Rapid healthcare innovation during the COVID-19 pandemic

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Abstract The COVID-19 pandemic challenged healthcare organisations in safely providing healthcare to patients while protecting employees and reducing the spread of the virus. This paper shows how the Mayo Clinic responded by implementing innovations, including screening, testing and tracing patients for COVID-19; expanding telehealth services; adjusting surgical and procedural operations and reallocating staffing and supplies. These changes were operationalised rapidly through the coordinated response from its leadership, partnership of experts across the organisation, prompt decision-making driven by data, redistribution of resources and expedited training. These innovations and methods of rapid implementation enabled Mayo Clinic to safely continue its mission of providing healing and hope to its patients worldwide, and quickly return to financial sustainability.

KEYWORDS: rapid innovation, pandemic response, COVID-19

INTRODUCTION

When the COVID-19 pandemic started to spread globally in early 2020, healthcare organisations needed to rapidly innovate to face unexpected and unprecedented challenges in order to provide safe, high-quality care for their patients, as well as to protect their employees.

Mayo Clinic, one of the most highly recognised and accomplished academic medical institutions in the world, faced similar challenges while the COVID-19 pandemic continued to spread. With campuses located across the United States (Minnesota, Florida, Arizona, Wisconsin and Iowa) and internationally in the United Kingdom (London) and the United Arab Emirates (Dubai), Mayo Clinic provides the highest levels of care for patients across the spectrum of complexity.

In March 2020, Mayo Clinic responded to the pandemic by launching a command centre structure and project teams to identify top priorities and address the most immediate concerns. This command centre paused all non-urgent/non-emergent patient care and all non-critical projects, which created capacity for leaders and staff to start new project teams to innovate and operationalise new methods as quickly as possible to provide safe, high-quality care.

The Management Engineering and Consulting (ME&C) Department at Mayo Clinic partners closely with leaders throughout the organisation's three shields of practice, research and education to provide systems engineering, project management and business consulting. In alignment with Mayo Clinic's leadership, ME&C reprioritised and refocused its staff on leading and/or assisting new project teams as directed by the command centre. These project teams rapidly designed and implemented new operations, including the following:

- Screening patients and visitors
- Testing symptomatic patients and community members for COVID-19
- Testing asymptomatic patients for COVID-19 prior to surgeries, procedures or treatments
- Contact tracing for positive cases
- Expanding telehealth services
- Adjusting surgical and procedural operations
- Reallocating resources, including staffing and supplies

These innovations, along with many others, enabled Mayo Clinic to safely continue its mission of providing hope and healing for patients who need it most, as well as to return to financial stability. Equally important to the innovations were the methods utilised to design and implement them rapidly and with cohesion across the overall system. Many methods of rapid innovation were similar across project teams and included the following:

- Coordinated leadership response
- Multidisciplinary project teams partnering experts
- Collaborative resource distribution
- Prompt data-driven decision-making
- Expedited training

Through rapid innovation, Mayo Clinic quickly adapted to the new external environment and continued providing critically needed healthcare in a safe manner for both patients and staff members.

RAPID HEALTHCARE INNOVATIONS

We live in proportion to our ability to respond to and correlate ourselves with our environment.

—Dr. Charles Mayo[1]

Mayo Clinic's leadership and command centre formed rapid-response teams to address the most immediate concerns. These teams included physician champions, operations administrators, managers, nursing leads, ME&C health systems engineers and project managers and various subject matter experts who quickly designed, implemented and operationalised innovative functions to meet patients' needs in a safe manner; additionally, these teams modified operational structures to evolve within the highly variable pandemic environment of frequently changing information, regulations, policies and best practices.

Screening patients, visitors and staff

One of Mayo Clinic's first steps to protect its patients and staff was screening all patients and visitors for COVID-19 symptoms and recent travel to outbreak regions prior to on-site entry. Early in the pandemic, only urgent and emergent patients were permitted to receive medical care per state government restrictions, so all other appointments were cancelled or rescheduled on the basis of providers' reviews and recommendations. Scheduling offices contacted patients prior to appointments to determine if they were experiencing COVID-19 symptoms or other concerns, and if so, postponed their appointments. Patients experiencing respiratory issues were rescheduled for appointments at new respiratory clinics created at multiple Mayo Clinic locations to limit the potential spread of COVID-19 infections.

