

What Do We Know so Far about the Physiotherapy Approach for COVID-19 Patients

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Abstract

Background

SARS-CoV-2-associated disease (COVID-19) is an infectious disease caused by a new highly contagious coronavirus. The first cases were reported in December 2019 in China and the virus gradually spread around the world. Most patients (80%) present with mild to moderate form (with or without pneumonia), 14% severe and 6% critical form (respiratory distress, septic shock, dysfunction of many organs). People with COVID-19 may have flu-like symptoms and respiratory infections. The main early symptoms of COVID-19 patients include fever (89%), dry cough (64%), fatigue (38%), muscle, nasal congestion and runny nose, secretion/ sputum production (34%), dyspnea, anemia / insomnia (19%), etc. The early clinical symptoms of COVID-19 are similar to the common flu. In view of the COVID-19 pandemic, physiotherapy plays a key role in the acute and subacute phase in the rehabilitation of patients with COVID-19 and in the continuation of rehabilitation for the disabled and the elderly with appropriate modifications in the provision of services ensuring prevention and precautionary rules as required the pandemic.

Objectives

This article aims to provide guidance on physiotherapy in the rehabilitation of patients with COVID-19 during the pandemic. Describe the indication and safety of early mobilization and exercise in mild to severe COVID-19 patients and investigate the use of tele-rehabilitation to provide rehabilitation programs to these patients.

Materials and Methods

A comprehensive literature search was conducted in the MEDLINE, SciELO, PEDro and Web of Science databases and in the National Library of Medicine (PubMed / Medline).

Results

The COVID-19 virus is highly contagious (it is spread through droplet transmission) and the condition is still evolving. Physiotherapy should only be provided when clinical indications are present, so as to minimize staff exposure to patients with COVID-19. Early treatment is recommended by the World Health Organization when the patient's clinical condition stabilizes. The physiotherapy program for patients treated with COVID-19 includes elements of respiratory support, active mobilization and functional rehabilitation.

Conclusion

As this virus is new, it is obvious that some questions remain unanswered and that the situation may change. Data on transmission duration have already evolved and more research is needed, as well as on immunization and the possibility of possible re-infection. The physiotherapist plays an essential role in caring for patients with COVID-19 in the long term, several weeks after illness. Management must be comprehensive and coordinated with other health professionals.

Abbreviations

Acute respiratory distress syndrome - ARDS

Coronavirus 2019 - COVID-19

Intensive Care Unit - ICU

Severe acute respiratory syndrome - SARS

World Health Organization - WHO

Introduction

SARS-CoV-2 (COVID-19) -infectious coronavirus disease is an infectious disease caused by a new highly contagious coronavirus. The first cases were reported in December 2019 in China and the virus gradually spread around the world [1-3].

On January 30, 2020, the World Health Organization (WHO) declared a public health emergency of international interest (PHEIC). Later, on March 11, 2020, the WHO designated COVID-19 as a pandemic after assessing infection rates [1,2,4]. At the beginning of June 2020, more than 6.5 million people were infected worldwide, with an estimated death rate of 5.9%. In France, it caused more than 29,000 deaths [3]. Over time, COVID-19 is increasingly recognized as a major global public health problem. According to the WHO, the COVID-19 outbreak has spread to 216 countries, regions or territories [4].

The COVID-19 virus is highly contagious (spread through droplet transmission) and the condition is still evolving. The exact incubation period is unknown, however based on previous coronavirus infections, it is estimated at 2-10 days (possibly extending to 14 days). Patients with COVID-19 are considered to be contagious while having symptoms, initial data from Wuhan, China, suggesting a median duration of viral expulsion of 20 days (Inter quartile range: 17·0-24·0), with the longest observed duration 37 days, period of development of immunity [5].

Most patients (80%) present with mild to moderate forms (with or without pneumonia), 14% severe and 6% of critical forms (respiratory distress, septic shock, multiple organ dysfunction). Patients with mild to moderate forms are preferably isolated at home and the most severe forms are hospitalized or in intensive care [3]. Admission rates to the Intensive Care Unit (ICU) are approximately 5%. Half of the hospitalized patients (42%) will need oxygen therapy [6]. Seventy-five to 80% of the patients have a stay of more than three weeks and up to a quarter of these patients are in intensive care. These patients exhibit respiratory dysfunction (which may like to become syndrome acute respiratory distress [ARDS]), renal, hepatic, or cardiac failure and often multiple visceral deficiencies [3].

