

Short Title

The Five Phases of Pandemic Care for Primary Care

Long Title

The Five Phases of Pandemic Care for Primary Care – Necessary Steps for Action

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In normal times, 75% of adults report one or more illness or injuries per month. Most manage symptoms on their own, and only 25% of the population consults a clinician.¹ Our health system is right-sized to meet that demand. During a pandemic, many more patients are likely to have symptoms and many more of those symptomatic patients will seek care. Nearly all will need primary care, and primary care will need to be there to help them.

In 2014, the Centers for Disease Control and Prevention (CDC) issued a framework to address the influenza pandemic.² They describe six intervals: 1) investigation of cases of novel influenza, 2) recognition of increased potential for ongoing transmission, 3) initiation of a pandemic wave, 4) acceleration of a pandemic wave, 5) deceleration of a pandemic wave, and 6) preparation for future pandemic waves. This is a great public health framework, but it does not address the specific needs of primary care practices.

We have seen and believe that there are five waves of needed primary care to address the current COVID-19 pandemic. The primary care waves we propose parallels the CDC's framework. With each wave, primary care will need to continuously reinvent and transform itself. The seismic changes required of primary care will all happen while (1) handling a ten- to hundred-fold surge in demand, (2) trying to protect clinicians, staff, and patients from exposing themselves and others with limited or no personal protective equipment (PPE), (3) experiencing personnel shortages as the primary care workforce gets infected, and (4) suffering financial hardships and staff layoffs as our predominantly fee-for-service healthcare reimbursement system fails primary care. Of course, throughout this process, primary care will need to continue to provide usual

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care, including managing chronic conditions, addressing new acute problems, and even promoting prevention.

Today, most communities in the US are entering wave one or two. A few are starting the third wave. All communities in the US will go through all waves, but to different degrees and at different times. There may be additional waves that we do not anticipate, some waves will happen simultaneously, some waves will repeat themselves, and the cycle will happen again as COVID-19 shifts and drifts and re-infects our communities.

The Five Phases of Primary Care Pandemic Care

Signal Phase (Wave 1)

Cases begin to appear in communities during this wave. Life may feel normal. Offices are open and functioning in the status quo, but patients are beginning to worry, and some are developing symptoms. Physical distancing recommendations emerge and practices scramble to cohort patients with respiratory symptoms in separate waiting rooms away from well patients, reduce the numbers of patients in waiting rooms by having sick patients wait in their car until ready to be brought directly to an examination room, spread chairs out six feet apart to enforce physical distancing, disinfect rooms after every patient, and have patients and staff wear masks and wash hands continually. Non-urgent appointments are cancelled, and practices dabble in switching to virtual visits and telephone-based care, agree to refill most medications by phone, and spend more time providing asynchronous care and counseling via email or other patient portal communication tools.

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During a pandemic, the quicker practices can move from phase one to phase two, the better they can protect their community. The problem is that every year viral infections spread in communities; only rarely are these pandemics. Most infections do not have the morbidity and mortality of COVID-19. Primary care cannot jump to phase two with every cough and cold. What primary care needs is public health monitoring for an early signal from other communities that are experiencing problems. Public health needs to sound the alarm that the second wave is coming so primary care can move to the next phase. Without this alarm, the infection spreads exponentially and the health system is quickly overwhelmed.

Spread Phase (Wave 2)

The second wave begins as the infection spreads throughout the community. Now patients, primary care clinicians, and hospital staff and leaders need to act urgently. Social distancing, hand washing, and limiting contact must be implemented to prevent spread and “flatten the curve.”³ Primary care must lead by example doing three things: (1) converting to complete virtual care, (2) implementing proactive population care, and (3) protecting patients, emergency rooms, and hospitals. *Complete virtual care* means every patient encounter needs to be through a video visit or phone call. A skeleton crew of clinicians can see the few patients that must be seen (e.g. someone with an abscess to drain), but only after triaging through virtual care. *Proactive population care* means that practices need to use their registry function to generate lists of vulnerable patients, including those at risk for infection, worsening chronic disease, or sequela from stress and burdens of the pandemic. These patients must be prioritized and proactively