All patients and visitors were screened upon entrance to the clinic and hospital buildings. Those who passed screening were allowed into the buildings, but those who failed were directed to exit or completed a virtual visit if their provider deemed it medically necessary. Mayo Clinic's campus in Rochester, Minnesota, quickly repurposed and redesigned one of its clinic areas to become a new 'COVID-19 Advanced Screening Clinic' for patients who failed entrance screening to receive virtual visits, phlebotomy and COVID-19 testing. Similar screening clinics were created at other Mayo Clinic locations too.

Employees entering campus were required to show identification at the screening entrances; otherwise, they would be directed to exit. Only those who provided direct patient care or whose position required them to work on campus were allowed to be on-site. All other employees were required to work remotely instead to limit potential COVID-19 exposures.

Testing symptomatic patients

Testing symptomatic patients is one of the most important tools that healthcare organisations have in slowing the spread of infections during a pandemic. Mayo Clinic implemented drive-through testing sites near many of its clinics and hospitals. These testing sites provided COVID-19 polymerase chain reaction (PCR) testing for symptomatic patients and community members, which identified positive cases to quarantine and to receive follow-up care. Initial volumes and wait times at the drive-through testing sites were high, so ME&C engineers completed patient flow analyses and worked with operational teams to streamline processes and address bottlenecks.

New end-to-end workflows were developed to ensure high quality and efficiency throughout the testing process. A new nurse phone triage group directed patients to symptomatic testing or to other community resources (eg emergency room). After PCR samples were collected at the drive-through sites, they were delivered to Mayo Clinic Laboratories, which developed a new COVID-19 diagnostic test approved by the appropriate regulatory agencies. Mayo Clinic Laboratories quickly increased its capacity to meet the demand of these COVID-19 samples arriving from local patients, as well as from other healthcare organisations across the country.

Testing pre-surgical and pre-procedural patients

To protect patients and staff and ensure the best patient outcomes, Mayo Clinic's practice leadership decided to require COVID-19 testing for all patients two to three days prior to scheduled surgeries, procedures and cancer treatment. At Mayo Clinic's campus in Rochester, the newly created 'COVID-19 Advanced Screening Clinic' was utilised to complete the point-of-care testing. The rooms and hallways for asymptomatic pre-surgical and pre-procedural patients were physically separated from the areas for symptomatic patients to eliminate any potential spread of infection between the two populations. The drive-through COVID-19 testing sites were also used for asymptomatic pre-procedural patients, primarily for those who were immunocompromised, for example, undergoing cancer treatment.

Asymptomatic patients received nasopharyngeal swab (PCR) tests 2 days prior to surgery, procedure or treatment, which matched evidence from literature.[2] If the patient was actively COVID-19 positive, their appointments were rescheduled to a later date unless they were medically urgent, and a Mayo Clinic care team of internists and nurses followed up on their condition for the next several weeks.

After implementation, the Advanced Screening Clinic's process flows were re-engineered to add more services, including serology testing for COVID-19 antibodies, rapid 1-day PCR testing and oropharyngeal swab tests. The processes were also streamlined to eliminate unnecessary work and process time, in order to minimise staffing, as they were needed back in their regular practice areas as clinical patient volumes increased.

Many patients who lived 50 km or more from Rochester requested their testing more locally to reduce travel time and overnight stays, and to allow more streamlined scheduling of their procedure. As a result, the COVID-19 Advanced Screening Clinic's end-to-end workflows, including the electronic medical record processes, were quickly replicated and implemented at Mayo Clinic Health System clinics located closer to patients. Regional teams collaborated to create a standardised order set and established minimum care hours dedicated to asymptomatic testing. Nursing, laboratory and administrative staff were pulled from a centralised labour pool to perform swab tests and blood draws at locations that previously had few or no laboratory services.

Despite the increasing rate of COVID-19 cases in the region, Mayo Clinic quickly returned to 100 per cent of its planned surgical and procedural volumes within three months, because it could safely and confidently test patients beforehand.

Contact tracing

Managing the pandemic's impact on workforce availability necessitated expansion of Mayo Clinic's Occupational Health Services group to address the complexities of maintaining a healthy work environment at locations across the United States. System capabilities were added to allow tracking and documentation required to keep all employees safe at work or home, whether they were exposed, potentially exposed or unexposed. This required understanding the disease symptoms, infectious windows, principal factors in disease spread, incubation period and work impact. Employees' exposures and symptoms needed to be managed systematically to enable proper care follow-up and work assignments. Clinical resources were increased to answer questions, monitor employees and manage tracing of disease symptoms. Systems were implemented to enable tracing services to be expanded to cover 24/7 as needed, which was critical in reducing pandemic spread and keeping the workforce and patients safe.

