Primary Care Population Management for COVID-19 Patients

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BACKGROUND: Most patients infected with SARS-CoV-2 have mild to moderate symptoms manageable at home; however, up to 20% develop severe illness requiring additional support. Primary care practices performing population management can use these tools to remotely assess and manage COVID-19 patients and identify those needing additional medical support before becoming critically ill.

AIM: We developed an innovative population management approach for managing COVID-19 patients remotely.

SETTING: Development, implementation, and evaluation took place in April 2020 within a large urban academic medical center primary care practice.

PARTICIPANTS: Our panel consists of 40,000 patients. By April 27, 2020, 305 had tested positive for SARS-CoV-2 by RT-qPCR. Outreach was performed by teams of doctors, nurse practitioners, physician assistants, and nurses.

PROGRAM DESCRIPTION: Our innovation includes an algorithm, an EMR component, and a twice daily population report for managing COVID-19 patients remotely.

PROGRAM EVALUATION: Of the 305 patients with COVID-19 in our practice at time of submission, 196 had returned to baseline; 54 were admitted to hospitals, six of these died, and 40 were discharged.

DISCUSSION: Our population management strategy helped us optimize at-home care for our COVID-19 patients and enabled us to identify those who require inpatient medical care in a timely fashion.

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INTRODUCTION

Approximately 80% of laboratory-confirmed COVID-19 patients have had mild to moderate disease that can be managed without hospitalization.[1] It is known that a significant percentage also require guidance with a worsening of respiratory status in the second week of illness[2–4]; there are anecdotal reports of patients dying at home for failure to recognize the severity of their symptoms. It is critical for COVID-19 patients to receive remote support and monitoring so that they can recover successfully at home when possible and be advised when in-person evaluation is needed. This monitoring ensures that patients remain at home when they are safe to do so and avoids exposing health care workers and using valuable PPE unnecessarily. In addition, there are suggestions in the literature that earlier admission to the hospital results in better outcomes.[5]

Due to responsibility for a large number of patients, access to the results of SARS-CoV-2 testing, and expertise in population management, our primary care practice was able to quickly design, implement, and evaluate an algorithm, an electronic medical record (EMR) component, and a population report for managing COVID-19 patients remotely. We sought to standardize outreach to COVID-19 patients, manage patients effectively at home when appropriate, and identify and quickly facilitate care for those who require inpatient medical support.

SETTING AND PARTICIPANTS

We designed, implemented, and evaluated our innovative approach within a large primary care practice at an urban academic medical center.

The study was deemed exempt by the Tufts Health Sciences Institutional Review Board (STUDY00000569).

Participants

Our hospital-based primary care practice staff includes 40 attending physicians, 76 internal medicine residents, five physician assistants (PAs), five nurse practitioners (NPs), and a team of registered nurses (RNs) caring for patients both in person and remotely. The practice is divided geographically by suite into 5 teams of clinicians, each consisting of 4–5 clinical full-time equivalents (cFTE) of MD (up to 8 physicians), one NP, one PA, and one cFTE RN. Since the start of the COVID crisis, each clinician works on site 1 day per week and remotely 4 days per week; the teams remain unchanged, and each continues to care for the same cohort of patients. Our patient panel consists of 40,000 people (~ 8000 per team),

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including patients participating in both Medicare and Medicaid accountable care organizations (ACOs), patients who are dually eligible, and patients who are commercially insured in risk contracts as well as PPOs. By April 27, 2020, 305 patients in our panel had tested positive for COVID-19 requiring ongoing evaluation and management.

PROGRAM DESCRIPTION

In March 2020, our practice implemented rapid changes to prepare for the COVID-19 pandemic. Among our first steps, we began shifting in-person appointments to telehealth visits, created a nursing phone triage algorithm to manage the high call volume from patients with questions about the novel coronavirus and concerns about getting tested, and launched an on-site respiratory symptoms clinic in one of our 5 suites. All of our residents were pulled to staff the inpatient and ICU services, and about half of our attendings entered a rotation to staff additional COVID and non-COVID ward services. Our respiratory symptoms clinic was staffed by preceptors with a now available session and other MD and NP/PA volunteers from all 5 teams. Once patients started testing positive for the virus in our clinic and the hospital testing center, we identified the need to innovate a population management structure to help us manage our growing number of COVID-19 patients remotely.