Based on recent data, people with a higher risk of developing a severe form of COVID- 19 and who will need hospitalization and / or ICU support are the oldest, men with at least a pre-existing co-morbidity, high severity of the disease (measured on the SOFA scale), high levels of D-dimers (ddimer) and / or lymphocytopenia [6].

The SARS - CoV -2 is highly contagious. It differs from other respiratory viruses in that human-to-human transmission occurs approximately 2 to 10 days before the individual becomes symptomatic [6]. Current studies have found that people who are sensitive to SARS-COV-2 include all nerves, and the main source of infection is confirmed patients with COVID-19, and those during the incubation period and asymptotically infected individuals.

SARS-CoV-2 has 4 main modes of transmission. The first is the transmission of droplets, generally the inhalation of droplets emitted by infected people when they cough or talk [7].

Second is the close contact transmission, contact with the mucosa or damaged skin of the COVID-19 patient or virus carrier or contact with the droplets of the infected person from the surface of an object [7]. The virus is transmitted to another person through contact of the hands with an infected surface and then by contact with the mouth, nose or eyes. Large droplets from coughing, sneezing or runny nose land on surfaces two meters away. measures the diseased / infected atom SARS-CoV-2 survives for at least 24 hours on hard surfaces and up to 8 hours in soft surfaces.

The third is aerosol transmission. aerosol inhalation formed by droplets emitted by infected individuals [7]. Aerosol with contaminated microparticles generated during sneezing or coughing that remain viable in air for at least 3 hours [6].

The fourth is other possible means of transmission, including faecal-oral transmission, etc. [7].

People with COVID- 19 may have flu-like symptoms and a respiratory infection [6]. The main initial symptoms of COVID-19 patients include fever (89%), dry cough (64%), and fatigue. (38%), muscle pain, nasal congestion and runny nose, secretion / sputum production (34%), dyspnea, anemia/ dyspnea (19%), etc. The severity of the disease varies from asymptomatic infection, mild upper respiratory infection, severe viral pneumonia with respiratory failure and/ or death. Recent studies estimate that 80% of cases are asymptomatic or mild, 15% of cases are severe (infection requiring oxygen therapy) and 5% are critical requiring mechanical ventilation and mechanical life support [6,7].

Clinical Symptoms

Patients may suffer from various shortcomings, such as impaired lung function, physical decomposition, muscle weakness, acute cerebrovascular disease, venous thromboembolism, acute heart failure, neurological complications, psychological disorders, and cognitive disorders. The common manifestation of COVID-19 is characterized by mild respiratory disease or moderate to severe pneumonia, causing acute respiratory distress syndrome (ARDS) and multiple organ failure. However, reports from most affected countries suggest other clinical findings including neurological symptoms (such as headache, dizziness, hypoglycemia, and neuralgia). and complications (encephalopathy, acute Ege falangeiakes disorders, ataxia, epileptic events, impaired consciousness? myopathy / neuropathy; musculoskeletal injuries and cognitive and psychological problems. Survivors said after ICU cognitive disorders (30-80%), new physical disabilities (25-80%), and post-traumatic stress disorder in 8-57% of patients. in addition, patients with ARD and prolonged hospital stay, said: sleep deprivation, delirium, pain, muscle atrophy, neuropathy, loss of mobility and function and get cut important. These issues require comprehensive long-term multidisciplinary management, including rehabilitation. Generally, patients with COVID-19 are in critical condition have long hospital stay and paratetame screen bed rest and immobilization inevitably lead to several negative consequences addition, patients with COVID-19 admitted to the ICU often need long-term support partial care and mechanical ventilation, which puts them at high risk of developing post-intensive care syndrome. In addition, relatively young patients surviving ARDS may experience persistent limitations, reduced physical endurance, reduced quality of life, and functional disability, increasing the cost and use of health care services. For all these reasons, early mobilization and exercises should be done to prevent, alleviate and / or recovery of such damages and limitations, Veronica Lourenco Wittmer *et al*, Auwal Abdullahi *et al*, Mariya P Jiandan *et al*, Stephen J Halpin *et al*) [8-11].