Standard processes were created to perform contact tracing at all Mayo Clinic sites, with core competencies performed centrally. This included identifying patients who were COVID-19 positive, understanding staff interactions with this individual, and evaluating each exposure to understand the associated risks. Multiple call centres were utilised to streamline the process and staffing required.

One non-clinical call centre collected information from patients and work area managers on possible contacts or exposures and connected with employees on symptom data collection twice daily. Another nursing call centre answered questions, evaluated symptoms, performed additional clinical assessments and coordinated care with providers as appropriate. This group of clinical staff collaborated on risk, exposures and work restriction assessments and assignments. On the basis of these findings, individuals would be released to work or placed on monitoring or restrictions. In less than three weeks, the processes and systems were developed to track activities and communicate information to managers, staff and contractors.

Telehealth expansion

As clinical practices temporarily ramped down due to COVID-19 mitigation efforts, many patients still required chronic and preventive care. Providers feared that these patients would experience further declines in their health without care management. The backlog of these patients began to accumulate after the first few weeks of postponing non-urgent and emergent care, and Mayo Clinic physicians searched for viable solutions to sustain ongoing care needs while simultaneously dealing with the evolving environment. Research by the Association of American Medical Colleges (AAMC) mirrors these concerns, with physicians worried about the long-term impact of delaying standard care on non-COVID-19 conditions such as cancer, heart disease and diabetes.[3]

Telemedicine provides patients access to providers from anywhere without travelling to a physical clinical location, which can be a safe alternative, especially during a pandemic. There are many additional benefits, including improved convenience, reduced travel and related costs, and efficient access to care, particularly in rural or community practice settings. Research from McKinsey & Company indicated that prior to the pandemic, approximately 11 per cent of people in the United States had received telehealth options.[4] Due in part to the pandemic, 76 per cent of healthcare consumers were interested in telemedicine, which requires care teams to integrate additional technology into patient care. For Mayo Clinic's telemedicine offerings, patients use their own computers, tablets or smartphones to connect with care team members using audio and video technology through an internet connection and patient-facing software platform.

To meet patients' ongoing care needs, Mayo Clinic's outpatient practice rapidly increased telehealth visits. Prior to the pandemic, the entire Mayo Clinic enterprise completed low daily volumes of outpatient video visits, and technical support was handled by a small team at Mayo Clinic's campus in Rochester, MN. Due to the pandemic, the daily volume of video visits completed by providers and other care team members (nurses, social workers, etc) increased by over 425 per cent in April 2020. This exponential growth required shifting resources and training care teams across the enterprise to further leverage Mayo Clinic's telehealth platforms.

Procedure and surgery planning

At the outset of the pandemic, Mayo Clinic's surgical and procedural practices promptly deactivated to comply with new state government orders, which required all non-essential surgeries and procedures to be postponed indefinitely, on the basis of guidance from the US Centers for Disease Control and Prevention (CDC) and Centers for Medicare and Medicaid Services (CMS). Many operating rooms closed and surgical case volumes dropped by 88 per cent at the Mayo Clinic campus in Rochester.

Patients with postponed elective surgeries expressed feedback and concerns about experiencing declines in their quality of health as a result. Without access to preventive interventions, the progression of their disease processes escalated, forcing some elective surgeries into the urgent and emergent categories.[5] On the basis of detailed modelling of large components of the practice from 2019, Mayo Clinic's surgical leadership identified a window of opportunity to increase operating room access. The plan included COVID-19 testing and quarantine, chest computed tomography (CT) testing, personal protective equipment (PPE) supply chain strategies and a robust case-listing criteria process; additionally, operating room allocations were overhauled to provide access for urgent and emergent patients, and to consolidate the number of operating rooms that were used for higher risk surgeries and procedures involving aerosol-generating procedures. These measures enabled a return to normal surgical volumes far ahead of schedule, as shown in Figure 1.