Because our EMR system can receive the results of most diagnostic tests ordered throughout the hospital, we were able to identify many patients in our practice who had tested positive for SARS-CoV-2 by RT-qPCR. However, we needed a population management strategy to allow us to outreach to this cohort. We wanted a solution that would (1) help us remotely manage COVID-19 patients recovering at home, (2) indicate when a visit to our respiratory symptoms clinic was required to answer clinical questions (oxygen saturation, chest x-ray for viral pneumonia, white blood count, e.g.) without taxing the Emergency Department, and (3) alert us in a timely fashion to instances when additional urgent interventions were required.

Based on published data regarding the clinical progression of the disease, we knew that some patients are more likely to rapidly deteriorate within 1 week after illness onset. Therefore, it was essential for our outreach program to identify patients with not only risk factors for severe illness but also increase monitoring during the days when they are most likely to worsen.[1] With this knowledge of the illness, we designed a population management algorithm, an EMR component for entering important COVID-19 identifiers, and a population report. The algorithm (Fig. 1) is used to guide triage decisions including how frequently to contact patients depending on symptom day and risk factors, and to identify clinical findings that indicate if the patient is safe to remain at home, the need for additional assessment, or

COVID-19 OUTREACH/Population Management – As of 4/9/2020

	Day 1-5 COVID symptoms	Day 5-10 COVID Symptoms			COVID Post-Discharge Management
Risk Assessment **Using COVID outreach component**	**Risk assessment—** ✓ Low if no comorbidities, ✓ High if 1 or more Comorbidities: Age > 60, Immunocompromise, Chronic lung dz, Poorly controlled DM, CHF, Transplant, CKD 4/5 **Symptom assessment—** Fever, chills, myalgia, anosmia/ageusia, anorexia, pharyngitis **COVID-19 diagnosis—** Positive test? Clinical diagnosis? ✓ Add to problem list ✓ Document date symptoms started	Questions: 1) **Shortness of Breath—measure O2 sat vs subjective dyspnea** Mild dyspnea but improving? Trouble going up a flight of stairs without getting winded? Pleuritic chest pain? Elevated respiratory rate >22-25? O2 sat <95% 2) **Trouble remaining hydrated?** Decreased fluid intake, <50% normal Lightheaded on standing? Unable to keep fluids or meds down ?Vomiting and/or diarrhea? 3) **Fever >100.4, >102** Responding to antipyretics or not? Myalgias and headaches? 4) **Chronic conditions well-controlled?**			Add COVID outreach component to post discharge encounter Family support? Continue isolation for at least 7 d with mask for14 days from start of symptoms Follow recommendations for Symptom Day out reach (Day 1-5 vs 5-10) VNA involvement? Comorbidity management
Management	**Prevent spread-** 1) **Health care worker or group living?** Must be tested 2) **Home isolation** and social distancing (wash hands, own bathroom and bed, wipe surfaces) 3) Do they have VNA? Live alone? 4) Encourage hydration, take regular meds 5) Counsel about when to call 911, GMA	**Manage at home** • Breathing ok • Fevers controllable • Able to eat and drink • Comorbidities managed • Remain isolated	**UC Respiratory Clinic Assessment** • High risk comorbidities • CXR/O2 sat would help with triage • Other comorbidities need to be assessed • Testing might put patient on non-COVID service • Needs further assessment/support but not ED level of care	**Send to ED** • Immediate support needed—hydration, O2 • 911 vs family to drive patient • Comorbidity needs acute management (chest pain, etc)	**When to stop phone outreach** 1) Breathing ok 2) Afebrile w/o antipyretics 3) Back to baseline and >day 10 **Return to work advice** • 72 hours afebrile w/o antipyretics • AND >7 days total from start of symptoms • **Home isolation** and social distancing • COVID symptoms have resolved • Call your own Employee Health • Mask for 14 days total from date of symptom onset
OTHER	Low risk—call every 2 d High risk— call daily	Low risk call daily High risk 2x per day	Low risk call daily High risk 2x per day	Call 2x per day if not admitted	Call based on illness day (1-5 vs 5-10)

CDC Symptom Checker https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/index.html
CDC 10 things to care for self at home https://www.cdc.gov/coronavirus/2019-ncov/downloads/10Things.pdf
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Fig. 1 COVID-19 outreach algorithm.

