising strategy. In such a complex, large-scale project, internal consultants provided connectivity among multidisciplinary teams and have been involved with high-level tasks such as process design and meeting facilitation as well as active management of frontline responsibilities for facilities planning, staffing resource projections and identifying qualified vaccine recipients.

The vaccination programme was successful because of teamwork (an important value of Mayo Clinic) and collaboration among all disciplines involved as well as from experience in planning and operating mass influenza clinics. Because of the framework created, teams have been able to pivot quickly to meet tight timelines and changed guidance and recommendations. The internal consulting team made recommendations on the basis of principles of process engineering and data analytics methodology, adding to the success of the implementation.

Through the efforts of multidisciplinary stakeholders and the COV-VAD work group, Mayo Clinic was able to prepare for a successful launch of its vaccine administration programme in late December 2020. Together, Mayo Clinic employees ensured that important tasks were completed, including those related to foundational planning, vaccine storage processes, vaccination facilities, resource allocation, process optimisation and daily operational coordination. Vaccinations will continue for eligible populations as vaccine allocations allow. Ongoing daily adjustments continue for clinic operations, staffing, appointment schedules and available vaccine. The frameworks, processes and tools created will help to maintain the system as more people become eligible to be vaccinated.

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