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addressed through outreach. Clinicians should add patients to this priority list who are seen virtually and need more active follow-up, such as patients with a COVID-19 infection at home or those with a new acute non-COVID-19 problem or worsening chronic disease. Staff should call these patients frequently and provide follow-up, elevating care to repeat virtual visits or a visit if the patient worsens. If these tasks are done well this will have a *protective function* for all. Patients can maintain social distancing while getting care. This will not only limit spread but ensure that only the sickest of patients who truly need emergency room or hospital care will present to these increasingly strained settings.

To make this happen, primary care needs informatics infrastructure to provide virtual care and advanced registry functionality. Ideally this would include tools integrated into the electronic health record to allow seamless, easy care. Existing restrictions on billing and privacy need to be lifted, as they have been for COVID-19, so care can be provided through any means possible, even commonly available tools like Skype, Facetime, and Google Hangout. In addition to informatics infrastructure, entirely new workflows and protocols need to be developed. Clinicians and nurses who normally work side-by-side need to communicate virtually, clinical decisions need to be primarily guided by history and not examinations or tests, and strategies to follow symptom progression over time need to be used to ensure that treatments decisions were correct and the patient is improving. Insurers and policymakers will need to make these processes easy, lifting existing bureaucratic protocols to relieve strain on clinicians (e.g. required in-person oversight of advanced practice providers to bill when in a virtual visit system).

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Some practices have been adapting to this phase well. One group of practices in Northern Virginia converted from the rare virtual visit to all virtual care in the span of two weeks, moving from 0.7% of the 9,000 per week patient visits being virtual in the first three weeks of March 2020 to 45.0% in the third week, and then nearly 100% in the final week.⁴ Other practices have struggled and either continued in-person visits using wave one strategies to reduce infection, or practices completely closed all operations and laid off staff. Either approach has great potential to hurt the community, the first approach being a major source to spread infection and the second approach leaving patients abandoned and increasing burdens on emergency rooms and hospitals.

Acute Phase (Wave 3)

As spread occurs at an exponential rate and infected patients start to get sick, practices will need to be ready for the acute phase of the pandemic. This is the wave that hospitals and ICUs are preparing for and the focus of much of our media attention. To put this in perspective for primary care, the Northern Virginia practices described above cares for about 200,000 patients in Northern Virginia. On any normal day, the practices care for about 10 to 30 patients in the hospital. If 10% of patients get coronavirus (n=20,000 patients) and if 15% of those infected need hospitalizations that means the practices will now need to care for 40 to 130 times as many patients as usual (n=1,333 patients). This will happen while trying to continue to maintain the virtual care, population care, and protective functions described above.

To be able to manage these tasks, primary care will need to partner with their local hospital systems, community service providers, palliative care clinicians, and public health officials. No

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one can do this alone. Protocols will need to be developed as to who needs to be tested, who needs in-person evaluations, who needs to be admitted, who will care for patients in the hospital, how some patients that would normally be hospitalized could be managed at home (i.e. *home hospital care*), and where overflow hospital care will occur. Primary care will be a key partner in all steps and will likely need to lead home hospital care. Some researchers and health systems have dabbled in home hospital care, testing home monitoring and treatments.⁵ Most interventions have relied on staff members doing frequent home visits and setup of significant equipment for monitoring; few interventions have been sustained and disseminated outside research settings. Now primary care will need to discover a new way to do home hospital care, limiting home visits given exposure risks and without monitoring equipment that will be in short supply. *Home hospital care* will include a spectrum of services ranging from (1) caring for those infected with COVID-19, (2) managing non-infectious conditions that would have been hospitalized but are now to limit exposure risks, and even (3) home hospice care for those who are sick but not eligible for or not interested in receiving intensive care. The virtual care infrastructure used in wave two can bring clinicians into the home; protocols and workflows can be adapted to more intensive services and a broader array of care team members; essential equipment like oxygen, antibiotics, and pain medications will need to be brought to people's home by home health agencies; unique strategies to get vital data and monitor progress will need to be considered (e.g., mobile oxygen saturation and telemetry monitoring); and non-healthcare workers like family and friends will need to aid in physical care such as cleaning and feeding.