Classification of Patients with COVID-19

Asymptomatic

These are people with a positive COVID- 19 nucleic acid test who have no clinical signs or symptoms and have a normal chest x-ray. Oxygen saturation is normal at rest and does not decrease during physical activity [12].

Symptomatic

These people may have symptoms of an acute upper respiratory infection (fever, fatigue, myalgia, cough, sore throat, runny nose, sneezing) or digestive symptoms (nausea, vomiting, abdominal pain, diarrhea). They may have normal satiety at rest, but may experience a decline with exercise or activity.

Symptomatic patients were further classified according to the severity of the respiratory symptoms and according to the oxygen requirement and taking into account the severity classification for COVID-19-MoHFW [12].

Physical Therapy and COVID-19

In the run-up to the COVID-19 pandemic, physiotherapy plays a key role in the acute and subacute phases of rehabilitating patients with COVID-19 and continuing rehabilitation for the disabled and the elderly with appropriate modifications to health care pandemic protection. The need for physiotherapy services despite the pandemic poses many concerns that require attention and possible challenges for professionals in physiotherapy [13]. Physical therapy plays an important role in rehabilitation. However, the emergence of coronavirus 2019 (COVID-19) posed a major challenge in its practice, especially in terms of the level of contact with patients. There is an absolute need to explore recovery options, in addition to personal contacts, to limit the spread of the virus. Tele-rehabilitation is a vital tool that uses technology to connect health professionals with patients. It is a necessary adjustment to ensure the continuous provision of physiotherapy services during the pandemic [1,10].

It is important to remember that strict hygiene measures must be observed when providing physiotherapy services. First of all, hand washing remains a fundamental measure and is the first barrier to the transmission of the virus. In addition, it is recommended that you wear a waterproof long-sleeved garment or long-sleeved garment with a plastic protective apron, goggles, *medical cap*, *type 2 face* mask (FFP2) and gloves [3].

Physiotherapy should only be provided when there is clinical evidence to minimize staff exposure to patients with COVID-19. Unnecessary intervention in patients with COVID-19 in their isolation area / area will also have a negative impact on the supply of personal protective equipment. Physiotherapy staff should not enter as a routine for simple respiratory testing in isolation areas where patients with confirmed or suspected COVID -19 isolated or crowded Patients will be screened through subjective examination and baseline evaluation, while direct contact with the patient should be avoided whenever possible, eg by calling the isolation room by telephone. patients and performing a subjective assessment for information on mobility and / or training of airway clearance techniques. Respiratory infection with COVID- 19 is mainly associated with dry, unproductive cough, and involvement of the lower respiratory tract usually involves interstitial pneumonia and not secondary bacterial infection. In these cases, respiratory physiotherapy is not indicated [2,3,6,8,10,14].

For independently ventilated patients who would require physiotherapy, vocal guidance techniques (non-patient contact, teletherapy) are preferred if possible. The use of techniques and coughing is not recommended. It is not recommended to use an in-exsufflator, but, if absolutely necessary, it is necessary to prefer a closed

circuit with an antibacterial and antiviral filter at the outlet of the device and another just before the interface. To facilitate ventilation, you should frequent position changes accompanied by adequate follow-up are encouraged [2,3,6,10,14].

Respiratory physiotherapy in a hospital clinic or ICU may be indicated in patients with suspected or confirmed COVID-19 cases when they develop concomitant or subsequent secondary bacterial infection of the lungs, hypersecretion of mucous membranes and mucosal secretions. Bronchial drainage is indicated in patients with pneumonia or lower respiratory infection with ineffective and productive cough [2,3,10]. Physical therapy will have in these patients and in their rehabilitation as well as in patients with co-morbidity, reduced functionality and / or (possible) muscle weakness acquired in the ICU [6]. Early mobilization and exercises, including lying at 45 ° with the head on the bed, regular bed changes, passive mobilization in all joints, frequent posture changes aimed at gradual semi-sitting position and / or neuromuscular electrical stimulation, are also recommended for patients with unconsciousness or depression. These therapeutic approaches should be selected based on the patient's clinical condition and are important in preventing skin lesions and the consequences of immobilization. The rehabilitation team should discuss the possibility of launching an active mobilization program as soon as patient depression is reduced, to prevent myopathy and physical disability. However, mobilization is not recommended in patients with clinical instability. In these cases, it is contraindicated as it may impose additional stress on the respiratory system, exposing patients to an increased risk of respiratory distress [8,10].

