



Special Communication

Implementing a Multidisciplinary Post-COVID Clinic in a Small Community Environment



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KEYWORDS

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Rehabilitation;
Rural community;
United States

Abstract The emergence of Post-Acute Sequelae of Sars Cov-2 (PASC), also known as long-COVID, has prompted response from the medical community with research in how to treat patient's symptoms, and in some places, development of post-COVID clinics. Publications about PASC clinics thus far have been in large academic research centers, which have access to many specialists, yet only treat a small amount of the US population. Our hospital system was able to develop a multidisciplinary post-COVID clinic in a small rural community using a PM&R (Physical Medicine and Rehabilitation) physician lead, and the ancillary services we had available in our town of 13,508 people. Funding for this was internal with no grant sources. As part of the patient rehabilitation team, the roles of PM&R providers, physical therapy, speech therapy, respiratory therapy, and psychology are portrayed. This developed clinical model is accessible to small communities across the United States.

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The novel SARS Cov-2 virus has infected and affected people across the globe. Since March 2020, 762 million people worldwide¹ have contracted COVID-19. Tragically, an estimated 1.04 million Americans have died.² Initially,

the primary challenge was the treatment of acute disease, but it soon became apparent that a percentage of patients develop long-term sequelae.³ This clinical syndrome has become known as Post-Acute Sequelae of Sars

List of abbreviations: PASC, post-acute sequelae of Sars Cov-2; PM&R, Physical Medicine and Rehabilitation; SLP, speech-language pathologist. Special thanks to Family Health West for their support and funding of this clinical endeavor.

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Cov-2 (PASC) or “long haul syndrome” or post-COVID syndrome.

The current definition of PASC is post-viral symptoms lasting greater than 12 weeks after the first suspected COVID-19 episode with no alternative explanation. PASC is a multi-system disease that can occur after even asymptomatic infection or very mild acute illness.⁴ Over 50 symptoms have been reported, but most of the patients experience post-exertional fatigue, brain fog, dyspnea, headache, chest pain, postural orthostatic tachycardia, cough, loss of smell, and post-traumatic stress disorder.⁵ Depression and neurologic changes have also been major components of PASC. The Lancet Psychiatry published a retrospective study of 236,000 patients in the USA and found 34% had psychiatric or neurologic conditions in the 6 months post a COVID-19 diagnosis. Another recent study showed 33% of hospitalized patients had persistent symptoms after discharge and 19% had worsening symptoms.⁶ Of the 66% who survived acute hospitalization, many suffered increased morbidity and inability to perform basic activities of daily living and had emotional symptoms from prolonged ICU stays.⁷

PASC is thought to occur in 10%-33% of those who are infected with COVID-19, resulting in 9 million Americans and 55 million people worldwide experiencing this syndrome. Many patients lives have been profoundly altered, making it impossible for them to regain their previous level of functioning.⁸ Wong et al⁹ have noted that patients with post-COVID have an overall 51% reduction on the Quality of Life scale. On a societal level, PASC could also stress our already beleaguered health care system.¹⁰

Complicating recovery for patients with long-haul COVID, many of these patients do not have access to a primary care provider 60 days post-discharge from the hospital.¹¹ In addition, health care can be fragmented, and there often is a lack of communication between providers and difficulty with the coordination of care. Because of the multitude of heterogeneous symptoms of PASC, these patients need a highly individualized treatment plan that requires an initial evaluation of cardiac, pulmonary, autonomic, and autoimmune status followed by a multidisciplinary rehabilitation conditioning program.⁶ These findings illustrate the need to develop better models to support COVID-19 survivors.

Physical Medicine and Rehabilitation (PM&R) physicians are uniquely suited to manage patients with post-COVID because they work through a multidisciplinary team approach and can provide ongoing support and empathy for these patients as they are accustomed to understanding and treating functional deficits and promoting independence.¹² PM&R team members can provide a safe space where a patient's concerns can be validated and addressed.

The primary source of post-COVID multidisciplinary clinics published thus far in the literature has been based in large academic medical centers with access to a broad team of specialists.¹³ However, these large academic centers only address a small minority of patients seen across the United States.¹⁴ We wish to show how we developed a multidisciplinary post-COVID clinic in a small rural community with limited resources. This could be a model for further clinics in small communities across the country.

