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COVID-19 FEATURE ARTICLE

Applying Telehealth Technologies and Strategies to Provide Acute Care Consultation and Treatment of Patients With Confirmed or Possible COVID-19

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ABSTRACT

Background and Purpose: The COVID-19 pandemic continues to grow, with 19% of total confirmed patients classified as severe or critical experiencing complications such as dyspnea, hypoxia, acute respiratory distress syndrome, or multiorgan failure. These complications require rehabilitative care. Considering the contagious nature of COVID-19 and the necessity to decrease the volume of health care professionals entering confirmed COVID-19 patient rooms and becoming a potential disease vector, can audiovisual technologies employed by telehealth and telerehabilitation help?

Case Description: This case discusses the Baylor Scott and White Institute for Rehab (BSWIR) Physical Medicine and Rehabilitation (PMR) department COVID-19 acute care therapy team's creation of a telehealth strategy to provide early rehabilitative intervention without increasing the odds of disease transmission.

Outcomes: The COVID-19 therapy team created a simple process for identifying and triaging care for patients with possible or confirmed COVID-19. These patients were evaluated and treated by the dedicated team using telehealth strategies. A structured risk-benefit analysis was used to determine when in-room care was indicated.

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Discussion: Acute care physical therapy, occupational therapy, and speech-language pathology telehealth strategies can add value by mitigating COVID-19–related harm and influencing recovery, while not unnecessarily becoming additional disease vectors consuming personal protective equipment. COVID-19 is not only an aggressive respiratory illness similar to acute respiratory distress syndrome but also highly contagious and a risk for health care providers. Telehealth strategies allow therapists to intervene early, opening the possibility to maximize recovery and prevent harm or decompensation. Telehealth strategies can be more prevention-focused while the patient is experiencing relatively good health with goals to maximize strength and endurance before the disease process evolves to critical illness. As COVID-19 progresses, therapy can help mitigate potential complications associated with prolonged intensive care unit stay and ventilator management.

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On December 31, 2019, the World Health Organization (WHO) was informed of cases of pneumonia with unknown etiology detected in Wuhan City, China.[1] By March 11, 2020, the WHO declared the coronavirus disease 2019 (COVID-19) a pandemic.[2] As of April 15, 2020, the Center for Systems Science and Engineering at Johns Hopkins University reported a total of 2 034 425 confirmed cases and 133 261 total deaths.[3] Health care professionals are at risk of hospital-associated transmission.[4]

According to a Chinese Center for Disease Control and Prevention report of 44 672 confirmed COVID-19 cases, 19% (8255) of the cases were classified as severe (dyspnea, hypoxia, and lung involvement) or critical (acute respiratory distress syndrome [ARDS], septic shock, multiple-organ dysfunction or failure), with a case fatality of 2.3% (1023).[5] In addition, COVID-19 survivors have been observed to stay in the hospital for a median of 28 days.[4] The significant pandemic spread along with disease duration and severity can tax hospital resources. COVID-19 projections in the United States estimate a peak of 58 831 total hospital beds needed, which is 3498 short of national capacity.[6]

COVID-19 ACUTE REHABILITATION NEEDS

COVID-19 primarily affects the pulmonary system, resulting in decreased functional endurance, inadequate airway clearance, and dyscoordinated breathing.[7,8] As the disease progresses in severity, the cardiac musculature is secondarily affected, closely followed by systemic inflammation and multiorgan system failure.[7,8] More severe cases can escalate to requiring hospital or potentially intensive care unit (ICU)–level care, a higher risk for nosocomial complications, including acquired weakness via critical illness polymyopathies and neuropathies.[9,10] The most vulnerable populations for severe clinical manifestations of COVID-19 are those already at risk for iatrogenic complications—the geriatric population and those with preexisting comorbidities including cardiovascular or pulmonary disease, diabetes mellitus, cancer, and other autoimmune suppressing conditions.[7]

These system impairments have corollary effects on the physical and cognitive skills required for activities of daily living (ADL) completion.[11] The long-term cognitive changes after COVID-19 recovery are unknown; executive dysfunction, short-term memory loss, depression, and anxiety have been established as part of the long-term sequelae in patients who have survived ARDS.[12,13] In addition, patients with critical illness and an ICU stay are at an increased risk for the development of delirium, creating both cognitive and behavioral changes that impact occupational participation.

Many patients, especially those with compromised respiratory status or requiring invasive respiratory support during the critical phase of their disease, are at an increased risk for dysphagia.[14] Dysphagia is a complex disorder frequently associated with a variety of medical diagnoses, interventions, and an increased risk of mortality.[15] Dysphagia in a patient population with underlying lung disease is a significant health risk and requires specially trained speech pathologists to collaborate with the medical team for best management. COVID-19 can also be a co-occurring diagnosis with other major medical diagnoses, such as acute or chronic stroke, traumatic brain injury, head and neck cancer, and various other cardiopulmonary diseases, for which dysphagia is a risk.