For hospitalized COVID-19 patients, the manner, timing and intensity of intervention for patients with COVID-19 should be tailored to the needs of each patient, especially the elderly, obese patients and those with comorbidity. Taking into account the overall condition of the individual, the intensity of the exercises can be reduced to adapt to patients with reduced muscle strength. As some mild to moderate patients with COVID-19 can rapidly develop severe acute respiratory syndrome (SARS), it is recommended that interventions not cause further burden on respiratory function, increasing the risk of respiratory distress [8,10,14].

Upon completion of intensive care, patients are transferred to other units or hospital services, such as COVID-19 only wards, infections and pulmonary wards. Patients in moderate forms who require intensive care are also cared for in these wards. When their clinical condition allows, patients return home and are confined there for at least 8 days, until two negative virological samples are taken two days apart. Those with a milder form that does not require hospitalization are confined directly to the home, under the same conditions. Any patient with significant functional limitations or at risk of developing them should benefit from physiotherapy. The goals of physical therapy are to restore the patient's respiratory function and functional rehabilitation, in order to facilitate the rapid return to his previous functional level. The hygiene rules remain the same as for the respiratory treatment, using the FFP2 mask for the physiotherapist and the surgical mask for the patient. It is recommended that you do not use hardware. If this is necessary, the equipment must be able to be disinfected according to COVID-19 standards [3,10,14].

Early treatment is recommended by the World Health Organization when the patient's clinical condition stabilizes. Sessions should not exceed 30 minutes and the patient should be encouraged to be active outside the sessions when possible. The techniques used are the same as the usual functional rehabilitation practice,

with respect to hygiene precautions and can range from passive mobilization (if you remain in intensive care) to getting up and retraining gait. The researchers, taking into account previous studies with critically ill patients, suggested that in the COVID-19 population, early mobilization and exercise may help prevent muscle atrophy, venous thrombosis, and joint and muscle stiffness, polyneuromyopathy, improving the quality of life, reducing recovery time and mortality during hospitalization, contributing to and optimizing cognitive, respiratory, neuromuscular and musculoskeletal function, reducing the length of stay in the intensive care unit (ICU) and clinical and functional consequences, in the prevention and treatment of many side effects of sedation and bed rest [3,8,14].

Tele-Rehabilitation

The term “telehealth” can be thought of as an umbrella to describe the provision of distance healthcare using information and communication technology (ICT) resources and encompasses all healthcare professions. Specifically for the field of physiotherapy, the term “telerehabilitation” has been used to date in much of the literature and is defined as “the provision of rehabilitation services through information and communication technologies” [15]. Brennan *et al.* (2010) described tele-rehabilitation as residential rehabilitation services provided by a remote rehabilitation professional, which is useful for assessment, monitoring, prevention, intervention, supervision, training, consulting and consulting. It includes the use of Internet video conferencing, telephone calls and virtual reality systems, where the other remote contact with patients can be either real-time or pre-recorded [1].

Tele-rehabilitation continues to be widely recommended for the perpetuation of rehabilitation services, especially in patients at high risk of developing and developing serious complications of the virus, and even the population that must comply with social hygiene measures. However, there are challenges to how tele-rehabilitation can bridge the gap between physical contact required for certain assessments and interventions by the physiotherapist [1].

During the pandemic, physiotherapists have explored a viable remote delivery service option (also known as telhealth or telerehabilitation) to ensure continued rehabilitation services for patients without COVID-19 [1]. For patients in the contagious phase confined to their homes, telemedicine should be encouraged. By the way, and by way of exception during the epidemic, health professionals can use digital “tools” and “public” communication applications to monitor patients with symptoms of infection or who are identified as having COVID-19. In order for remote home care to take place in safe conditions, it is recommended that the patient not be alone during these sessions. A patient- led diary can help improve program compliance and effectiveness with telephone monitoring [1,3,8,14].

Extreme Ages

The Elderly

For those who were hospitalized with infection COVID-19, the first cases of the National Health Service (NHS) of England estimated that 50% will not require input from public health and the social care, 45% would take public health and social care, 4% would require rehabilitation in in-house or intermediate care

facilities and 1% would require new institutional care. Data from the global ISAR IC study confirm that people most affected by COVID-19 would have a longer hospital stay [16].