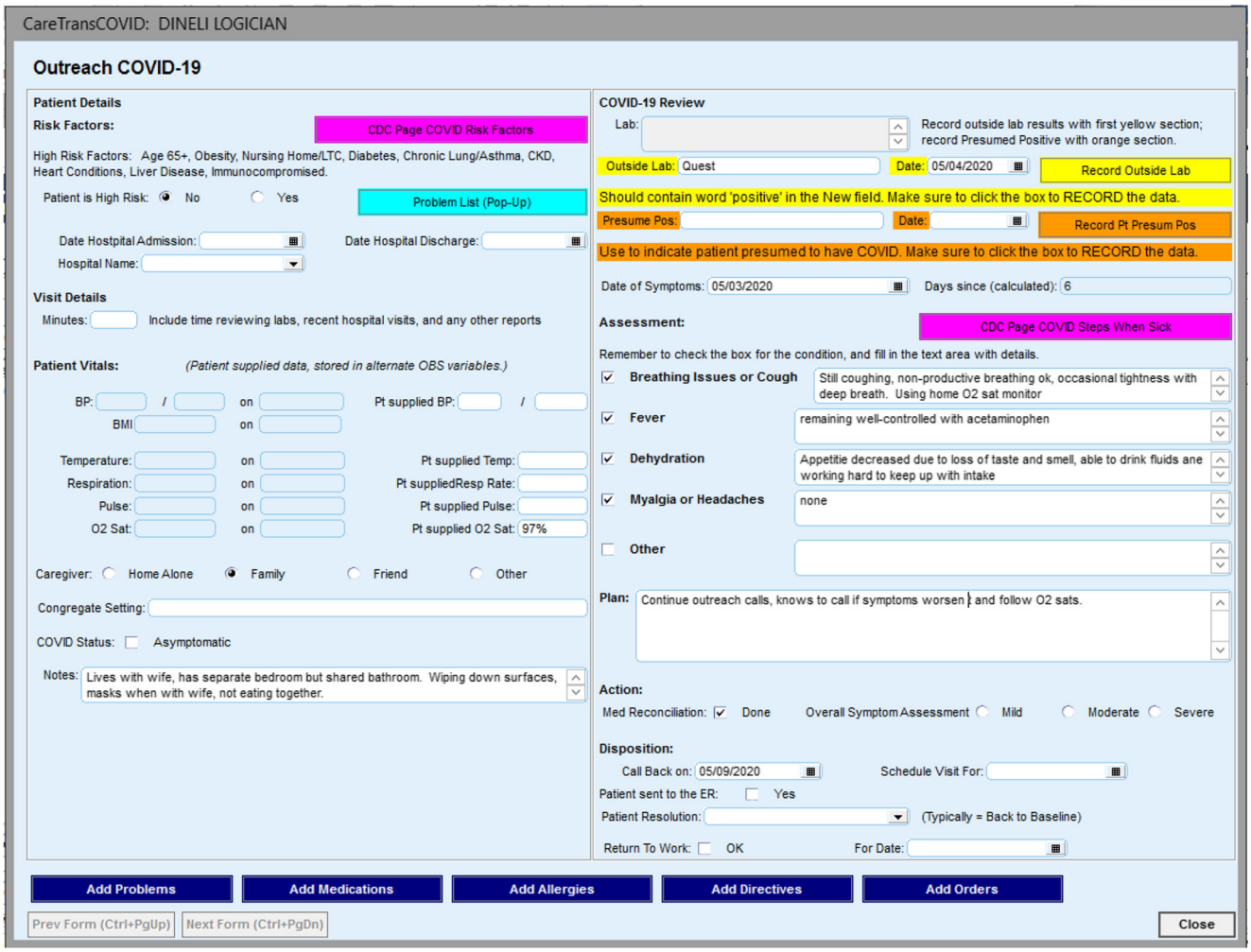

Fig. 2 COVID-19 outreach EMR component (GE Centricity).

emergency intervention. The component (Fig. 2) is used to populate a twice daily report that allows us to tailor our outreach, and includes symptom date, age, comorbidities, last date of outreach, PCP, and whether a patient is currently hospitalized or had returned to baseline.