With only 155,000 people, Mesa County is a small isolated rural Western Colorado county. The number of COVID-19 cases to date is 52,511 cases and 504 deaths.¹⁵

Family Health West hospital is a 25-bed Critical Access Hospital with a level IV trauma center in a town of 13,508 people. When the pandemic surged, we collaborated with the larger St. Mary's Hospital, in Grand Junction, to offer step-down and recovery care retrofitting 5 rooms with negative pressure vents to accommodate the patients with transitional COVID-19. In December 2020, Family Health West responded to the need to provide services to patients with post-COVID and launched a multidisciplinary “Post-COVID Recovery Clinic,” which was the only program offered in the Western half of Colorado. As of February 2023, we have treated 317 patients with post-COVID in the clinic. The physician champion to head this effort was a PM&R Specialist. This paper describes how we established our clinical approach and our experience thus far in treating patients with PASC. We will discuss the initial organization process, patient access, the team we assembled and their roles, and patient demographics. The IRB of Colorado Mesa University approved the use of deidentified large aggregate data discussed in this article.

Our small rural community PASC clinic is now part of a 40-clinic PASC collaboration network.¹⁶ This network was created by the American Academy of Physical Medicine and Rehabilitation to support each other and collaborate in treating patients with post-COVID and has been a source of education and ongoing research. We are the only clinic thus far in the network in a rural setting.

Initial Program Organization and Patient Access

The initial concept of the Family Health West Post-COVID Recovery Program was developed over an impromptu lunch where the Rehabilitation Medical Director and Associate Vice President of Business Development were discussing the growing number of COVID cases in Mesa County, Colorado, and how many patients were exhibiting lingering effects. The concept of a Post-COVID Recovery Program developed quickly due to several factors including: the unique need that was identified was not being addressed by any other health care facility in Western Colorado; Family Health West already had a robust medical team including Physical Medicine & Rehabilitation Physicians, Respiratory Therapy, Psychology, Physical Therapy, Occupational Therapy, Speech-Language Pathology, and Exercise Physiologists who were identified as critical members of a well-rounded Post-COVID program; a business proposal was developed by the Associate Vice President of Business Development and presented to the hospital Executive Team. Approval to proceed was quickly obtained and the team moved into the implementation phase. At this point, multiple departments were brought together to tackle the rapid development project including the formation of the clinical team, patient onboarding process, grant funding opportunities, marketing, and business development.

Simple patient intake

One of the primary desires in the design of the patient admission process was to enable the target patient suffering from post-COVID symptoms, to be able to sign up directly on

the hospital website through a HIPAA secure collection method. This enabled the capture of patient demographics, payer info, and clinical symptoms. Eliminating the requirement of a referral from a primary care provider allowed patients direct access to the program. Once the patient filled out the online form, the clinic front office would call and schedule their initial evaluation.

Marketing

To launch the program and build public awareness, the marketing department used several forms of traditional marketing methods including TV commercials, radio, billboards, brochures, and newspaper ads. We also included a variety of electronic methods such as social media posts and videos, display ads, and pay-per-click search engine ads. Marketing efforts also included sending information to local physicians via emails, newsletter articles, brochures, and postcards (fig 1). Because TV commercials were airing on national platforms like Hulu, we began to receive online inquiries from across the nation. The building of this nationwide awareness was then picked up by NBC Nightly News for inclusion in a national news story on March 1, 2021 “Inside ‘Post-COVID’ clinics: How Specialized centers are trying to treat long-haulers”. Local TV stations and Colorado Public Radio also ran dedicated news stories about our Post-COVID Recovery Program (supplemental appendix S1).

Funding

All funding for the Post-COVID Recovery Program was obtained through the general hospital operating funds. Our grant writing team researched several potential grants but was not able to identify any that we would be eligible for.

Demographics

A total of 317 patients have been seen in our Post-COVID-19 clinic as of February 10, 2023. Men numbered 96 and women 217, so over double the number of women were seen as shown in figure 2. Long-COVID is now established as having symptoms 12 weeks past infection date, however this was not as defined when the clinic started earlier in the pandemic. Taking patients 14 days after their initial COVID infection was the first time we would allow them access to the clinic. Despite allowing earlier access, as shown in figure 3, over half of our patients first presented to us after 12 weeks. When you break this down by sex as seen in figure 4 almost double the number of women presented after 12 weeks, while about half of the men presented before 12 weeks. The age distribution of long-COVID is interesting as the largest group with symptoms was age range 40-60 years indicating a disease more common in the middle ages rather than the young or the old (table 1 and fig 5). At the time of acceptance into the clinic, 30% were unemployed, 52% were employed, and 7% were retired (fig 6).