People with a higher risk of developing a severe form of COVID-19 and who will need hospitalization and / or ICU support are the ones who are older [6]. It is clear that COVID-19 disproportionately affects the elderly. This is the group that will most likely require hospitalization and this is the group most likely to die from COVID-19 infection.

People who live with fragility and multiple comorbidities (who are more likely to be older) are also more likely to be affected [16]. In the respiratory system, COVID-19 can cause viral pneumonia with extensive pulmonary infiltration, deep dyspnea and hypoxia. Hypoxia can be slow to resolve, requiring prolonged supplemental oxygen use. In those with COVID-19, a hyperinflammatory condition can cause multiple organ dysfunction, including myocarditis and heart failure. This hyperinflammatory state, combined with the immobility and poor food intake are all risk factors for acute sarcopenia - loss of muscle mass and strength observed in patients in the acute phase and especially in the elderly [16]. Other events of COVID-19 which are particularly recognized in the elderly and are of particular importance for rehabilitation needs are delirium as well as other neurological manifestations, including Guillain-Barre syndrome and encephalitis. The risk of venous and arterial thromboembolism after COVID-19 appears to be very high, including stroke with its accompanying physical and cognitive deficits. In addition, survivors of a serious illness [especially those admitted to the ICU] may develop post-traumatic stress disorder. COVID-19 can therefore affect physical, cognitive and psychological function in many ways. A combination of low muscle strength due to weakness and impaired endurance due to cardiorespiratory disease is common, complicated by cognitive and psychological deficits [16].

Rehabilitation strategies must therefore address not only the wide range of deficits caused by COVID-19, but must also be able to provide rehabilitation to people with pre-existing disability and disease. Rehabilitation needs may range from minimal for those with mild symptoms to intensive, prolonged rehabilitation for patients who have been in the ICU for a long time or who have otherwise suffered significant loss of function. Not everyone needs the elderly suffering from COVID-19 official restoration infection, the need will depend not only on the severity of the disease, but the degree of pre-existing weakness and functional impairment; paragonies which should take into account all the sorting systems recovery [4,16].

Children

In most studies the participation of children is still rare and many doubts have arisen about the infections caused by the virus in this particular population [17]. Children present only with mild fever and cough, in contrast to Adult symptoms and deaths are extremely rare [9]. However, we recommend that they be closely monitored, as damage to the developing nervous system can be catastrophic. According to the World Health Organization (WHO), recent findings of symptoms in children who tested positive for COVID-19 have shown an unexplained inflammatory syndrome, mainly in several European and North American countries. However, due to uncertainty in the definition of symptoms related to COVID-19 in children, it is important to have more evidence before their symptoms are included in specific neurological and / or musculoskeletal symptoms [9].

Regarding the rehabilitation due to lack of articles and studies, no specific physiotherapy intervention was found in children with COVID-19 except for the management of ventilation. Currently, the reported figures include 2,143 children suspected of having COVID-19 with a mean age of 7 years. The authors reported viral confirmation in 731 children (34%), 13% of confirmed cases of asymptomatic infection, 5% of symptomatic patients had dyspnoea or hypoxemia and 0.6% developed acute coronavirus 2 (SARS-CoV-2) respiratory syndrome or multiple organ failure. The other minors showed either drunken or moderate events [17].

The most common symptoms were reported in a retrospective study of 171 children in Wu han, China, who tested positive for COVID-19 and had coughs (48.5%), pharyngeal erythema (46.2%) and fever (41.5%) and, more rarely: diarrhea, fatigue, rhinorrhea, vomiting and nasal congestion. The authors also report that 15.8% of children with COVID-19 had no symptoms or radiological findings, 7% had asymptomatic radiological signs, and only three patients required intensive care and invasive mechanical ventilation [17]. Infants <1 year diagnosed and hospitalized in China showed mild symptoms and none required admission to the intensive care unit [17] children with chronic lung disease such as asthma, cystic fibrosis, congenital heart disease or are immunosuppressed (haematological malignancy or solid tumor) the clinical picture of SARS-CoV-2 may be more severe [17].

Physiotherapists work in many different environments (primary care, community care and acute care). Physiotherapists develop a physiotherapy strategy after evaluating and communicating with the treating physicians [17].