We run the population report (Appendix Fig. 3) at 7:30 am each morning and distribute it by email to the five practice teams of MDs, NPs, PAs, and RNs who then reach out by phone to patients individually. Typically the primary care doctor, who knows each patient's history best, reviews their list and determines based on their clinical schedule and patient complexity, who they will outreach to personally, with plans to turn outreach calls into telehealth visits when appropriate and the patient consents. The NP and PA on the team collaborate with all the PCPs on their team and reach out to patients they have relationships with and those the PCPs will not have time to reach. The report is run again at 3:00 pm and redistributed so that the primary teams can see who has not been contacted and the team working in the Respiratory Symptoms clinic, including RNs who have been triaging COVID patients and know some of those on the list, can supplement our calls and ensure that those who are particularly concerning are reached.

Since the COVID-19 outbreak began in Massachusetts, our practice has had daily leadership meetings and a daily email update to all working in the practice both at home and remotely. The clinical algorithm for the population management of COVID-19 patients was created by the Division Chief and Clinical Director of Nursing and reviewed by an Infectious Disease attending physician on the Infection Prevention Team. We then worked with our Manager of Applications and Analytics to build the EMR component and the population report. Once completed, we piloted the solution with our nursing team, and then rolled it out to the practice using our daily emails and our weekly practice-wide Zoom meeting to ensure all had a chance to learn the system and receive answers to their questions. The entire process, from design to implementation, took less than 1 week.

PROGRAM EVALUATION

With a rapid rollout of our COVID-19 management program, we have applied transparent communication and a continuous

improvement approach to ensure its effectiveness. Our staff is currently working predominantly from home, and attendance at our practice-wide (now virtual) meetings has skyrocketed, resulting in improved communication and collaboration. Based on feedback from the team since rolling out our new tool, we have made some adjustments. For example, initially, "Back to Baseline" was the only criterion to stop reaching out to COVID-19 patients, but we have added "Inpatient," "ICU," and "Deceased" to the drop-down menu. We have also added identifiers for patients diagnosed clinically or at other institutions to ensure outreach happens regardless of location of diagnosis. We expect to continue to adapt our strategy as we learn more about COVID-19 disease progression and how best to care for COVID-19 patients.

As of April 27, 2020, 305 patients in our practice have been diagnosed with COVID-19 in by SARS-CoV-2 by RT-qPCR testing performed at our Tufts Medical Center testing site, in our respiratory clinic, or performed at an outside location or empirically diagnosed and manually entered into our system. Of the 305 cases of COVID-19, 196 patients have returned to baseline, 54 were admitted to hospitals; of the hospitalized patients, six have died and 40 have been discharged.

DISCUSSION

Our primary care response to the COVID-19 pandemic builds upon our knowledge and expertise in population management for chronic conditions with the need for proactive management and outreach in order to achieve best patient outcomes. We leveraged our experience with existing EMR tools and workflows developed for population management of patients with conditions such as diabetes and opioid addiction when we realized that responding to the COVID-19 pandemic would require a similar approach. Our new population management strategy for COVID-19 patients enables us to provide these patients with remote support and monitoring so that they can isolate and recover at home where they are most comfortable when appropriate, while also allowing us to identify those patients requiring additional assessment and support in a timely manner. Additionally, this strategy helps conserve PPE and medical staff resources both in our clinic and in our Emergency Department. It is worth noting that the robustness of remote monitoring for COVID-19 patients would be enhanced by an increased availability of at-home blood oxygen saturation monitors and/or improved accuracy of oxygen saturation smartphone apps.

Our new algorithm, EMR component, and population report for COVID-19 patients allow us not only to identify patients at high risk of disease complications but also to focus our outreach on symptom days 5–10, when patients are most vulnerable. Frequent conversations with these patients enable us to follow their symptoms and quickly determine when a patient is deteriorating, and we have sent patients to the Emergency Department who required admission. Patients, both young and old, who are socially isolated in their homes due to the COVID-19 pandemic, have told us how much they have appreciated our calls. We anticipate using this program as long as COVID-19 is active in our community, and we believe other primary care practices could successfully implement our population strategy to help them optimize care for their own COVID-19 patients.

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Compliance with Ethical Standards:

Conflict of Interest: *The authors declare that they do not have a conflict of interest.*

Ethical Approval: *This study was given an exempt approval (STUDY00000569) by the Tufts Health Sciences Institutional Review Board (IRB).*

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