POST-COVID RECOVERY TEAM

We've Opened a Post-COVID Recovery Program to Address Lingering Effects of the Virus

We're proud to announce the opening of our Post-COVID Recovery Program, the first of its kind in Mesa County. This program gives patients in western Colorado access to specialized care addressing lingering effects of COVID-19.

Lingering Effects of COVID-19

Fatigue, heart palpitations, changes in lung function, muscle weakness, memory loss, concentration, brain fog, and even depression and anxiety are among the long list of lingering effects some COVID-19 survivors experience.

How We Can Help

We've learned from other diseases that the sooner patients receive services such as respiratory therapy, counseling, rehabilitation, and access to specialized physicians in neurology, psychiatry, and pain management, the outcomes are better—which means patients shouldn't ignore any physical or cognitive changes.

Phone: (970) 200-1511 | Fax: (970) 858-3211
Online Referral Form: fhwcare.org/recoveryteam

POST-COVID RECOVERY TEAM

Looking at recovery from every perspective

If you're not feeling sick, but not feeling like yourself following a COVID-19 diagnosis, you need an assessment from the Family Health West Post-COVID Recovery Team. As we learn more about the lingering effects of COVID-19, subtle changes like brain fog and muscle weakness could point to something more serious. We will assess both your cognitive and physical changes to better ensure your full recovery.

SCHEDULE YOUR POST-COVID ASSESSMENT

Family HEALTH WEST

INNOVATIVE TEAM APPROACH
 Multiple disciplines looking at all aspects of your health and caring for the whole you.

CONTACT US
 970.200.1511
 fhwcare.org/recovery

Fig 1 Post-COVID recovery team advertisements.

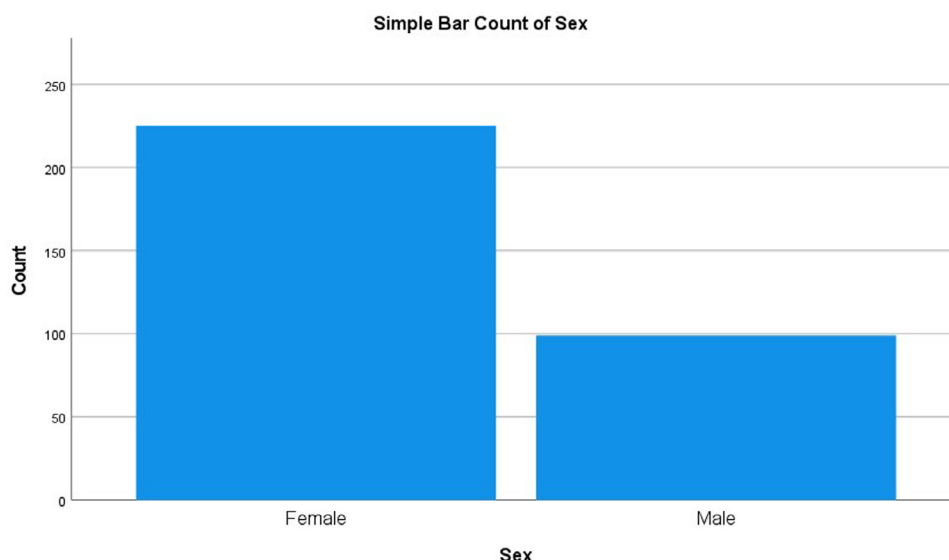


Fig 2 Bar graph of patient sex.

The Multidisciplinary team

Assembling a team to work with people suffering from PASC to make a personalized plan for their rehabilitation needs, and also using the personnel we had available in our limited resource environment, was a key process in clinic development. Our multidisciplinary approach to rehabilitation includes checking and investigating symptoms followed by an individualized treatment plan which may include fatigue management, breath retraining, pool exercise transitioning to land to treat deconditioning and dysautonomia, and psychological/behavioral support.¹⁷ A flow diagram (fig 7) is provided as an outline of the team members and their roles and is discussed further below.