To address these comprehensive sequelae, the WHO recommends multidisciplinary collaboration to address multimorbidity and functional decline with a person-centered assessment.[16] Acute care physical therapists (PTs), occupational therapists (OTs), and

speech-language pathologists (SLPs) typically provide these assessments and interventions to mitigate functional decline during acute illness and design treatment plans and recommendations to expedite recovery.[11,15,17] Considering the contagious nature of COVID-19 and the necessity to decrease the volume of health care professionals entering confirmed COVID-19 patient rooms and becoming a potential disease vector, can telehealth technologies employed by telehealth and telerehabilitation help?

TELEHEALTH HISTORY AND STRATEGIES

COVID-19 has changed the landscape of telehealth and rehabilitation services with communication technology-based PT, OT, and SLP services in acute care practice. Fauci and colleagues[18] discussed the global pandemic with its sobering realities as navigating the uncharted in our health care system. The Health Resources & Services Administration defined telehealth as the use of electronic information and telecommunication technologies to support long-distance clinical health care, patient and professional health-related education, public health, and health administration. Technologies include videoconferencing, the Internet, store-and-forward imaging, streaming media, and terrestrial and wireless communications.[19] Telerehabilitation refers to the delivery of rehabilitation and habilitation services via information and communication technologies, also commonly referred to as telehealth technologies.[20] Telerehabilitation is primarily applied to PT and OT services via telehealth, while "telepractice" is the term applied for telehealth SLP services.[20]

The concept of telehealth in the United States was first introduced in the 1924 issue of Radio News, with the first recorded use of telehealth taking place in 1959.[21,22] By the 1960s, the National Aeronautics and Space Administration established a telehealth program to monitor its astronauts as well as assist in international disaster emergency relief efforts. More recently, US federal programs including the Veterans Health Administration and the Indian Health Services have led the telehealth use in the digital age.[22]

Telehealth was first mentioned as "virtual care" and seen as an opportunity for the PT profession to collaborate with other health care professionals and systems.[23] The APTA defines telehealth as the use of secure electronic communications to provide and deliver a host of health-related information and health care services, including, but not limited to, PT-related information and services for patients and clients.[24] In practice, telecommunication technology delivering real-time interactive audio- and videoconferencing between providers and patients in different locations is described as synchronous telehealth.

Key considerations for telehealth in acute care for cardiovascular and stroke management noted early benefits for telehealth providers and users; however, barriers to access to telehealth services persist.[25] During this COVID-19 crisis, the federal and state payer guidelines, regulatory hurdles, and patient privacy barriers in the US health care system have been loosened but it still requires permanent fixes in nonemergent situations. For example, Keesara and colleagues[26] recommended expansion of telehealth broadly to include digital tools beyond interactive audio and video that may provide necessary additional services, including the use of phones in various settings. In addition, principles for delivering telerehabilitation services should include evaluation, assessment, monitoring, prevention, intervention, supervision, education, consultation, and coaching.[20] However, these recommendations still require evidence in the acute care environment to become a sustainable practice. In this case report, telehealth in acute care practice is explored with additional opportunities for interprofessional collaboration, improved access to care, and safe delivery of services in a single health care system. The key lessons from this innovative approach to patient and client management in an acute care setting during COVID-19 may encourage future practitioners to consider using telehealth strategies as a means of rehabilitation delivery for PT practice in the digital age.

CASE DESCRIPTION

Setting

The Baylor Scott and White Institute for Rehab (BSWIR) Physical Medicine and Rehabilitation (PMR) department has 117 employees, including 27 full-time PTs, 3 full-time PT assistants, 21 full-time OTs, and 10 full-time SLPs. The BSWIR PMR program operates primarily in the 1025-bed acute care facility in Dallas, Texas.

Creating a COVID Team

On March 13, 2020, the BSWIR PMR department implemented its first general COVID-19 response plan and trialed a synchronous audiovisual evaluation on March 27, 2020. The department leadership team created a dedicated COVID-19 response group on March 28, 2020, to serve as content experts and formalize all COVID-19–related processes. The COVID-19 team consisted of 11 PTs, 7 OTs, 2 SLPs, and PMR director and manager. The COVID-19 team's responsibilities were to serve as COVID-19 disease process and therapy intervention experts, create COVID-19–specific patient information, and implement formal triaging and scheduling for all confirmed and possible COVID-19 case evaluation

and treatment. In addition, the team was charged with designing and implementing telehealth strategies to provide care for confirmed and possible COVID-19 cases without entering the room when indicated.

COVID Team Telehealth Strategy Development

The epidemiological consensus was to limit the number of proximity contacts with confirmed COVID-19 cases and those identified as persons under investigation (PUIs).[27] To limit becoming additional disease vectors when not needed and to preserve personal protective equipment (PPE), initial health care in-room providers were limited to a physician, a nurse, and a respiratory therapist. The nature of PT, OT, and SLP practices deems it necessary to be in very close contact with most patients to ensure safety, proper technique, and in-time correction to optimize function, making direct consultations challenging. Using audiovisual methods to evaluate and treat provided a safe option for interacting with these patients and became the approach for each initial evaluation.

To avoid delayed therapy evaluation and care, the COVID-19 team created a novel virtual care strategy using telehealth strategies and technologies. Each morning, the assigned schedulers accessed the electronic medical record for all confirmed COVID-19 cases and PUIs with therapy referrals. These patients were triaged to the COVID-19 team member list for telehealth initial evaluation or "direct contact." The assigned team member for the telehealth evaluation then initiates contact with the bedside registered nurse (RN) to schedule a telehealth evaluation visit.