Another intervention made to operating and procedural rooms was creating room air turnover requirements to ensure proper aerosol clearance. Previous CDC guidance prescribed 21-min air turnover to guarantee a safe environment for patients and staff. Mayo Clinic's facility engineering group performed testing to determine how many aerosols were generated during various procedures such as cardiac stress tests, pulmonary function tests and ear, nose and throat (ENT) scoping procedures in order to better understand the PPE required. This facility engineering group studied aerosol clearance time in all surgical and procedural rooms, and then implemented a standard clearance time that decreased by as much as 40 per cent, on the basis of room air exchanges and type of procedure, to ensure clearance of aerosolised particles. The anaesthesia team published 'COVID-19 Room Rules' to help surgical and procedural teams understand aerosol-generating

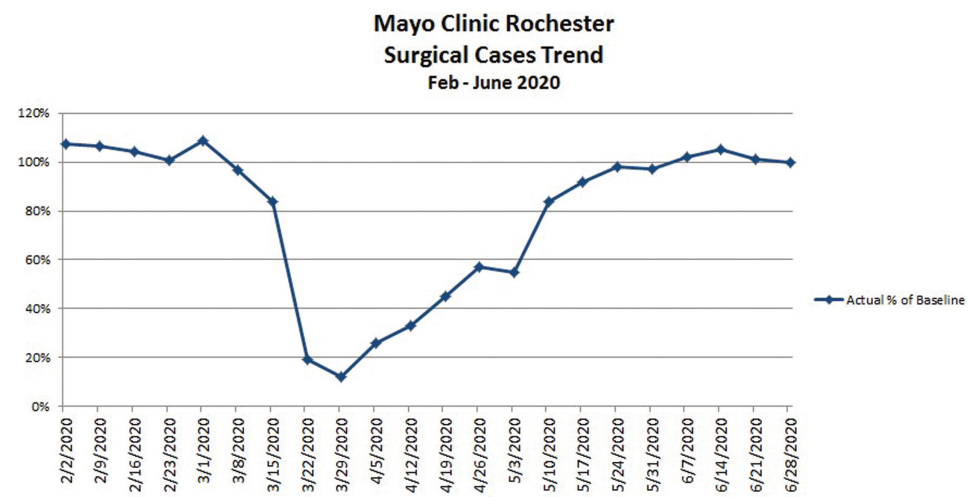

Figure 1: Surgical cases trend 2/2/2020 to 28/6/2020

procedures, modes of infection, aerosol and droplet precautions and room air turnover based on the characteristics of air handling and flow in surgical and procedural rooms.

Reallocation of staffing and supplies

The pandemic caused continual changes in the types of care being delivered, methods of testing, restrictions for patients and visitors and capacities in clinics and hospitals. Managers collaborated across locations and departments to appropriately allocate resources, including staffing and supplies.

To staff the symptomatic drive-through testing, nurses and administrative staff were pulled from other responsibilities to provide this new service for communities near Mayo Clinic's many campuses. Staffing ratios were proposed using staffing-to-workload tools developed from process engineering and time studies. Appropriate staffing allowed the drive-through testing sites to serve up to 1,200 patients per day with a targeted wait time of less than 30 minutes.

As testing sites increased in patient volume, regularly scheduled shipments of critically needed disinfectant wipes were halted from manufacturers. These wipes were crucial to sanitising surfaces to reduce infections. Mayo Clinic's enterprise had only enough supply of disinfectant wipes to last for 3-days with no readily available alternatives. A solution was proposed to use a refillable, dry wipe canister system prepared in-house at Mayo Clinic's campus in Rochester. A team organised the logistics of training, distribution and collection of existing inventories to ship to other campuses within a time span of 3 days.

KEYS TO RAPID INNOVATION

The methods that Mayo Clinic utilised to implement its innovations with more speed and agility were just as important to successfully responding to the COVID-19 pandemic as the innovations themselves. The leadership launched a crisis management command centre to streamline decision-making and narrow the organisation's focus to the top priorities. Teams partnered differently to bring multidisciplinary expertise together swiftly. Critical resources, like staffing and supplies, were reallocated to the areas with the most need. Workflow development, communication and training methods were modified to operationalise ideas more quickly. The combination of these methods allowed Mayo Clinic to innovate within days or weeks instead of months or even years, which resulted in safer care for patients and staff, and a sooner return of patient volumes and financial stability.