Physiatrist and Nurse Practitioner

Physiatrists and nurse practitioners were leaders of the PASC team, and points of initial contact. Performing a thorough history and physical, review of the previous records, as well as documentation of the date of COVID-19 infection, exposure, and quarantine history were all initial tasks. The standardized questions we used for information gathering are listed in [Box 1](#) and include history items such as any hospitalizations, functional status, and comorbidities. Baseline Measurements performed to investigate patients' status at intake and are outlined in [Box 2](#). These include cardiovascular and neurologic assessment, and well as functional tests like a 6-minute walk test. These baseline measurements could be repeated at future visits to show progress or regression in patient abilities.

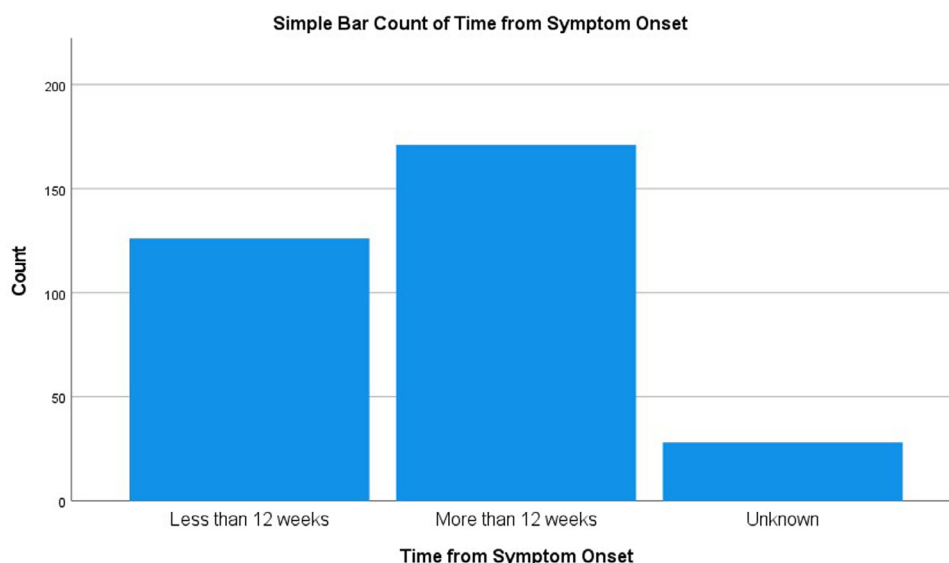


Fig 3 Bar graph of time from symptom onset.

Box 1 Post-COVID clinic questions

- If the patient was hospitalized what treatment were received and what are the results of these treatments?
- What was their functional status at discharge and how much care did they need from family or home care providers?
- What are their comorbidities such as asthma, diabetes, kidney disease, ischemic heart disease, or hypertension?
- Were they able to return to work?
- How much can they do for themselves in terms of ADL's and how has their life changed since the COVID-19 diagnosis?

Box 2 Post-COVID clinic baseline measurements

- Orthostatic evaluation-assess dysautonomic function and response to treatment
- Peak flow
- Rehabilitation needs screen:
 - Bowel, bladder, pain ADL performance, cognition, equipment needs, mobility, sleep, and skin
- Auscultation of heart and lungs
- Full neurologic assessment
 - MOCA if cognitively impaired
- 6-minute walk
- Outcome measures
 - Oswestry disability index: to assess disability and quality of life
 - PHQ-9: to monitor severity of depression and response to treatment
- Blood type
- Level of pre-COVID fitness level
- All data logged into a database to allow for future research efforts

Further workup was ordered as clinically indicated including echocardiograms, electrocardiograms, computed tomography angiograms, ventilation-perfusion tests, pulmonary function tests, nocturnal oximetry, follow-up chest x-ray, and blood tests such as C-reactive protein, sedimentation rate, B-naturetic peptide, troponin, and D-dimer. After initial investigation, these providers could design a specific rehabilitation plan and refer to other team members to execute. For long-term management, it was essential over time for communication back to the physiatrist or nurse practitioner about ongoing needs such as new symptoms or progression of symptoms prompting further workup or new treatment plans. To facilitate communication, the post-COVID team met monthly to review patient cases and manage care plans.