The initial evaluation with confirmed COVID-19 patients was completed on an Apple iPad, iPad Air 2, or sixth-generation iPad with the use of the Microsoft Teams application. Occasionally, telehealth evaluations and treatments were completed via a standard hospital room telephone in a room that had access windows for viewing of the patient completing tasks. The therapist used the Microsoft Teams application via a Health Insurance Portability and Accountability Act–compliant hospital-provided laptop to complete these evaluations and treatments. As long as the patient was deemed able to participate via the telehealth system, therapists would continue with daily follow-up care. RNs were a vital part of the process as they were an extension of therapy services in the room. RN roles included environmental setup, assistance with setup, and placement of the iPad device and/or telephone for patients who did not have access to the iPad device. RNs also provided supervision or minimal assistance for physical tasks that the patient was asked to perform, including therapeutic exercise, bed mobility, transfers, basic ambulation with and without a device, ADL, and swallowing. The role of the RN during mobility, ADL, and swallowing was kept to that of a therapy technician to maintain safety, licensure, and scope of practice limitations. For more complex cases, or those requiring additional hands-on PT, OT, or SLP intervention, the session was concluded safely, and a request for direct contact risk-benefit analysis was initiated. Many of the patients treated for COVID-19 did not require continued inpatient therapy services and were able to remain mobile until discharge. Telehealth was also used to facilitate mobility, education, and activity modification for the RN staff to assist this population of patients with continued mobility and activity.

The rationale for determining direct contact care varied on the basis of individual patient needs, as described in Figure 1. The general criteria included discharge planning concerns (homeless, post–acute care discharge barriers due to COVID-19 status), cognitive impairment (delirium, dementia), and increased physical burden to the staff (significant physical assistance and time required for mobility and ADL). An alert and oriented patient, following commands and mobilizing in the room with RN assistance, benefited from the telehealth-delivered guidance of prescribed exercise progression and functional mobility training to improve strength and endurance. In some cases, a hybrid approach blending telehealth strategies and in-room care was used.

The 3-tiered system in Figure 2 describes specific populations and case-based scenarios when a telehealth medium was inappropriate and when telehealth-only or a mixed-delivery hybrid system was indicated. Tier 1 encompassed patients with significant cognitive impairment, severe physical impairment, or weakness who would not benefit from telehealth therapy services. Specific diagnoses were identified that would be less likely to benefit from telehealth solely, such as acute or chronic neurological dysfunction, orthopedic surgical procedures, and severe deconditioning related to prolonged immobilization. The second tier was for those who were able to tolerate a mixed approach of telehealth and in-room care but had common diagnoses treated by therapy services and required long-term management such as congestive heart failure exacerbation, chronic obstructive pulmonary disorder, or myocardial infarction. The third tier was for those who had milder medical conditions but may have had more complicated discharge needs that would require more than telehealth could provide.

Risk-Benefit of Shifting to in Isolation Room Care

Each step in the process required a risk-benefit analysis to triage patients deemed appropriate for in-room therapy intervention (see Figure 2). The non–critical

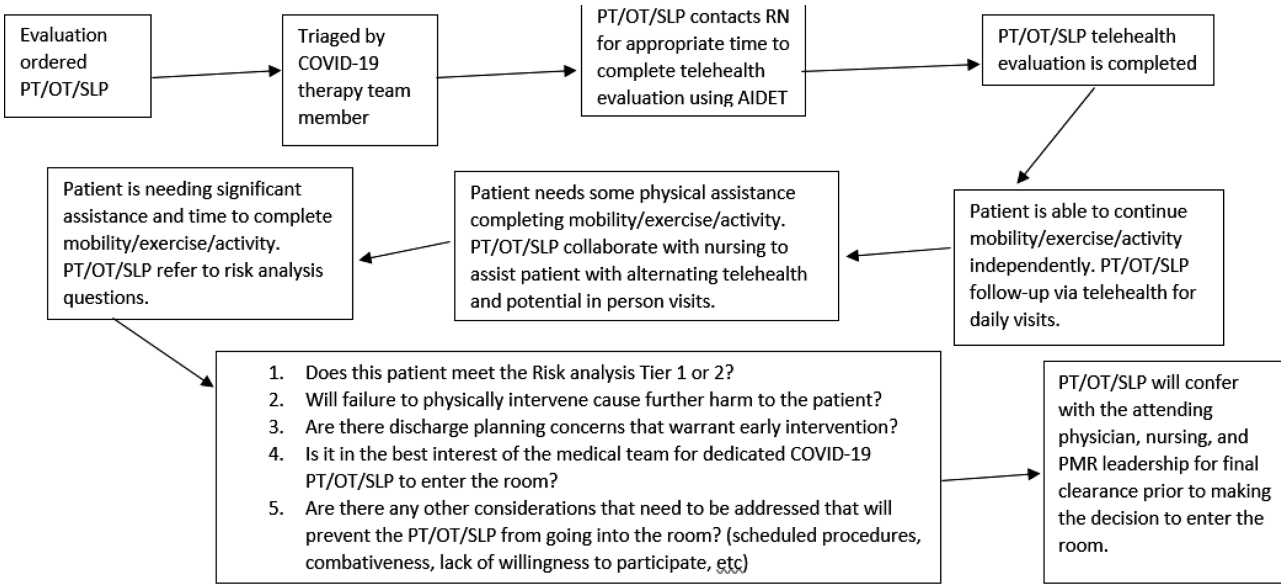

FIGURE 1. COVID-19 consultation process flow. PT indicates physical therapist; OT, occupational therapist; SLP, speech-language therapist.