Convalescent Phase (Wave 4)

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The fourth wave is characterized by hospitalized patients improving from life threatening illness and entering the recovery phase. Patients can be discharged from the hospital, but they are still too debilitated and weak to go home. Usually, patients would go to a nursing home or an acute rehabilitation center. However, these centers cannot risk taking post-infectious patients and infecting their existing residents. Even if they could take patients, they only have a small fraction of the capacity that will be needed. If a place is not found to care for these patients, they will linger in the hospital, occupying space sorely needed for new acutely infected patients or they will be sent home to an unsafe environment lacking needed support and treatment.

Primary care will need to be ready to care for these patients and this work will rapidly and exponentially increase as many patients transition to a recovery phase which can last for months. Primary care will need to partner with their health systems, rehabilitation centers, public health officials, and community centers to define who can be taken care of at home and who will need more intensive support, build a workforce to provide patients support for activities of daily living, develop workflows for how clinicians will interact with daily support staff, and even consider establishing make-shift recovery centers throughout the community. Done well this will ensure patients get the help they need to recover while freeing up critically needed hospital resources.

Consequence Phase (Wave 5)

The direct consequences of the COVID-19 epidemic will include premature deaths, prolonged recovery periods for those infected, and sequela of infections such as permanent lung disease or

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other complications. The indirect consequences may result in a greater toll on health. These include inadequate care as clinicians adapt and ration care; worsening chronic disease as patients' self-management declines and traditional care is delayed; new onset or worsening depression, anxiety, alcohol and substance misuse, and domestic violence; and greater social needs such as financial troubles, housing instability, and food insecurity further stressing and harming patients. These will all cause greater morbidity and mortality if not addressed than the direct consequences of COVID-19.

To combat this fifth wave, primary care will need to implement evidence-based strategies to address unhealthy behaviors, mental health, and social risks. Even when times are good, these are tremendously difficult domains to help patients, often requiring intensive support over prolonged periods of time from community-based and social service programs. Health insurance often does not fully cover these services for patients - even those deemed to be medical care services, such as mental and behavioral health care. Social programs have been greatly underfunded in the US compared to other countries, so these programs lack infrastructure and support to help more people than they currently help.

Similar to other waves, primary care will need strong health system, community, and public health partnerships to address these needs as well.⁶ Some successful strategies may include developing or extending integrated mental health and primary care,⁷ expanding the roles of social workers within health systems, deploying large numbers of community health workers, defining roles within primary care versus the community, and leveraging the clinician-patient longitudinal

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relationship to address these needs. Primary care's active advocacy will also be essential during this time as social and economic policies that promote health and healing will be essential.⁸ All of this will be challenging as our health system and nation is recovering from the prior four waves.

Conclusion

Thinking about the tasks needed from primary care one thing is clear, if primary care does not do well in this crisis, the system will be *completely overwhelmed*. If primary care does everything perfectly, the system will *just be overwhelmed*. Either way, there is a tough road ahead, and there are thousands of natural experiments occurring across the nation. It is critical to learn from these experiences and to be prepared for next time. The transformations that are occurring present an opportunity for our health system to evolve, build informatics infrastructure, expand digital health, support diverse multidisciplinary teams to care for patients across settings, fix payment to enable comprehensive, continuous care, and convert to a true community-based focus for patient-centered and population-focused care that helps all in need.