Therapy services

Specialists such as cardiology or pulmonology are not in practice at our rural health center, therefore our access to

therapies became an essential part of the PASC Team. Physical therapy, occupational therapy, speech therapy, and respiratory therapy were all used. Therapists used the Post-Acute COVID-19 Exercise and Rehabilitation course for training. The post-acute COVID-19 Exercise and Rehabilitation Project is coursework developed by the American Physical Therapy Association to increase practitioner proficiency in cardiovascular and pulmonary physical therapy, including critical illness sequelae.¹⁸

Physical therapy

Depending on the severity of the initial disease, the post-COVID patient can experience many barriers to participating in an active exercise program. They may have suffered viral myocarditis, post-intensive care unit- syndrome, or pulmonary compromise from pneumonia making physical exertion more difficult, or experienced cognitive slippage making it difficult to remember to attend outpatient visits.¹⁹ All of these issues present a challenge for rehabilitation. Therapy did not start until 7 days after the initial diagnosis of COVID-19, the patient was able to perform ADLs independently, and was able to walk 500 meters without excessive fatigue or breathlessness.

Using a graded exercise program with fatigue management as the primary determinant of whether to progress to the next step in therapy was essential. Short rather than long bouts of exercise, and the Borg rating of Perceived Exertion scale²⁰ helped us gauge appropriate exertion for patients. Listening attentively to patients helped to not to push them past fatigue.

If patients were orthostatic, therapists started with prone or supine therapy on a plinth and slowly progressed with tolerance to upright. Baseline heart rate, oxygen saturation, and blood pressure were monitored throughout the activity, and changes noted. Multiple options for home and in-person exercises were based on that day's energy level. Going back to step 1 if the patient was not progressing or relapsed was important for some patients, especially during their first few visits.

Occupational therapy

Assessing for visual changes, difficulty with reading, vestibular ocular reflex, and other generalized vestibular issues such as dizziness and falls was the role of occupational therapy. Return to work and activity with modification, and education on appropriate amounts of activity duration, intensity, and frequency of tasks were all part of the total care program. Educating on energy conservation and work simplification techniques for work and home was important, as fatigue was a common complaint with those suffering from PASC.

Speech therapy

Referrals to speech-language pathologists (SLPs) for "brain fog" or word-finding problems were common. Positive reporting by patients with PASC that they avoided certain foods, coughed frequently during or after meals, or if they had been intubated, lead to full dysphagia evaluation.

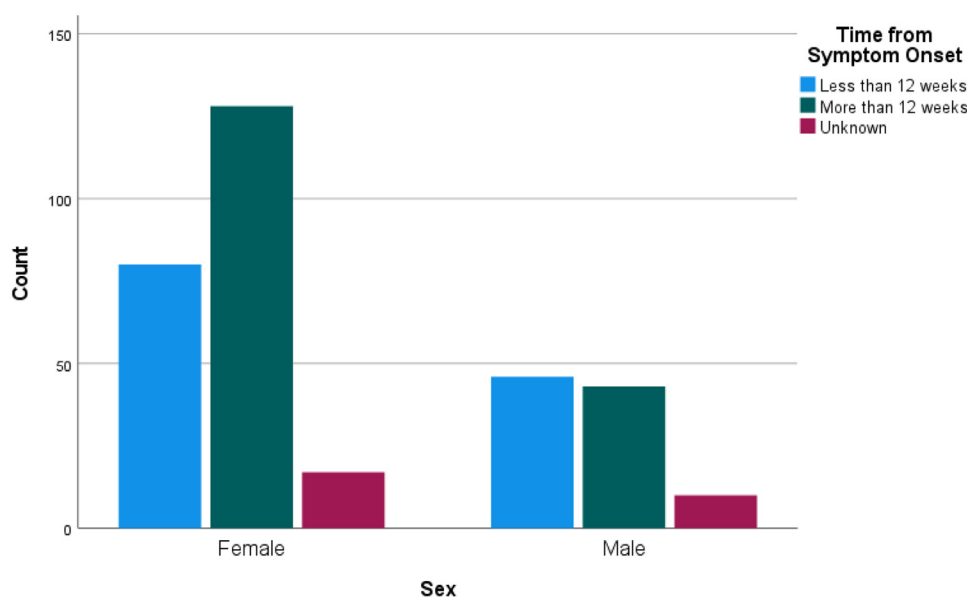


Fig 4 Bar graph of time from symptom onset per sex.

Table 1 Age of participants

Age of Participants		
Age	Count	%
20-29	15	12
30-39	15	12
40-49	37	29
50-59	28	22
60-69	13	10
70-79	15	12
80+	3	2

Symptoms of reflux were abundant, and SLPs addressed this with behavioral changes and prescription management by the physician team.

