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Brief Report

Access to Care: End-to-End Digital Response for COVID-19 Care Delivery



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A B S T R A C T

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The coronavirus disease 2019 pandemic disrupted health care, requiring organizational leaders to act quickly to manage the health-related concerns of individuals and communities. The ability to offer a variety of digitally enabled telehealth services with 24/7 access to nurse practitioners and physician assistants allowed us to care for patients in their homes. It reduced the spread of the virus, protected our employees from further disease spread, and provided early interventions to those in need. The roles of nurse practitioner leaders, the enacted strategies, and patient outcomes demonstrate the impact of an innovative digital care delivery model on care across the continuum.

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Health care leaders have been faced with a challenge unlike any other with the experience of the novel coronavirus disease 2019 (COVID-19) pandemic.¹ COVID-19 has strained governmental preparedness and economic, personal, and health care organizations' capabilities.² Before the pandemic, our health care system had already initiated a strategic emphasis on advancing digital health technology. In 2019, a dedicated digital health entity and leadership structure was developed to support population-based care in communities across the OSF HealthCare system, which geographically expands over 500 miles and 2 states. The vice president (VP) of advanced practice role was expanded to include a new role as chief clinician executive (CCE) for digital health. Responsibilities for this new role included leadership and oversight for the opening of urgent care clinics within our system with nurse practitioners (NPs) and physician assistants (PAs) serving in the primary roles of provider. There were many opportunities to use NPs and PAs more effectively, with digital health as one. Our digital approach expanded and maximized resource use during the COVID-19 pandemic, which enabled us to deliver care to individuals where and when they need it. With a deliberate focus on disruptive innovation,³ agility, collaboration, and performance risk taking, we learned lessons very quickly.⁴

Our integrated health care system services both rural and urban populations in Illinois and Michigan, with more than 350 locations including 15 hospitals ranging in size from critical access to an academic medical center and 45 urgent care facilities, with 909,705 persons served. The needs of our 14 acute care hospitals differed depending on their location and community positivity rates of COVID-19. The challenge of predicted surges in admissions, the use

of intensive care unit beds, and access to care needed to be managed as proactively as possible. Like other health systems across the nation,⁵ the pandemic stressed our financial operating margin tremendously because of decreased inpatient, outpatient, and surgical volumes. However, we were well poised to consider the effective use of NPs and PAs in virtual provider roles as part of the innovative strategies designed within our end-to-end digital response.

The specific aims of our digital response strategies were as follows: 1) provide at-home care for individuals with presumed mild COVID-19 symptoms, 2) deliver early and appropriate intervention to those in need, 3) protect our communities and employees from further disease spread, and 4) reduce the potential overwhelming of our hospitals and health care facilities.⁶ In the first 10 days of operation, 26,000 COVID-19–related chatbot conversations were completed, and 12,500 phone calls were made to the dedicated COVID-19 registered nurse (RN) hotline. As early as April 2, 2020, we integrated virtual visits with NPs, PAs, and physicians to provide care for symptomatic patients.

Methods

Leadership Roles

The chief medical officer of innovation/digital health and the chief medical officer of clinical innovation led the planning work for the use of community health workers (CHWs) within our system before the pandemic.⁷ This CHW framework⁸ was core to the transition to a pandemic health worker (PHW) program; however,

few, if any, publications discussed the rapid adaptation of CHW programs to pandemic needs and the enablement of technology and clinicians to provide care in rural and urban settings.⁹ The senior VP for digital health, the VP of digital care, and the VP of advanced practice/CCE were accountable to lead the implementation of operational and clinical needs for the digital response efforts. Other physician and nursing leaders were assigned to lead specific programs and clinicians.