care patients were discussed with a provider to ensure that the full risk-benefit was addressed prior to the PT and the OT engaging in direct patient care. In the critical care unit, a member of the COVID therapy team either attended medical rounds or communicated with providers/advanced practice practitioners on the risk versus benefit of engaging in-room therapy. Once a patient was identified as appropriate for skilled intervention, including but not limited to an assessment of cognitive status, laboratory values, and ventilation

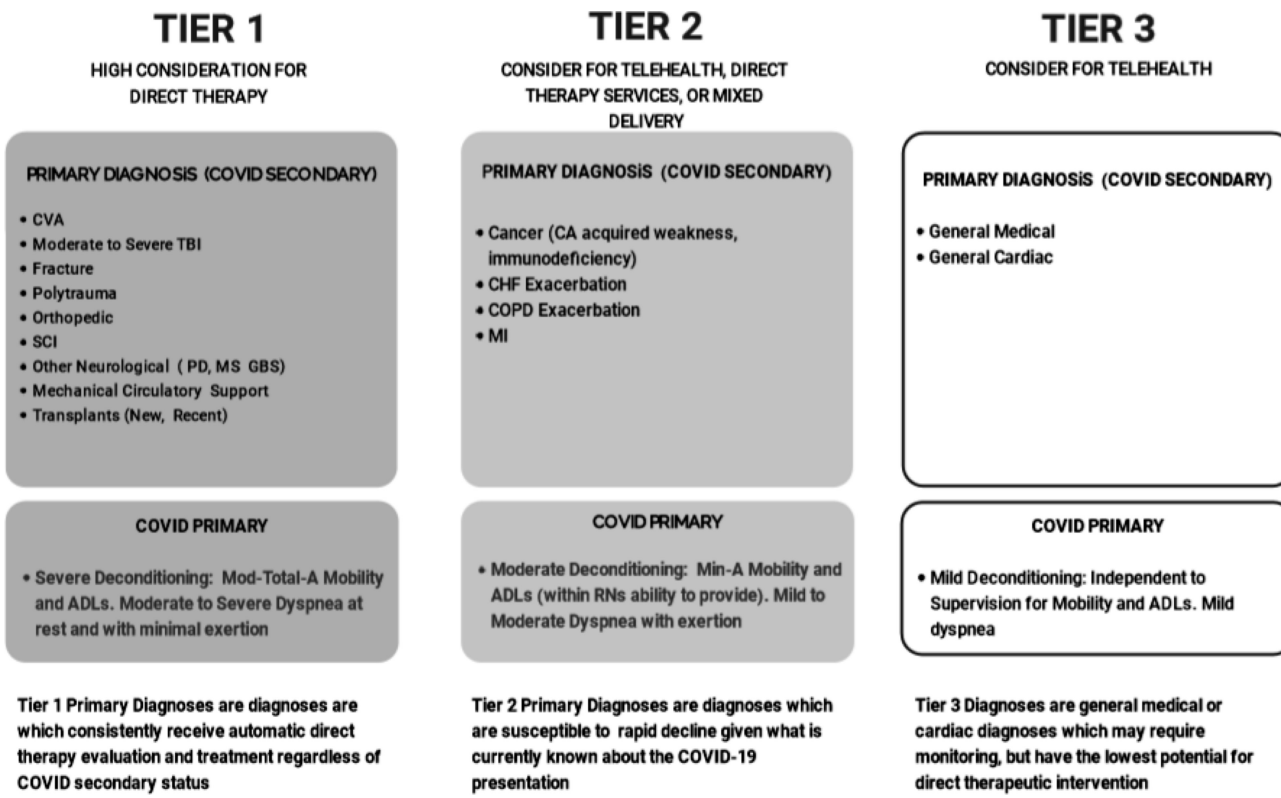

FIGURE 2. COVID-19 telehealth and in-room tiers. CVA indicates cardiovascular accident; TBI, traumatic brain injury; SCI, spinal cord injury; PD, Parkinson disease; MS, multiple sclerosis; GBS, Guillian Barre syndrome; ADL, activities of daily living; CA, cancer; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease.

requirements, the bedside nurse was engaged. The initial telehealth therapy team consisted of 2 PTs, 2 OTs, and 1 SLP. The goal was to create continuity and consistency with the process. As the process became streamlined, other members of the COVID-19 therapy team were instructed and mentored in the process before completing a telehealth evaluation independently. On the basis of the success of the initial telehealth evaluation, patients were further triaged into continued daily telehealth visits, hybrid therapy using telehealth, or transitioned to direct contact intervention.