Patients with voice complaints after prolonged intubation were referred to an otolaryngologist to examine for physical etiologies and SLPs provided voice therapy as needed. Breathing strategies were used to assist with hoarse or weak vocal quality and vocal fatigue.

Because “brain fog” was a common PASC complaint, SLPs assessed domains often associated with brain injury or stroke. Commonly reported problems involved attention, memory, word-finding, sentence formation, slow language processing speed affecting expression and comprehension, and occasionally phonemic paraphasias.

The standardized metric used by our SLPs for a relatively quick severity rating was the Repeatable Battery for the Assessment of Neuropsychological Status. To measure patient-reported problems with sustained attention, decision-making, and processing speed that occur in complex daily environments, subtests of the Functional Assessment of Verbal Reasoning and Executive Strategies were employed.

Patients with “brain fog” were taught coping strategies such as anticipating the mental energy required to complete tasks, scheduling breaks to reset, minimizing interruptions, and subdividing complex tasks. To help them acquire the

cognitive stamina to resume work responsibilities, SLPs simulated work activities with increasing attention demands, complexity, and duration. Patients created external aids such as a written protocol for more complex tasks. To assist with prospective memory, they practiced strategies represented by the widely used acronym, WRAP: write it, repeat it, associate it, picture it.

Respiratory therapy

Respiratory therapy performed a thorough history of pre-existing conditions including current or past medical history of asthma, chronic obstructive pulmonary disease, a significant smoking history, or sleep apnea, as these patients were at higher risk for lung problems.

Inflammation from acute infection with COVID-19 for patients with asthma can trigger prolonged recovery depending on the severity of the asthma symptoms²¹ and treatment includes medications, airway clearance, and monitoring peak flow daily.²²

Patients with chronic obstructive pulmonary disease are at an increased risk for severe COVID-19²³ and routine care with their controller medications was continued, while counselling for smoking cessation and continued social distancing was performed.²⁴ Additional airway clearance equipment used included inspiratory and expiratory trainers, chest physiotherapy, and positive airway pressure therapy.²⁵ Oxygen saturations were monitored routinely in house and with the patient at home. A drop of 3% prompted further assessment, while a drop of 4% or more made us consider hospitalization.²⁶

Nocturnal hypoxemia was common, and risk factors for this were chronic lung, liver, or kidney disease, current and former smokers, hypertension, cancer, asthma, diabetes mellitus, obesity, and HIV infection.²⁷ We would screen those with risk factors with a nocturnal pulse oximetry study.

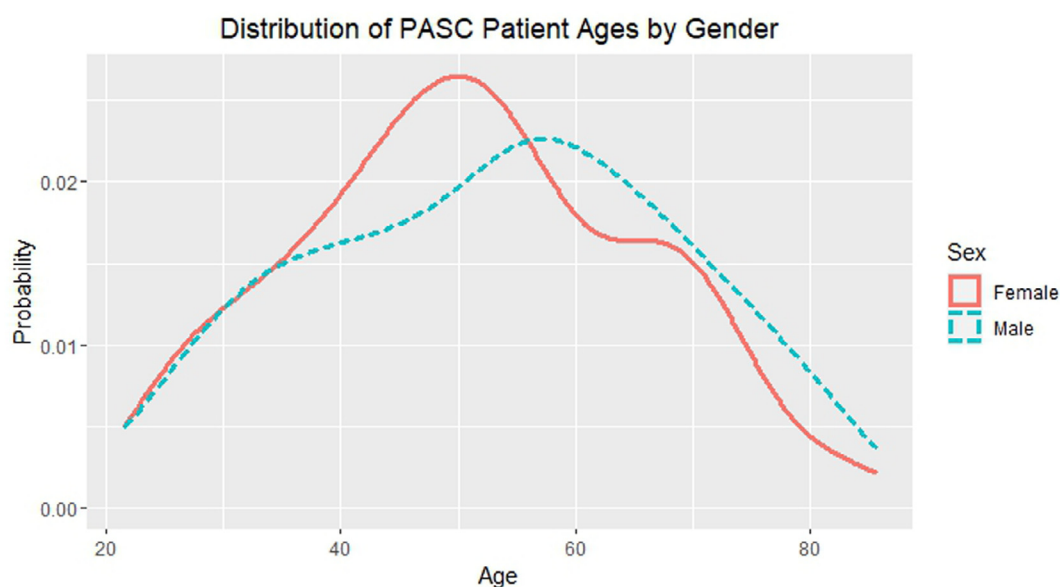


Fig 5 Distribution of PASC by sex.

