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Role of Screening and Physiotherapeutic Interventions among COVID-19 Patients in Acute Care Hospital Settings: An Overview

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ABSTRACT

Mysterious unidentified pneumonia with transmission rate of 66% was detected in the working staff of china in December 2019, then reaches the border and traveled globally resulting in 2019-20 coronavirus pandemic which was declared a health emergency in Jan-2020 by World Health Organization. Patient with COVID-19 manifested with influenza-like symptoms and respiratory tract infection covering (89%) fever, (68%) cough, (38%) fatigue, (34%) sputum production, along with (19%) shortness of breath. The search for the relevant journal was carried out using PubMed, PubMed Central (PMC), daily situations report, World health organization, Australian and New Zealand Intensive Care Society guidelines, and from other Internet sources. The physiotherapist moreover specialized in cardio-respiratory plays a sympathetic role in managing acute respiratory conditions. The patient must follow the interventions thoroughly in order to assist coughing, mobilize & remove secretions, and to improve the lung volume and cough effectiveness along with complications that arise from the immobility induced symptoms in COVID-19 patients. A focus must be given on the task force designing and planning, proper screening program, and physical therapy interventions with comprehensive knowledge about safety measures, donning and doffing of personal protective equipment, workplace and equipment disinfection, airborne and droplet precautions, risk of exposure during delivery of physical therapy to COVID-19 patients in the acute care hospital settings. The purpose of this study is to collect information regarding the role of screening and physiotherapeutic Interventions in acute care hospital settings and the precautionary measures to be taken during contact with COVID-19 patients.

Abbreviations

COVID-19: Coronavirus disease -19

SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2

WHO: World Health Organization

ARDS: Acute Respiratory Distress Syndrome

ICU: Intensive Care Unit

ICCU: Intensive critical care unit

IPD: In patient Department

HDU: High Dependency Unit

AGP: Aerosol generating procedure

PPE: Personal Protective Equipment

INTRODUCTION

Mysterious unidentified pneumonia manifested by fever, dry cough, fatigue, and occasional gastrointestinal symptoms was first originated from the seafood market, in Wuhan, Hubei, China with 66% transmission-rate within the working staff in December 2019. The novel coronavirus disease-2019 (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). [1] The rampant spread of the disease reaches the borders of China and then travelled globally resulting in the ongoing 2019-20 coronavirus pandemic and health emergency, as declared by W.H.O**.** The first confirmed case reported in India was on 30 Jan 2020. Currently, the ministry of health and family welfare estimated a total number of active cases (178014); (248189) recoveries (cured and discharged), including (1) migration and (14011) deaths in India. [2]

The disease is highly contagious and is transmitted from person to person through respiratory secretions (Droplet/Aerosols from coughing, sneezing, or rhinorrhoea) within 2 meter distance from the infected person. [3] The virus is also transmitted by touching eyes, mouth, or nose through hand that has been touched by the contaminated surfaces. SARS-CoV-2

remains viable on the hard surface for at least 24 hours and up to 8 hours on the soft surfaces. [3] India's case fatality ratio is relatively lower at 3.09%, compared to the global 6.63% as on 20 May 2020 [4] with mortality rates of 3-5%, new reports of up to 9% in contrast to influenza at around 0.1% [2] The recent WHO report publishes a new scientific evidence on the virus transmission during aerosol- generating procedures, or the possibility of generating microscopic aerosols (<5 μm) by evaporation or by normal breathing or talking that generate exhaled aerosols, or by fomites, fecal-oral route, blood-borne, other than the contact and droplet transmission. [46]

The patient with COVID-19 had influenza-like symptoms and respiratory tract infection covering (89%) fever, (68%) cough, (38%) fatigue, (34%) sputum production, along with (19%) shortness of breath. [5] The daily situation report-(46) estimates that the severity of the disease ranges from asymptomatic infection to mild upper respiratory tract infection, to severe viral pneumonia with respiratory failure and/or death. Around 80% of cases identified by the WHO are asymptomatic or moderate, 15% of serious cases need oxygen therapy, and 5% of ICU-admitted critical cases need mechanical ventilation and life support. [6] Older adult with at least one co-morbidity (lymphocytopenia, higher Fibrin degradation product (FDP) levels with advanced disease severity) are at higher risk and require highly defined unit care. [7-8] COVID-19 patient develops acute respiratory distress syndrome (ARDS) pneumonia resulting in significant changes in the ventilation-perfusion ratio with possible shunting. Physical therapy/ physiotherapy acts as a keystone to these symptomatologies which was well-known. [9-10-11-12]

In addition, cardio-respiratory physiotherapist play a beneficial role in the management of acute and chronic respiratory conditions in ICU/ IPD accompanied by rehabilitation with evidence role in complications arising from immobility induced by prolonged ventilation. [13] The various physiotherapy techniques act as an adjunct therapy to remove the copious amount of airway secretions from the patient chest when the patient is unable to clear it autonomously. These therapists are in close contact with the patients, rendering them highly susceptible to COVID-19 disease. Physiotherapist must expand knowledge regarding the current COVID-19 outbreak prior implementing these therapies onto the patients. The purpose of this study is to collect information regarding the role screening and physiotherapeutic Interventions in acute care hospital settings and the precautionary measures to be taken during contact with these COVID-19 patients.