The director of advanced practice clinical education and fellowships was redeployed to serve as an interim clinical leader in collaboration with the director of education who served as the operational leader for several of the newly designed digital platforms. This NP leader in collaboration with the VP of advanced practice/CCE put education, competencies, and NP/PA workforce provider roles into place for the digital COVID-19 response.¹⁰ Advanced practice leaders understand the role, educational background, required competencies, and methods needed to evaluate NP/PA performance. It was very evident that without a well-established advanced practice leadership structure, delays in identifying the best NPs and PAs to fulfill these roles would occur. In 1 week, 15 NPs and PAs were reallocated from other roles to serve in digital health roles that served a large community-based population. As a disruptive innovation, all programs were simultaneously in design phases with rapid successive deployment given the pandemic.

Program Design and Implementation

The journey for access to care ([Supplementary Figure](#)) started with a chatbot followed by a texting solution, which connected patients to information regarding COVID-19. Digital end-to-end solutions were accelerated through partnerships with digital innovative disruptors. A dedicated call center was implemented within 72 hours from planning to start-up and was staffed with RNs to triage patients who may be “worried well” or have symptoms of COVID-19 to the appropriate level of care using structured algorithms. All callers were offered the digital programs based on their symptoms and residential area. If a caller needed a higher level of care, the RNs transferred the caller to an NP or PA for a virtual visit. The program remains operational at this time, with a potentially different focus postpandemic.

Traditional electronic medical record (EMR) solutions were insufficient for the rapid stand-up of services. A team created a software layer with appropriate Health Insurance Portability and Accountability Act provisions¹¹ and other protections to facilitate intake interviews; enrollments; and screening for social determinants of health, such as food insecurity, housing, or transportation needs. These data were used to appropriately characterize client needs and to deploy additional internal resources such as social workers and PHWs to mitigate barriers to COVID-19 management within our comprehensive response program.

A digital connection¹² was offered to all callers and was available for 16 days for patients to use, with an option of program reenrollment as needed. The patients would input symptoms daily, and the program triaged them according to severity of illness; those with higher severity triggered an RN triage alert that was followed up with an RN call for evaluation and, if needed, a scheduled NP/PA virtual visit. Patients with comorbidities who were high risk for complications from COVID-19 were eligible for intermediate-level remote monitoring by RNs and NPs. This program allows patients to remain at home while being remotely monitored by RNs and NPs/PAs from a centralized location. The program was active by April 2020 and was in line with the Centers for Medicaid and Medicare Services Hospitals Without Walls

regulatory changes, which were announced in March 2020.¹³ The monitoring equipment supplied by our health care system allowed for evaluation of blood pressure, heart rate, and pulse oximetry 3 times daily. Patients enrolled in the acute home monitoring program who deteriorate are evaluated virtually by NPs and PAs, and those requiring a higher level of care are directed to local urgent care facilities or emergency departments by private car or ambulance depending on provider evaluation of the patient. In most instances and communities, these facilities are located within our health care system, allowing for an ongoing flow of health information through the EMR and ensuring better continuity of care.

Another program launched and designed to care digitally for COVID-19 patients within the home environment is the Acute Covid at Home program. An NP leader who co-led and facilitated the implementation of a similar transitional program for pediatric ventilated patients in late 2018 oversaw the development and implementation of the program. The Acute Covid at Home program was in the planning phases when the pandemic ensued and was quickly operationalized to decompress our acute care facilities, providing throughput and the capacity needed during the surge of patients. The Hospital at Home program operates through early hospital discharge of lower acuity patients to their homes in collaboration with home health nursing, digital remote monitoring equipment, and virtual visits by the medical team.¹⁴ The digital monitoring of patients postdischarge allows for the evaluation of blood pressure, heart rate, pulse oximetry, and daily physical assessments by RNs in the patient’s home. This program, too, was well ahead of the Centers for Medicaid and Medicare Services expansion of Acute Hospital Care at Home waiver.¹⁵ Objective patient data are monitored by RNs and addressed through daily virtual NP or PA visits, ensuring appropriate intervention to manage care safely or to arrange face-to-face contact with providers if necessary.