Evaluating for possible sleep apnea was also important as this can make it difficult to recover and can complicate the treatment for post-COVID.²⁸

For patients who had symptoms of dyspnea, we would screen with a D-dimer to detect thrombosis (Li, 2020) and evaluate lung function with pulmonary function testing. We noted similar findings to that in the literature such as decreased pulmonary diffusing capacity, impaired total lung capacity, and residual volume.²⁹ The cause for the impairment may be attributed to muscle impairment,

physical deconditioning, or decreasing in the peripheral muscle mass.

Behavioral health

The psychological effect of this pandemic has been devastating for many, both at a societal level, as well as for an individual with PASC. Behavioral health was an important key to our post-COVID-19 clinic. Patients are often devastated financially after

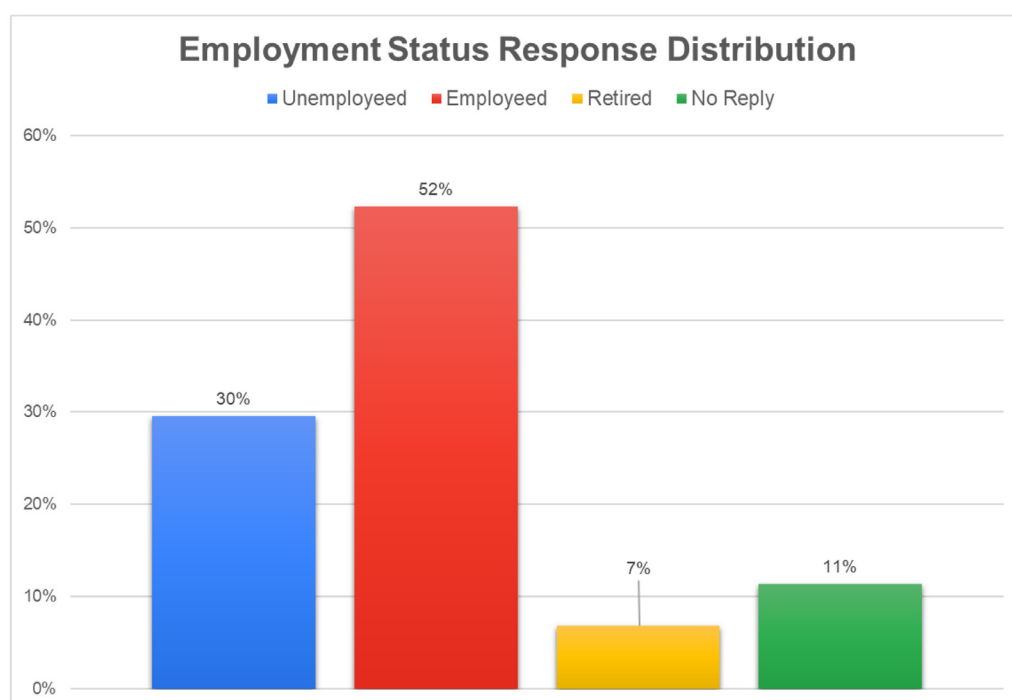


Fig 6 Bar graph of employment status.