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TABLE 1. Five Waves of a Pandemic and Primary Care Actions

Primary Care Wave	Description	Primary Care Actions to Care for the Community
Signal wave	Cases begin to appear in multiple communities.	<ul style="list-style-type: none"> - Partner with public health - Implement physical distancing - Separate patients with symptoms and those who are well - Minimize patients in waiting room - Disinfect rooms after every patient - Have patients and staff wear masks - Wash hands continually - Cancel non-urgent visits - Consider switching to virtual visits and telephone-based care
Spread wave	Infections rapidly spread in and across communities.	<ul style="list-style-type: none"> - Partner with public health and health systems - Convert to complete virtual care - Implement proactive population care to identify and reach out to at-risk patients for infection and worsening chronic conditions, mental health, or social needs - Implement policies to protect patients, staff, and clinicians - Keep patients away from emergency rooms and hospitals unless necessary
Acute wave	Patients increasingly get sick and require intensive hospital support.	<ul style="list-style-type: none"> - Partner with their local hospital systems, community service providers, palliative care clinicians, and public health officials - Develop protocols for who needs to be tested, who needs in-person evaluations, who needs to be hospitalized, and who will care for patients in the hospital - Create home hospital care for sick patients who cannot be hospitalized due to lack of beds or to protect patients with non-infectious issues from being infected - Expand home palliative care for patients who do not want aggressive care in the event they get sick

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Convalescent wave	Hospitalized patients improve from life threatening illness and need rehabilitation services.	<ul style="list-style-type: none"> - Partner with their health systems, rehabilitation centers, public health officials, and community centers - Define who can be taken care of at home and who will need rehabilitation - Create home rehabilitation care - Expand the workforce to provide home rehabilitation and intermediate and basic activity of daily living support - Develop protocols for how clinicians will interact with daily support staff - Consider need for overflow recovery centers throughout the community
Consequence wave	Patients recover from uncontrolled chronic disease, untreated acute problems, missed preventive opportunities, new and worse mental health conditions, and new and worse social needs.	<ul style="list-style-type: none"> - Partner with health system, community, and social services - Expand the provision of evidence-based care for unhealthy behaviors, mental health, and social needs - Expand/create integrated mental health and primary care - Expand the role of social workers and community health workers - Leverage the clinician-patient longitudinal relationship to address needs - Advocate for essential social and economic policies

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REFERENCES

1. Green LA, Fryer GE, Jr., Yawn BP, Lanier D, Dovey SM. The ecology of medical care revisited. *N Engl J Med*. 2001;344(26):2021-2025.
2. Holloway R, Rasmussen SA, Zaza S, Cox NJ, Jernigan DB. Updated preparedness and response framework for influenza pandemics. *MMWR Recomm Rep*. 2014;63(RR-06):1-18.
3. In: Nicholson A, Shah CM, Ogawa VA, eds. *Exploring Lessons Learned from a Century of Outbreaks: Readiness for 2030: Proceedings of a Workshop*. Washington (DC)2019.
4. Bacon JA. NoVA Healthcare Adapts to the Epidemic. In. Vol 2020. Bacon's Rebellion2020.
5. Shepperd S, Doll H, Angus RM, et al. Avoiding hospital admission through provision of hospital care at home: a systematic review and meta-analysis of individual patient data. *CMAJ*. 2009;180(2):175-182.
6. Krist AH, Shenson D, Woolf SH, et al. Clinical and community delivery systems for preventive care: an integration framework. *Am J Prev Med*. 2013;45(4):508-516.
7. Working Party Group on Integrated Behavioral H, Baird M, Blount A, et al. Joint principles: integrating behavioral health care into the patient-centered medical home. *Ann Fam Med*. 2014;12(2):183-185.
8. Adler NE, Glymour MM, Fielding J. Addressing Social Determinants of Health and Health Inequalities. *JAMA*. 2016;316(16):1641-1642.

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