Coordinated leadership response

The leadership team at Mayo Clinic instituted a crisis command centre structure, which was given the authority to make critical decisions to guide the organisation during the turbulent time. It focused on the highest priorities rooted in Mayo Clinic's values, including its primary value of 'the needs of the patient come first'. Patient and staff safety are paramount, and operations immediately focused on implementing protective measures to reduce the spread of COVID-19. Another focus was to adjust operational capacities to meet the fluctuating number of patients, particularly with new government regulations restricting the types of patients who could receive care. Major financial losses were also projected due to the significantly reduced patient volumes, which required immediate mitigation.

During normal operating times, Mayo Clinic has a robust committee structure that is used to review and approve any significant decisions and changes to policies, procedures and systems. The committee structure ensures that changes continue to align with Mayo Clinic's values, strategy and many different stakeholders' needs. During the pandemic, however, time was of the essence and the typical committee structure was paused. Critical decisions were routed to the command centre for review and approval instead of multiple committees. Supported by just-in-time project team communication, this structure flattened decision-making and increased the speed to delivery.

The command centre connected with existing operational groups and newly created project teams to gather information and make difficult decisions, including pausing or cancelling non-essential projects. This allowed Mayo Clinic to reallocate resources to more critical projects and reduce unnecessary expenses during the financially uncertain time. The command centre and its project teams broadly and frequently communicated significant changes to policies and procedures through institutional channels, including frequently visited internal webpages and direct e-mails to managers and staff.

Project team partnerships

> *The best interest of the patient is the only interest to be considered, and in order that the sick may have the benefit of advancing knowledge, union of forces is necessary.*
>
> —Dr. William Mayo[6]

To deliver expedited solutions during the pandemic, partnerships between project teams and their members were more important than ever. Subject matter experts from multiple disciplines on teams collaborated more closely to complete tasks quickly and with high quality. The ME&C Department's health systems engineers partnered together to combine technical skills and knowledge of various Mayo Clinic practice and operational areas. As a result of decreased patient volumes, team members had more availability to meet frequently and focus primarily on completing projects, which allowed them to rapidly develop ideas into reality.

Partnerships of multidisciplinary experts

> *… essential that the specialist, to do efficient work, must have some association with others who, taken altogether, represent the whole of which the specialty is only a part.*
>
> — Dr. Charles Mayo[7]

One example where Mayo Clinic's multidisciplinary experts partnered together more closely during the pandemic was implementing COVID-19 contact tracing. Occupational Health leaders pulled in operational leaders from other departments with expertise in clinical practice, legal matters, processes and information systems to develop the infrastructure in a streamlined manner. Nurses from Mayo Clinic's existing 24/7 call centres were underutilised as their work had slowed down during the pandemic, and they were reassigned to support contact tracing efforts that required their knowledge and licensure. Assessments were made to review the disease acuity, time sensitivity, patient preference and available practice resources, similar to research from Prachand et al.[8] and Esser.[9]

Another project example was implementing the new disinfectant wipe system. Multidisciplinary experts from supply chain, nursing, environmental services and systems engineering collaborated closely to develop a solution. Typically, each respective group would have completed their part and then handed off to the next team, but they successfully implemented an innovative solution much more quickly by working together concurrently.

Partnerships between ME&C engineers

ME&C health systems engineers typically work on projects for their clients independently from one another to reduce overlapping responsibilities. They may have individual consults between engineers, or projects, where they implement the same deliverable in different practices or regions, but they do not typically partner closely with one another otherwise. The rapid turnaround required for COVID-19-related projects, however, increased the collaboration between health systems engineers who were assigned to the same projects.

One example where partnership between ME&C engineers proved to be valuable was utilising simulation to model potential changes of volumes and various processes for medical procedures in the division of Gastroenterology and Hepatology (GIH). Healthcare simulation is complex and requires many components to be effective for decision makers. Technical expertise in simulation principles and techniques, and a thorough understanding of the practice area, are both critical in developing useful simulation models. Bringing together these competencies in a short timeline is challenging, and ME&C partnered two health systems engineers, one with simulation expertise and the other who was embedded with the GIH practice, to accomplish this modelling solution. The simulation expert built the model's technical components accurately, while the GIH expert gathered accurate clinical information and data to input into the model. To use best practices like parameter estimation with appropriate uncertainty, it's necessary to have sufficient simulation model development time and an understanding of the actual clinical practice's operations.[10] Working together, the two engineers quickly developed realistic models of the GIH procedure schedule and simulated various adjustments to the practice. These simulation models provided valuable information to the GIH division's leadership team, who needed to frequently adjust procedure schedules during the pandemic.