Direct contact intervention required a dedicated check-and-balance system. Each patient who was identified as a potential direct contact required a conversation with the assigned triaging therapist. An efficient set of 5 questions was developed, and each patient was required to meet 3 of 5 criteria to ensure that the benefit for direct contact outweighed the risk. The triaging therapist then communicated with the medical team (provider, charge nurse, and nurse manager) for collaboration on the case and to have a final discussion to ensure that direct patient contact was indeed the correct choice.

To limit potential vectors for the continued spread of COVID-19, those who entered the room for direct contact were considered dedicated confirmed COVID-19 and PUI treating therapists and required to bundle their treatments with non–COVID-19-related daily patient care. These therapists treated their non–COVID-19 patients in the morning and reserved the afternoon for treatment of COVID-19 and PUIs. As the caseload increased, therapists were able to see only COVID-19 and PUIs. The dedicated COVID-19 therapists were removed from any treatment of immunocompromised patients. Delayed care in those PUIs who were at higher risk and pending the confirmed negative was also employed to further decrease the risk of spreading COVID-19.

The time required to complete a direct contact evaluation was extensive, including a prolonged and intricate process for donning and doffing PPE. That time allotment was considered when determining the caseload for a therapist doing direct contact care. The desired caseload for direct contact was 6 to 7 patients. After meeting the caseload threshold, an additional direct contact therapist was added. While specific time limits were not provided, the goal was to limit direct contact time to 45 minutes. While in the isolation room, the therapist provided assistance to nursing with tasks that were within the scope of practice. These additional tasks helped protect our RN colleagues from increased exposure risk. Therapists also assisted via co-treatments conducted by another discipline in the room or via telehealth, allowing for additional skilled assessment to occur for the benefit of the patient. Other obstacles in providing direct patient care included coordination with the nursing staff, time spent engaging providers for the risk-benefit analysis, as well as the medical stability of the patients, which was subject to change daily.

OUTCOMES

The initial week of telehealth included challenges related to scheduling, coordination of care, patient availability, and therapist scheduling flow. The day started with initiating contact with the bedside RN, which required multiple phone calls to schedule successfully. These calls also involved scheduling an appropriate time for the patient coinciding with RN availability to assist the patient with setting up the telehealth medium and completing tasks required by the evaluating therapist. Some barriers included RN availability, patient availability, willingness to participate, and increased physical, physiological, or environmental demand for completing the telehealth evaluation. Increased physical demands were classified as needing the assistance of more than 1 health care provider to complete a task or needing increased physical time to complete a task. Increased physiological demands were classified as patients having poor activity tolerance for minimal functional activity quantified by desaturation or abnormally elevated heart rate.

Navigating the new telehealth communication strategies and providing instructions via an audiovisual medium to both a patient and an RN required practice. The RN and therapists quickly completed a needs assessment and telehealth process analysis and modified processes in real time. By week 2, telehealth ran efficiently and with RN staff acceptance on the benefit to both the patient and the medical team. The most common interventions completed via telehealth included bed mobility, transfers, ambulation, swallowing evaluations and diet plan initiation, grooming, dressing, motor coordination, toileting, self-feeding, functional cognition (home safety evaluation), and adaptive and ambulatory equipment instruction (see the Table).

PT Telehealth Strategies

PT intervention is known to be safe and effective in the acute and critical care settings, with early mobility currently accepted as best practice in order to decrease the likelihood of further complications, including secondary infections, deconditioning, weakness, and morbidity/mortality while improving functional capacity and potentially assisting with ventilator liberation.[9,28] Because the clinical course of COVID-19 can quickly progress and have a prolonged and complicated course, incorporating skilled,

TABLE. Rehabilitation Therapy COVID-19 Focuses

Rehabilitation therapy COVID-19 focuses	Maximize recovery and prevent harm or decompensation. Prevention-focused intervention while the patient is experiencing relatively good health and rehabilitative in severe cases of ARDS and decompensation.
Physical therapy—Early and continued mobility, activity prescription, strengthening, endurance, positioning, home exercise program—hospital and home	Identify mobility deficits and barriers, and barriers to safe discharge home Educate patients on exercises and activity prescription to address deficits and maintain baseline function. Collaborate with nursing on mobility and therapeutic exercise interventions to progress and maintain mobility to help facilitate safe discharge home.
Occupational therapy—ADL, activity prescription, energy conservation, and dyspnea, psychosocial stress and health, delirium, occupation, and identity	Identify ADL deficits, barriers to ADL completion, and barriers to safe discharge home. Educate patients on exercises and activity prescription to address deficits and maintain baseline function. Collaborate with nursing on mobility and therapeutic exercise interventions to progress and maintain mobility to help facilitate safe discharge home.
Speech language pathology—Many COVID-19 patients, especially those requiring invasive respiratory support, are at an increased risk for dysphagia	Dysphagia with underlying lung disease is a significant health risk and requires SLPs to collaborate with the medical team. COVID-19 with other major diagnoses, such as TBI and stoke, for which speech, language, and cognitive interventions are required. Interventions and testing options—Swallow evaluation and treatment, PMV evaluation and treatment, speech/language/cognitive evaluation and treatment, when to (not) offer MBSS (dysphagiagram) and FEES.