Program Evaluation

From the inception of the digital response program, metrics for use of the various care delivery models have been tracked and reported internally and externally to the state of Illinois, which reimburses for telehealth ([Table 1](#)). Enrollment remained steady from April 2020 through March 2021, enabling us to meet the needs of our communities with services provided to patients from 78 counties within the state. By March 31, 2021, we received over 179,304 calls to the RN hotline and 9,739 client enrollments in the COVID-19 response program and delivered 38,622 virtual visits (NPs: 95% and PAs: 5%), all surpassing our expectations. Hospitalization and emergency department utilization are also reported, which helps gauge the escalation of care for enrolled patients during the pandemic. Peak enrollment for the PHW program occurred in late November 2020, with 859 active patients. For the acute monitoring programs, peak enrollment occurred in January 2021, with 335 unique patients.

Demographic data for enrolled patients enabled us to see the diversity of participants ([Table 2](#)), which are similar between those elected to participate and those who declined, with a slightly higher percentage of males declining (42.3%).

Exit surveys provided patient satisfaction and engagement data as other important markers of success. Monthly survey completion rates for program participants averaged between 17% and 23%. Ninety-one percent of patients from the COVID-19 response programs reported that the program “helped them to know what to do next,” and 96.7% of patients indicated they would recommend the program (agree/strongly agree). The most common reasons for nonparticipation in the PHW program were testing negative/

Table 1
Monthly Program Metrics, April 2020 Through March 2021

Monthly Metric	April 2020	May 2020	June 2020	July 2020	August 2020	September 2020	October 2020	November 2020	December 2020	January 2021	February 2021	March 2021	Cumulative of All Months
Hotline volume	17,370	15,448	5,347	14,495	20,384	16,319	20,607	33,869	13,625	10,637	7,335	3,868	179,304
COVID-19-specific chatbots	4,784	3,032	1,972	3,131	3,462	3,003	5,310	10,163	4,716	3,968	2,970	1,989	45,800
Provider (APP/MD) virtual visits	2,230	1,906	679	2,623	3,900	4,113	5,489	3,217	5,356	5,898	2,313	898	38,622
Total cumulative enrollment	850	818	238	644	698	648	996	2,016	1,234	1,017	387	193	9,739
PHW enrollment only	730	664	189	492	460	450	712	1,290	559	344	155	120	6,165
Enrollment acute monitoring at home programs	100	114	55	140	214	170	281	658	608	631	216	65	3,252
Hospital Utilization													
Admissions	23	15	12	22	34	51	50	126	80	63	30	22	528
ER visits	64	76	35	46	88	84	131	266	215	149	76	45	1,275

APP = nurse practitioner or physician assistant; COVID-19 = coronavirus disease 2019; ER = emergency room; PHW = pandemic health worker.

waiting for results (25.1%), asymptomatic/condition improving (14.9%), or under provider care (9.2%).

Discussion

This end-to-end solution provided a viable approach to addressing community needs during the COVID-19 pandemic. Given the rising numbers of hospitalizations and emerging variants, COVID-19 still poses a formidable threat within the United States and globally, although it has helped to advance digital health forward in a significant way.¹⁶ The crisis served as the impetus for complete immersion into digitally driven care, including our primary care locations where virtual visits were used minimally in 2019.