Another example partnering ME&C health systems engineers involved the operationalisation of the pre-surgical COVID-19 testing. Many processes in the end-to-end workflow needed to be coordinated between the Department of Surgery and the new COVID-19 Advanced Screening Clinic, including ordering, scheduling, capacity constraints and communication across staff. One ME&C engineer embedded with surgery leadership collaborated closely with a second ME&C engineer helping to operationalise the pre-surgical testing at Mayo Clinic's campus in Rochester. These two ME&C engineers collaborated with a third engineer to implement the pre-surgical testing workflows in the Mayo Clinic Health System sites. These engineers worked closely with a fourth ME&C engineer who was embedded with the Mayo Clinic Children's Center to develop workflows for paediatric patients to receive pre-surgical and pre-procedural testing in the paediatric outpatient setting. As a result of these partnerships between ME&C engineers, the end-to-end workflows were more seamless for everyone involved and were implemented more rapidly.

Prompt, data-driven decision-making

At the outset of the pandemic, decisions on operational adjustments needed to be made quickly and with confidence that their implementation would have the intended positive impact. Decision makers needed new types of information in real time, like the number of positive COVID-19 cases in the region and at Mayo Clinic, and the fluctuations in patient volumes by practice department. Creating dashboards to display accurate information and developing models and prototypes to better forecast the future were essential. Utilising a more agile trial-and-error method for process engineering applicable workflows shortened the planning time needed for implementing new operations. Asynchronous communication with innovative technology allowed clear transfer of knowledge from the front lines to leadership. Applying these techniques, Mayo Clinic was more agile in its decision-making while responding to the pandemic.

Dashboard creation

Data became paramount for decision makers to evaluate the expected impact of a surge in COVID-19 cases on the hospital system. National- and state-level models created by reputable institutions provided valuable information at the macro level; however, this information did not answer the specific questions of Mayo Clinic, especially for its rural healthcare system locations. Considering the many unknown impacts of COVID-19 and its progression, one of the surge planning teams determined that evaluating actual data on confirmed cases and deaths would better inform Mayo Clinic's expected pandemic trajectory than the macro-level models. This strategy proved correct as the disease progression in the region did not follow the original external projections.

As new complex questions emerged from practice leaders, ME&C engineers created dashboards that collated the complex data into a simple visual format that helped leaders easily interpret the information and make sound decisions in a chaotic environment. The goal was to visualise the progression of the pandemic in the geographic regions and the resulting reaction of the hospital system. ME&C health systems engineers developed the architecture needed to share data on community COVID-19 cases, testing activity in Mayo Clinic's system, hospital bed utilisation and patient flow. In one example, ME&C engineers built a dashboard to better understand changes in room utilisation as adjustments were made to the air exchange rate for aerosol-generating procedures. The dashboard combined descriptive data on practice volumes with a predictive tool using Monte Carlo simulation to provide the probability of various utilisation levels by hour of day. This combination of data illustrated the current and potential future states of the practice to better inform decision-making during these very uncertain times.

Modelling/prototyping

> *Essentially, all models are wrong, but some are useful.*
>
> —George Box[11]

When built correctly, models and prototypes can provide useful information to make better decisions. Building them correctly on a short timeline is especially challenging to ensure that they meet the needs of the decision makers, and that the input and output of data are accurate.

ME&C health systems engineers collaborated closely with decision-making proponents to first understand the problems being faced, and then build models that could be used in making operational adjustments to address those problems. These models were built using real data, and ME&C engineers quickly iterated the models to provide options to adjust parameters and to output the desired data with high quality. The proponents used this data to better inform their decisions.

Workflow trial & error

New workflows typically take many months to design and implement at Mayo Clinic. They typically involve a project team comprising all key stakeholders working together to develop and gain consensus on the details of the process flows, piloting them with a smaller population and then implementing more broadly after working out any problems. The COVID-19 pandemic required immediate responses, and the timelines to engineer new workflows shortened to days or weeks as there was not enough time to refine workflows to perfection before broad implementation.