ADL, activities of daily living; ARDS, adult respiratory distress syndrome; FEES, fiber-optic endoscopic evaluation of swallowing; MBSS, modified barium swallow study; PMV, Passy Muir Valve; SLP, speech-language pathologist; TBI, traumatic brain injury.

acute mobilization techniques in a safe, appropriate, and efficient manner can prevent further severity of disease and ensure the return to the patient's highest level of function. Confirmed COVID-19 patients demonstrated dyspnea on exertion and, in extreme cases, at rest, muscle weakness related to decreased oxygen uptake in the muscles and decreased activity tolerance. PT interventions focused on proximal muscular strengthening, endurance, and positioning for proper breathing. The activity prescription for this patient population was based on physiological factors of ventilation and cardiovascular function such as longer duration for the session to allow for recovery and daily frequency to allow for appropriate training effect. Heart rate response to activity was monitored and activity was adjusted as needed for those with an abnormal response. This was an indication of their level of deconditioning. Many of these patients were also on β-blockers, so when able, the Modified Borg Scale was used as an assessment of perceived exertion. The use of biofeedback was incorporated using oxygen saturation measurements in those with severe respiratory dysfunction. PTs used the Modified Borg Scale for education on perceived dyspnea with activity for the patient to use with supervised graded activity and for self-assessment when completing the home exercise programs. PTs also focused on maximizing patients' independence with gross motor function and movement, prevention of further deconditioning related to the perceived need for immobility, and assessment for any barriers to discharge that the medical team needed to consider. PTs and OTs completed telehealth and in-room co-assessments and treatments as needed not only for the safety of the patient and the therapist but also to limit the burden on those patients who did not yet have the functional reserve to complete 2 separate sessions. Following each session, the PT debriefed with the RN on safe mobility and activities for patients to complete on their own or with RN assistance. PTs continue to investigate new telehealth

strategy-enabled interventions such as the feasibility of instructing on positioning and self-proning when beneficial.[29]

OT Telehealth Strategies

OTs addressed physical and functional cognitive impairments to baseline ADL function, as well as provided interventions to help mitigate the concomitant psychosocial stressors, which impact mental health and well-being.[11] Some examples include journaling, written letters to family and friends, and adaptive activities to add in return to activity. Dyspnea severity as a result of respiratory distress or respiratory failure impacted the position in which ADL were performed, the ability to meet the task-specific exertional requirements, the ability to perform the functional mobility required to navigate the home environment, and eventually community environment. Each discipline considered the following factors when assessing for dyspnea in this patient population including laboratory results, vital signs, imaging (x-ray imaging and computed tomography), and supplemental oxygen requirements.[30,31] This understanding impacted treatment design and patient prioritization of patients in recovery from respiratory failure and those at risk for respiratory failure. OT interventions to address the dyspnea and respiratory fatigue associated with COVID-19 presentation were analogous to those implemented with other respiratory disorders, with emphasis on incorporating breathing and energy conservation strategies during ADL and instrumental activities of daily living (IADL) subtasks and work simplification modifications to task performance.

OTs, in collaboration with SLPs, addressed these functional cognitive changes with techniques such as modification of ADL and IADL subtask sequencing, organization and problem-solving strategies, and metacognitive strategies to increase insight and emergent anticipatory awareness.

Isolated patients are often undergoing first-time critical illness, socially isolated from their primary social groups, in specialized isolation or infection control rooms, and working with staff who are limiting their frequency of direct patient care to reduce the potential for being a disease vector.[11] In addition, because of the social distancing and shelter-in-place orders by local and state municipalities, patients, along with members of their communities, are undergoing occupational deprivation or an inability to engage in essential and preferred occupations due to external factors.[32] The novelty of this illness is compounded by occupational disruption, or temporary loss of essential and meaningful occupations, superimposed on their existing occupational deprivation.[32] OTs provided psychosocial intervention for this loss of their occupational roles and routines and its effects on mental health and well-being.[11]

SLP Telehealth Strategies

The SLP focused on the evaluation and management of dysphagia in addition to speech, language, and cognitive needs. Telehealth has proven to be an effective modality for evaluation and treatment of dysphagia.[33] Despite the value in telehealth for evaluation and treatment of dysphagia, most acute care hospitals do not use this intervention delivery model. After review of the literature and acknowledging the difficult situation for the medical team to manage a patient with concern for dysphagia without standard access to speech pathology services, telehealth swallow evaluations and intervention were initiated. The risk of aerosolizing that occurs with dysphagia assessment was mitigated with the telehealth delivery model and allowed patients to continue to receive the speech pathology services they needed while also being responsible for staff exposure, limiting virus transition risk, and PPE conservation. For confirmed COVID-19 and select PUIs, SLPs completed telehealth swallow evaluations using standardized protocols, including the Mann Assessment of Swallowing Abilities, Functional Oral Intake Scale, and patient-reported outcomes. The SLP was assisted as needed by an in-room PT, OT, or RN.