Collaboration across the health care system was important but complex; this process changed how decisions were made and the leaders who made them. The traditional consensus and committee structure for decision making was replaced with daily stand-up meetings and tight deadlines for implementation. The primary focus on disruptive innovation clearly tested the speed at which traditional health care organizations can move with regard to implementing change. We leveraged the skills and talents of our

innovation and advanced practice leaders and provider workforce across the organization to move the work forward from merely ideas to operational programs. Requesting feedback from teams across our system allowed leaders and providers of virtual care to grow and develop as well as to build credibility within the organization.¹⁷

The delivery of safe, effective care in a virtual platform requires a competent and educated workforce.¹⁰ The advanced practice leaders in OSF HealthCare were able to strategize and determine the locations and models for the NPs and PAs to serve and quickly transition them to a new virtual model of care. Advanced practice leaders who are practitioners themselves play a critical role in organizations as change agents and advocates while ensuring workforce optimization with scope of practice considerations that are maintained. The digital structure effectively managed our organization's performance by increasing access to care and by contributing substantively to the type of clinical care delivery modalities and percentages of virtual visits, all while driving toward quality patient outcomes. Data demonstrated that a larger percentage of our patients referred to the programs by themselves or a provider required lower acuity monitoring through the PHW program, with 34% requiring remote patient monitoring assistance supported by NP/PA virtual visits. Improved patient outcomes through early recognition of acute deterioration were noted, particularly with patients exhibiting hypoxia without respiratory distress.

Direct communication; rapid decision making in the absence of understanding all variables; and immediate, pointed feedback on performance prevailed as the interprofessional teams collaborated toward a common goal. The unpredictability of the virus spread influenced staffing and resources, causing a continuous fluctuation in process and modeling strategies, which required ingenuity and flexibility. Technology challenges were faced not only by our team but also by the patients themselves because some areas were impoverished or rural with limited Internet connectivity, and others did not have a telephone or email account and, thus, were challenged to access and understand the digital solutions provided.

Conclusion

Health care leaders are starting to understand better the consumer demand of convenience and 24/7/365 access. Providing this level of service requires organizations to think and respond differently for the future.⁴ NPs and PAs have a critical role in digital health as part of the workforce of the future, helping to deliver end-

Table 2
Demographic Characteristics of Participants (N = 9,739) in Coronavirus Disease 2019 Response Programs

Characteristics	Enrolled Participants
Sex	Number (%)
Men	3,615 (37.1)
Women	6,124 (62.9)
Age, years	
< 18	5 (0.05)
18–24	661 (6.8)
25–34	1,488 (15.3)
35–44	1,669 (17.1)
45–54	1,843 (18.9)
55–64	1,821 (18.7)
65+	2,252 (23.1)
Race/ethnicity	
White	7,440 (76.4)
Black or African American	941 (9.7)
Hispanic or Latino	590 (6.1)
Other	155 (1.6)
Asian	107 (1.1)
American Indian or Alaska Native	18 (0.2)
Not collected	488 (5.1)

to-end solutions for access to care.¹⁸ Their knowledge and clinical skills make them strong leaders for new models of care delivery. Our organization is currently in developmental stages with digital programs that have broader implications for addressing social determinants of health; these programs can be used by NPs/PAs who deliver population-based health care. Having dedicated advanced practice leadership ensures that NPs and PAs are used at the top of their license while developing and implementing new processes, programs, solutions, and evaluation methods within the NP and PA workforce. Research investigating the high utilization of virtual care delivery programs and NP/PA roles is needed to examine patient-centered outcomes more clearly and how they are improving the health and lives of individuals.