Project teams brought together key stakeholders and subject matter experts to create workflows and anticipate challenges, but they met more quickly and frequently as their primary focus became completing these projects. Leaders and project teams expected to implement new workflows with high quality, but also understood they would not be perfect and would be subject to change. New workflows were often implemented with minimal or no piloting, and employees were trained to complete the necessary workflows and escalate questions to their supervisors. Any problems were quickly analysed to understand their root causes, and improvements were immediately developed and diffused to resolution. As Mayo Clinic policies and procedures frequently changed to match best practices, staff workflows were continually modified and communicated to the staff impacted.

Asynchronous communication

Out of necessity, effort in crisis becomes more distributed and is characterised by multiple teams working concurrently on similar objectives. Synchronous communication is challenging as stakeholders are busy working on their own deliverables. As a result, asynchronous communication with leaders becomes necessary when their time is limited, and there are many competing high priorities.

In normal operational environments, the primary mode of asynchronous communication is often e-mail, which lacks the ability to provide additional context and information to support the sharing of new ideas. During the pandemic, conversations and detailed explanations could not wait for calendars to align. When time is of the essence, utilising new technologies can improve asynchronous communication. By utilising a screen capture video, the author can record a video of their computer screen and add narration simultaneously. This tool allowed team members to communicate necessary details effectively and efficiently regarding project deliverables and updates. This allowed for expedited and improved team communication and change approvals. This innovative technology will be leveraged further by ME&C on other projects beyond the pandemic to efficiently provide information for many different purposes.

Collaborative resource distribution

Mayo Clinic's command centre realised there was a need to redistribute staff and supplies from departments that were now underutilised by the pandemic response to others that critically needed their assistance. A labour pool was created to identify which areas had available staff to repurpose and where there were gaps. A common Microsoft SharePoint webpage served as the main communication hub and uniform spreadsheets allowed managers to see which roles were available and for which time periods. Python programming was used as a daily automated method to collect and collate thousands of pieces of information into one source, and systematically utilise it to inform the scheduling managers.

The new operations for entrance screening and the COVID-19 Advanced Screening Clinic were fully staffed by individuals who were moved from a variety of clinical and non-clinical departments. Contact tracing and nurse triage phone centres expanded into much larger teams by utilising staff who were reallocated from other clinical practice areas where workload was slower than normal.

Similarly, medical supplies such as PPE and disinfectant also needed to be reallocated to new areas. Existing inventories of supplies were moved to a centralised staging area, while labour pool staff searched closed clinical areas to collect these critical supplies. After the Mayo Clinic campus in Rochester implemented the in-house disinfectant wipe canister system, the manufactured disinfectant wipes were shipped to other campuses. Staff changed the way they worked at one location to allow other locations to continue operations without concern for supply chain disruptions.

Expedited training

As new operations were implemented or existing ones were expanded, expedited training methods were used to educate staff on new or changing workflows.

As patient demand for outpatient visits exponentially increased, many providers required expedited training to perform those visits effectively. In the Southwest Wisconsin region of the Mayo Clinic Health System, a group of seven super-user providers experienced with virtual video visits developed plans to train 200 providers within 7 business days. They met together to review the workflows and training materials; then they submitted a schedule of their availability, and each was assigned a roster of providers to train. Operational leaders and providers received communication that supported the urgency for change and outlined the plan for training.

The provider super-user team trained 1–2 providers at a time during 15–30 minutes sessions, using a standard training checklist to ensure consistency. Strong physician leaders championed the training team and its goals, which helped change management efforts for successful implementation. Frequent communication to the provider super-users motivated them and disseminated updates on resources and best practices.

CONCLUSION

Innovating rapidly in healthcare settings can be incredibly challenging because of the inherent constraints of utilising evidenced-based methods, which typically take considerable time to develop and study to prove they positively impact patients in a sustainable way. At the onset of the COVID-19 pandemic, rapid innovation was imperative to continue providing necessary care while protecting patients and staff. Mayo Clinic implemented crucial innovations using a combination of methods to shorten the time frames to turn ideas into reality. The leadership launched proven crisis management structures to focus priorities and expedite decision-making. Project teams collaborated creatively to deliver solutions and provide clear data to leaders to make informed decisions in the chaotic environment. Focused prioritisation on patients and the institution's most critical needs enabled Mayo Clinic to provide safe, high-quality care for its patients and stability for its staff. The urgency of these efforts accelerated progress on strategic initiatives like telehealth, developed enhanced agility in decision-making and institutionalised the knowledge needed to face future challenges.

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