DISCUSSION

Employing telehealth strategies to provide early and continued care for patients with possible or confirmed COVID-19 has proven simple and effective. After the clinical team identified all possible and confirmed cases with therapy consultations, the COVID-19 therapy team oversaw all care using the established process. A consistent process followed by a dedicated group allowed consistency, which lends to efficiency. COVID-19 is not only an aggressive respiratory illness similar to ARDS but also highly contagious and a risk for health care providers. It is commonly associated with pneumonia and moderate respiratory distress classified by respiratory rate of 30 or less bpm, Pao_2/Fio_2 (fraction of inspired oxygen) ratio less than 300, and/or lung infiltrates of more than 50% within 24 to 48 hours. In most severe cases, this virus has been associated with septic shock and multiorgan failure.[34] Therapists commonly treat patients with these underlying medical characteristics with positioning, breathing techniques, therapeutic exercise, activity modification, and functional mobility training. These are the same tools used to treat patients with COVID-19. Using audiovisual technologies to facilitate self-administered examination while decreasing

disease transmission can provide accurate evaluative data and decrease the risk to health care providers.[35] Telehealth strategies allowed PTs, OTs, and SLPs to intervene early, opening the possibility to maximize recovery and prevent harm or decompensation. Telehealth strategies can be more prevention-focused while the patient is experiencing relatively good health with goals to maximize strength and endurance before the disease process evolves to critical illness. As COVID-19 progresses, therapy can help mitigate potential complications associated with prolonged ICU stay and ventilator management. These therapy interventions can address the deconditioning (fatigability and generalized weakness), dyspnea, and acute mental and emotional distress our patients are experiencing because of this condition. Early intervention is critical when considering each patient's long-term outlook and projected discharge disposition or needs.

Limitations

The first limitation is the lack of evidence-based research in COVID-19. This is an unprecedented time in our current era of medicine where research, guidelines, and conjecture are based on expert opinion and limited case studies, which are lower on the hierarchy of evidence structure. Clinicians need to extrapolate from other disease states that are similar and use interventions that have been shown to be effective. Second, the authors were unable to provide data that would state that our process made a statistically significant change in the course of the disease process, patient improvement, length of stay, or readmissions. It would be unethical in this disease with high mortality to withhold care with the goal of establishing a control group.[36] Finally, there was a relatively small group of patients being seen for telehealth and/or direct in-room therapy as compared with total therapy caseload. The average daily census for COVID-19 or PUIs with therapy orders was 51 patients, with 17 being direct contact, compared with a daily census for the department of 228 patients. These small groups of patients make drawing statistical conclusions on the benefits of telehealth and in-room therapy in this population difficult. Anecdotally, the benefit of therapy in acute respiratory disease has been assessed and proven to be effective.

Recommendations

The authors recommend collecting demographic and outcome data related to the treatment of patients with COVID-19, related specifically to therapy interventions. More evidence is needed on how the fields of PT, OT, and SLP are contributing to the recovery of patients with COVID-19.

Conclusions

Acute care physical therapy, occupational therapy, and speech-language pathology telehealth strategies can add value by mitigating COVID-19–related harm and influencing recovery, while not unnecessarily becoming additional disease vectors or consuming PPE. The authors recommend that acute care hospitals incorporate telehealth strategies into care for possible and confirmed COVID-19 cases.

REFERENCES

1. World Health Organization. Novel coronavirus (2019-nCoV) situation report-1. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports. Published January 21, 2020. Accessed April 15, 2020.
2. World Health Organization. Novel coronavirus (2019-nCoV) situation report-51. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports. Published March 11, 2020. Accessed April 13, 2020.
3. Center for Systems Science and Engineering at Johns Hopkins University. Coronavirus COVID-19 (2019-nCoV). COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU). https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6. Published April 15, 2020. Accessed April 15, 2020.
4. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 Hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA*. 2020;323(11):1061-1069. doi:10.1001/jama.2020.1585.
5. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention. *JAMA*. 2020;323(13):1239-1242. doi:10.1001/jama.2020.2648.
6. Institute for Health Metrics and Evaluation. IHME | COVID-19 projections. https://covid19.healthdata.org/projections. Published April 12, 2020. Accessed April 13, 2020.
7. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *J Autoimmun*. 2020;109:102433. doi:10.1016/j.jaut.2020.102433.
8. Pollok T, Tompkins J, Engel H, et al. *COVID-19: Clinical Best Practices in Physical Therapy Management* [webinar]. Alexandria, VA: American Physical Therapy Association; 2020.
9. Zhang L, Hu W, Cai Z, et al. Early mobilization of critically ill patients in the intensive care unit: a systematic review and meta-analysis. *PLoS One*. 2019;14(10):e0223185. doi:10.1371/journal.pone.0223185.
10. Connolly B, O'Neill B, Salisbury L, Blackwood B; Enhanced Recovery After Critical Illness Programme Group. Physical rehabilitation interventions for adult patients during critical illness: an overview of systematic reviews. *Thorax*. 2016;71(10):881-890. doi:10.1136/thoraxjnl-2015-208273.
11. Esbrook C, Jordan K, Robinson M, Wilcox J. Occupational therapy in hospitals & inpatient care: responding