Asymptomatic Infection: In children without clinical symptoms of COVID-19 and without radiological findings in the chest, physiotherapy planning focuses on prevention. Physiotherapy interventions are not indicated for clearing the airways. The proposed strategies are educational in nature and include care for the environment, isolation at home and the provision of physiotherapy services, telecommunication networks and the Internet (telehealth in physiotherapy / telerehabilitation). The family must take part in the therapeutic approach, as adults are involved in the care of these children, providing and encouraging rehabilitation by creating a friendly and supportive environment [17].

Acute Upper Respiratory Tract Infection: Physiotherapy with close contact, the patient presents with symptoms such as fever, fatigue, muscle pain, shortness of breath and nasal congestion. Patients in this classification show no signs of pneumonia with chest imaging or lower airway secretion.

Upper airway clearance techniques

Mobilization and early activities with regard to mobilization and early activities, caution is advised when exercising in the acute phase of the disease, even in patients with mild illness, these patients are likely to progress rapidly to more severe conditions. P. aronio the patient asymptomatic infection, should be encouraged to remain functional by performing simple exercises or activities of daily living for avoiding sedentary activities. Teletherapy plays an important role here [17].

Mild Pneumonia: Children in this category have a fever and / or symptoms in the lower respiratory tract with imaging findings but without the need for supplemental oxygen.

Chest extension exercises can be used to eliminate sputum

Bronchial drainage techniques.

Active breathing cycle

Similar precautions for mobilization / early activities mentioned above should be considered [17].

Severe Pneumonia: Supportive care and referral to physiotherapy are required. Symptoms in the lower respiratory tract with indications and inability to clear secretions.

Oxygen therapy and non-invasive mechanical ventilation

Continuous monitoring of peripheral oxygen saturation (SpO₂)

Bronchial drainage techniques.

Cause cough

Mobilization and early activities Several multimodal early activity mobilization protocols have been reported in the literature, ranging from simple exercises to assisted [17].

Critical Cases: There is a possibility that a smaller number of children will have respiratory failure due to COVID-19 / SARS-CoV-2 and will need to be admitted to the intensive care unit and IMV, compared to adults. Management of the pediatric population with respiratory failure due to SARS-CoV-2 has been developed based on previous data for SARS-CoV-2 acute respiratory distress syndrome (ARDS). However, so far, there is no clear indication of safety in this particular respiratory care strategy, as well as the risk of mortality [17].

Interventional mechanical ventilation

Suction position It is recommended that children with SARS-CoV-2 be placed no more than 1-2 hours, three or four times a day.

Bronchial drainage techniques. The technical Kes clearing the airways has to be administered only when it is absolutely necessary for the clinical improvement of the patient with the suitable PPE, and preferably in environments with negative respiratory isolation pressure. They are not suitable in these circumstances, as it can cause pain, crying, increasing atelectasis in a lung that is already heterogeneous. It is recommended to avoid airway clearance techniques that require artificial airway disconnection and the use of a closed suction system is an effective option [17].

Mobilization and early activities Similar to the “severe pneumonia” patient, this protocol has already been established in the literature and should be maintained for critical SARS-CoV-2 cases [17].

Conclusions

As this virus is new, it is obvious that some questions remain unanswered and that the situation may change. Data on the duration of transmission have already evolved and more research is needed, as well as on immunization and the possibility of possible re-infection [3].

The physiotherapist plays an essential role in caring for patients with COVID-19 in the long term, several weeks after illness. Management must be comprehensive and coordinated with other health professionals. The main axes of rehabilitation are the respiratory and motor aspects and the early prevention of complications. The goal is the rapid functional recovery of patients and the reduction of the long-term consequences of this pathology, which remain unknown to date [3]. We must be careful about both the timing of exercise and the choice of the population. patients depending on the severity of the disease. Considering the balance between physical activity and patients' physical ability, we recommend that patients with mild COVID-19 cases perform the exercises daily [4].

To date, research on the pathophysiology of COVID-19 is still limited. Current knowledge does not allow us to know the long-term effects of COVID-19 and studies need to be conducted to answer this question in order to better guide the medical and physiotherapy treatments for these patients [3].

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Conflicts of Interests

The authors declare no conflict of interest in this work.

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