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References

- Kim C, Kritek P, Lynch J, et al. All hands on deck: how UW medicine is helping its staff weather a pandemic. *NEJM Catal.* 2020;1:1-7.
- John J, Council L, Zallman L, et al. Developing an intensive community Covid-19 management strategy: helping our patients access patient-centered care across a continuum of Covid-19 disease needs. *NEJM Catal*; Published online May 27, 2020, <https://doi.org/10.1056/CAT.20.0181>.
- Sounderajah V, Patel V, Varatharajan L, et al. Are disruptive innovations recognised in the healthcare literature? A systematic review. *BMJ Innov.* 2021;7: 208-216. <https://doi.org/10.1136/bmjinnov-2020-000424>.
- Overage J, Glaser J. The “rebar” disruptors: a wake-up call for traditional healthcare systems. *NEJM Catal*; Published online February 19, 2020, <https://doi.org/10.1056/CAT.20.0009>.
- Khullar D, Bond AM, Schpero WL. COVID-19 and the financial health of US hospitals. *JAMA.* 2020;323(21):2127-2128. <https://doi.org/10.1001/jama.2020.6269>.
- Kuy S, Gupta R, Correa R, et al. Best practices for a Covid-19 preparedness plan for health systems. *NEJM Catal*; Published online April 30, 2020, <https://doi.org/10.1056/CAT.20.0108>.
- Kangovi S, Mitra N, Norton L, et al. Effect of community health worker support on clinical outcomes of low-income patients across primary care facilities: a randomized clinical trial. *JAMA Intern Med.* 2018;178:1635-1643. <https://doi.org/10.1001/jamainternmed.2018.4630>.
- Kim K, Choi JS, Choi E, et al. Effects of community-based health worker interventions to improve chronic disease management and care among vulnerable populations: a systematic review. *Am J Public Health.* 2016;106(4): e3-e28. <https://doi.org/10.2105/AJPH.2015.302987>.
- World Health Organization. Responding to community spread of COVID-19: interim guidance. <https://apps.who.int/iris/handle/10665/331421>.
- Frey MB, Chiu SH. Considerations when using telemedicine as the advanced practice registered nurse. *J Nurse Pract.* 2021;17(3):289-292. <https://doi.org/10.1016/j.nurpra.2020.11.011>.
- Bulletin: HIPAA privacy and novel coronavirus. Washington, DC: Office for Civil Rights, US Department of Health and Human Services. February 2020. <https://www.hhs.gov/sites/default/files/february-2020-hipaa-and-novel-coronavirus.pdf>.
- GetWell Loop. Accessed March 2, 2020, <https://www.getwellnetwork.com/getwell-loop/>.
- Centers for Medicare and Medicaid Services. Additional background: Sweeping regulatory changes to U.S. Healthcare systems address Covid-19 patient surge; March 30, 2020. Accessed June 25, 2021, <https://www.cms.gov/newsroom/fact-sheets/additional-backgroundsweeping-regulatory-changes-help-us-healthcare-system-address-covid-19-patient>.
- Murali N, Messina T. No place like home: bringing inpatient care to the patient. *NEJM Catal.* 2019;5:1-13. <https://doi.org/10.1007/s11846-019-00339-2>.
- Rhaiem K, Amara N. Learning from innovation failures: a systematic review of the literature and research agenda. *Rev Manag Sci.* 2019;13:1-46.
- Centers for Medicare and Medicaid Services. CMS announces comprehensive strategy to enhance hospital capacity amid COVID-19 surge; November 20, 2020. Accessed June 25, 2021, <https://www.cms.gov/newsroom/press-releases/cms/announces-comprehensive-strategy-to-enhance-hospital-capacity-amid-COVID-19-surge>. Accessed June 25, 2021.
- Ryu J, Russell K, Shrank W. A flower blooms in the bitter soil of the Covid-19 crisis. *NEJM Catal*; Published online June 24, 2020, <https://doi.org/10.1056/CAT.20.0321>.
- Rosa W, Fitzgerald M, Davis S, et al. Leveraging nurse practitioner capacities to achieve global health for all: COVID-19 and beyond. *Int Nurs Rev.* 2020;67(4): 554-559. <https://doi.org/10.1111/inr.12632>.
- DinosoftLabs. User icon. Flaticon.com. https://www.flaticon.com/free-icon/user_3349798?term=person&page=1&position=43.
- Freepik. Laptop icon. Flaticon.com. https://www.flaticon.com/free-icon/laptop_59505?term=computers%20and%20laptops&page=1&position=14.
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- Gorbachev V. Minivan icon. Flaticon.com. https://www.flaticon.com/free-icon/minivan_961387?term=minivans&page=1&position=17.
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