to a pandemic. https://myaota.aota.org/shop_aota/product/OL8102. Published April 1, 2020. Accessed April 15, 2020.
12. Sasannejad C, Ely EW, Lahiri S. Long-term cognitive impairment after acute respiratory distress syndrome: a review of clinical impact and pathophysiological mechanisms. *Crit Care Lond Engl*. 2019;23(1):352. doi:10.1186/s13054-019-2626-z.
13. Wu Y, Xu X, Chen Z, et al. Nervous system involvement after infection with COVID-19 and other coronaviruses. *Brain Behav Immun*. 2020. doi:10.1016/j.bbi.2020.03.031.
14. Martin-Harris B. Clinical implications of respiratory-swallowing interactions. *Curr Opin Otolaryngol Head Neck Surg*. 2008;16(3):194-199. doi:10.1097/MOO.0b013e3282febd4b.
15. ASHA American Speech-Language-Hearing Association. Adult dysphagia: overview. https://www.asha.org/Practice-Portal/Clinical-Topics/Adult-Dysphagia. Accessed April 14, 2020.
16. World Health Organization. Clinical management of severe acute respiratory infection when COVID-19 is suspected: interim guidance V 1.2. https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected. Published March 13, 2020. Accessed April 13, 2020.
17. APTA. Guide to Physical Therapist Practice 3.0. http://guidetoptpractice.apta.org/. Published 2014. Accessed April 13, 2020.
18. Fauci AS, Lane HC, Redfield RR. Covid-19—navigating the uncharted. *N Engl J Med*. 2020;382(13):1268-1269. doi:10.1056/NEJMe2002387.
19. Health Resources & Services Administration.Telehealth programs. https://www.hrsa.gov/rural-health/telehealth. Published April 28, 2017. Accessed April 15, 2020.
20. Richmond T, Peterson C, Cason J, et al. American Telemedicine Association's principles for delivering telerehabilitation services. *Int J Telerehabil*. 2017;9(2):63-68. doi:10.5195/ijt.2017.6232.
21. Bashur R, Shannon G. *History of Telemedicine: Evolution, Context, and Transformation*. New Rochelle, NY: Ann Liebert Inc; 2009. https://www.liebertpub.com/doi/abs/10.1089/9781934854112. Accessed April 15, 2020.
22. Cowper-Ripley DC, Jia H, Wang X, et al. Trends in VA telerehabilitation patients and encounters over time and by rurality. *Fed Pract*. 2019;36(3):122-128.
23. Richardson J. Tipping the scales of time. *Phys Ther*. 2020;80(11):1121-1124.
24. APTA. APTA definitions and guidelines on telehealth. http://www.apta.org/uploadedFiles/APTAorg/About_Us/Policies/BOD/Practice/TelehealthDefinitionsGuidelines.pdf. Accessed April 13, 2020.
25. Recommendations for the implementation of telehealth in CV & stroke care. *Science News Archive*. https://professional.heart.org/professional/ScienceNews/UCM_490662_Recommendations-for-the-Implementation-of-Telehealth-in-CV-Stroke-Care.jsp. Accessed April 14, 2020.
26. Keesara S, Jonas A, Schulman K. Covid-19 and health care's digital revolution. *N Engl J Med*. 2020. doi:10.1056/NEJMp2005835.
27. Centers for Disease Control and Prevention. Interim guidance for healthcare facilities: preparing for community transmission of COVID-19 in the United States. https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-hcf.html. Published February 11, 2020. Accessed April 16, 2020.
28. Nydahl P, Sricharoenchai T, Chandra S, et al. Safety of patient mobilization and rehabilitation in the intensive care unit. Systematic review with meta-analysis. *Ann Am Thorac Soc*. 2017;14(5):766-777. doi:10.1513/AnnalsATS.201611-843SR.
29. Bamford P, Bentley A, Dean J, Whitmore D, Wilson-Baig N. *ICS Guidance for Prone Positioning of the Conscious COVID Patient 2020*. London, England: Intensive Care Society; 2020.
30. Xu Z, Shi L, Wang Y, et al. Pathological findings of COVID-19 associated with acute respiratory distress syndrome. *Lancet Respir Med*. 2020;8(4):420-422. doi:10.1016/S2213-2600(20)30076-X.
31. Pan F, Ye T, Sun P, et al. Time course of lung changes on chest CT during recovery from 2019 novel coronavirus (COVID-19) pneumonia. *Radiology*. 2020. doi:10.1148/radiol.2020200370.
32. Whiteford G. Occupational deprivation: global challenge in the new millennium. *Br J Occup Ther*. 2000;63(5):200-204.
33. Kantarcigil C, Malandraki GA. First Step in telehealth assessment: a randomized controlled trial to investigate the effectiveness of an electronic case history form for dysphagia. *Dysphagia*. 2017;32(4):548-558. doi:10.1007/s00455-017-9798-y.
34. Cascella M, Rajnik M, Cuomo A, Dulebohn SC, Di Napoli R. *Features, Evaluation and Treatment Coronavirus (COVID-19)*. Moses Lake, WA: StatPearls Publishing; 2020.
35. Owusu-Akyaw KA, Hutyra CA, Evanson RJ, Cook CE, Reiman M, Mather RC. Concurrent validity of a patient self-administered examination and a clinical examination for femoroacetabular impingement syndrome. *BMJ Open Sport Exerc Med*. 2019;5(1):e000574. doi:10.1136/bmjsem-2019-000574.
36. Brighton B, Bhandari M, Tornetta P III, Felson DT. Hierarchy of Evidence: from case reports to randomized controlled trials. *Clin Orthop Relat Res*. 2003;(413):19-24. doi:10.1097/01.blo.0000079323.41006.12.