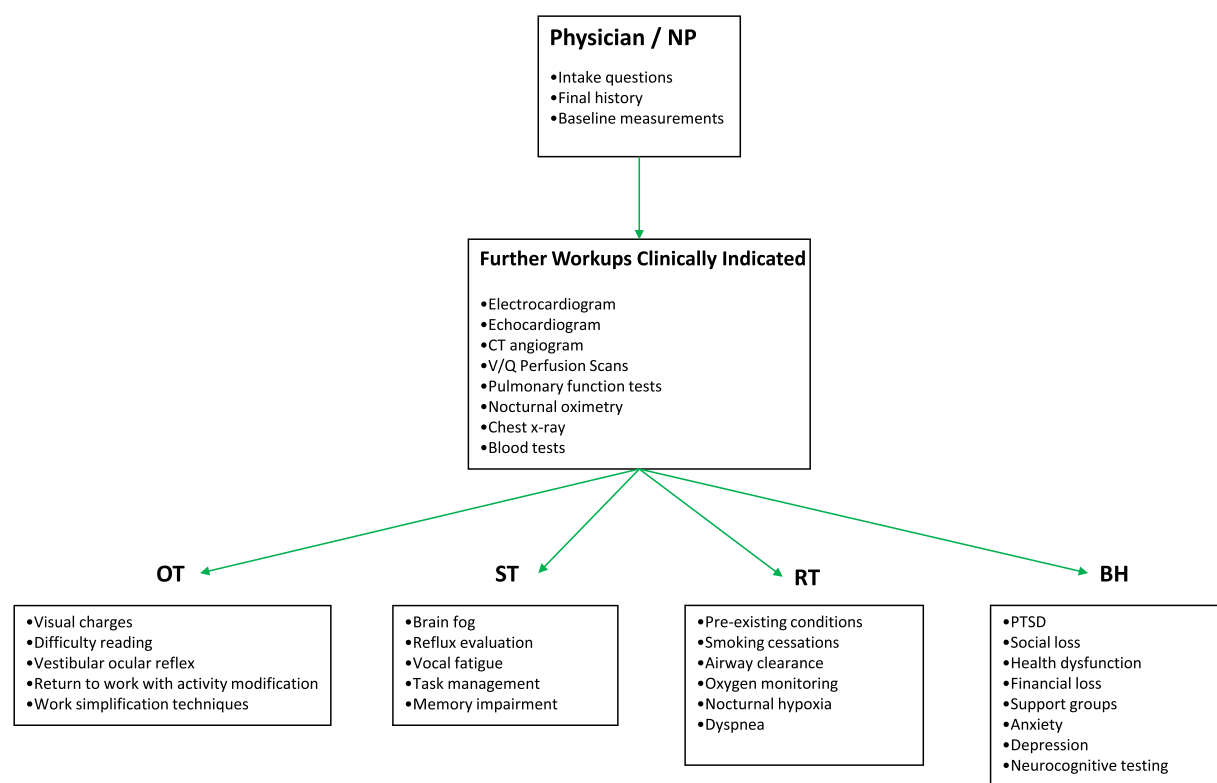


Fig 7 Flow diagram of team distribution.

acute hospitalization and from job losses. Patients also have post-traumatic stress disorder from the daily barrage of news and fear of contracting and potentially dying from the effects of the virus. To facilitate recovery from these issues, Family Health West's psychologist hosted a virtual post-COVID support group that met once a month, and as pandemic restrictions decreased; this transitioned to an in-person group. Invitation to the group was offered by health care providers on the team, and was open to patients and family members at no cost. Topics addressed included recovery and long-term adjustments to the lingering medical complications associated with COVID-19 including cognitive changes, and mood and emotional difficulties. In addition, we address the psychosocial effect of quarantine, losses, life changes, social isolation, and altered life circumstances that have been prevalent during the pandemic.

Our psychologist was also available to provide treatment to individuals suffering residual mental health difficulties in a one-on-one therapy setting. When indicated, neurocognitive testing for persons who have experienced cognitive changes

referred to as "brain fog" was performed to help identify deficits to guide individualized treatment plans.

Discussion

How many patients with PASC were referred to each therapy team is described in [table 2](#). Speech therapy and respiratory therapy were the most common referrals. We experienced 34% of men and 47% of women referred to speech therapy, and 41% of men and 36% of women referred to respiratory therapy. For rural towns to set up their own post-COVID clinic, these would be the most used ancillary services.

Conclusion

Our PASC clinic has operated in a rural resource-poor environment, including a lack of specialists, such as pulmonology or cardiology. In addition, we were able to operate this clinic without any outside funding source. By using the resources we had available to us in a small town, we were able to set up a care clinic for patients with long-COVID not only locally, but also regionally as we attracted not only patients from Western Colorado, but also surrounding states. Many small communities across the United States can easily access this model with the resources they already have to care for those in their communities.

While the future of patients with COVID and long-COVID is still unclear, these patients exist in our communities now. Small clinics such as this one could be set up, and potentially

Table 2 Therapy referrals

Service	Men	Women
None	23	25
Physical therapy	23	66
Occupational therapy	4	8
Speech therapy	33	101
Respiratory therapy	39	79
Medications prescribed	44	115

have further support from national networks and collaborations giving specialized care access to underserved communities. If more small clinics were available across the United States, the medical community would be better situated to help PASC sufferers. The outlined processes should be able to guide those in a non-academic setting to use the resources they have to help patients with PASC in their catchment area.

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