METHODOLOGY

The search for the relevant journal was carried out through the use of the PubMed, PubMed Central (PMC), Daily situation report, IPC (Invention prevention control), WHO (World health organization), Australian and New Zealand Intensive Care Society (ANZICS) guidelines, SCCM (Society of critical care medicine), NICE (National Institute for Health and care guidelines, Ministry of Health (MOH) guidelines, World Confederation for Physical therapy (WCPT) guidelines, and from other Internet sources.

CLINICAL MANIFESTATION

The WHO summarizes the symptoms of patients suffering from COVID-19 following mild illness, pneumonia, severe pneumonia, acute respiratory distress syndrome, Sepsis, and Septic Shocks. These patients need to be hospitalized. [14] (Table-1) demonstrates the various clinical symptoms of patients suffering from COVID-19 infection.

SCREENING AND INTERVENTIONS

The physiotherapy opted in acute-care hospital settings must focus on the following aspects:

1. Outline of task force designing and planning.
2. Screening program in acute care hospital settings.
3. Physiotherapeutic interventions with comprehensive safety measures.

1. OUTLINE OF TASK FORCE DESIGNING AND PLANNING

Before screening, evaluation, and implementation of physiotherapy services to COVID-19 patients, it is strongly recommended to develop a task force. The layouts of these protocols are influenced by various guidelines as well as many consensus approaches. [8] (Table-2)

2. SCREENING PROGRAM IN ACUTE-CARE HOSPITAL SETTINGS

The screening program must be completed under two processes as suggested by Thomas and colleagues among COVID-19 patients. [8]

2.1 PRIMARY SCREENING PROCESS

To protect the entire community from the unintentional spread of the disease, the patients must first be screened prior visiting the hospital (Table-3) and then categorized into confirmed, probable (presence of high-risk features), or suspected categories as according to IPC guidelines.[21]

2.2 PHYSIOTHERAPY SCREENING AND REFERRAL PROCESS

These are based on respiratory and other intervention criteria. **A) Respiratory intervention** includes 1) No physiotherapy and contact with the patient in case of mild symptoms devoid of major respiratory compromises. [22] 2) No physiotherapy and patient contact in case of pneumonia associated with oxygen flow <5L/min for $SpO_2 \geq 90\%$, non-productive cough, or able to clear the secretions independently. 3) Physiotherapy with full PPE protection is recommended in case of mild symptoms and/or pneumonia with co-existing co-morbidities and difficulty in airways clearance. 4) Severe suggestive signs of pneumonia with lower respiratory tract infection characterized by pyrexia, dyspnoea, productive coughing, and diagnostic visuals indicating clear consolidation need to be referred to physiotherapy for airways clearance. **B) Other Intervention** includes mobilization, exercises, and rehabilitation for patients at risk/or with evidence of developing functional limitations e.g. feeble patient, patient with multiple co-morbidities, ICU acquired weakness with significant functional decline, or with immobility induced symptoms, etc among COVID-19 Patients. [14]

3. PHYSIOTHERAPEUTIC INTERVENTIONS WITH COMPREHENSIVE SAFETY MEASURES

Thomas P and colleagues reported respiratory physiotherapy may be indicated for COVID-19 patients admitted in ICU/ Isolation ward, or at the same time develop exudative consolidation, mucous hyper secretions, or difficulty clearing the secretions independently. [8] Lazerri M and colleagues reported that there is an increased load on breathing pattern with alteration in the blood oxygenation cycle due to acute respiratory failure with consequences in declining lung compliances. [22] This results in rapid and shallow breathing patterns of minimum inspiratory effort and maximal mechanical efficiency in COVID-19 patients. Due to this reason, these patient must be strictly adhered to the respiratory physiotherapy techniques like ACBT, PEP, etc. in order to strengthen the breathing pattern, lung functions, and cough effectiveness. [23] In COVID-19 patients, the commonly used

respiratory techniques and modalities are strictly contraindicated as they compromise the increased respiratory load. [24] (Table-4)

3.1 PROPER POSITIONING

Proper positioning is recommended for a) Instant gravity-assisted drainage technique [25] b) to prevent lung collapse, c) to improve ventilation, and d) to prevent pressure sores. Lazerri M and colleagues put more emphasis on a semi-prone or prone position with cushions aids for acquiring a patient's stable position while performing a non-invasive ventilation technique. He also suggested prone position for at least 12-16 hours/day preferably within 72 hours of endotracheal intubation for invasive mechanical ventilation. [23]

3.2 SUCTIONING, NEBULISATION, & HUMIDIFICATION

The suctioning process is only used when required due to the high risk of exposure to the aerosol generated by it. The close inline suction catheters with endotracheal tube (ET) clamped and ventilator disabled are recommended. [19] Nasopharyngeal or oropharyngeal suctioning should only be undertaken when secretions cause physiological deterioration or distress or when the other non-invasive techniques are unsuccessful. [25] According to ANZICS guideline to avoid aerosolization a metered-dose inhaler (MDI) are indicated. [8-19] (Fig-1) Passive humidification heat and moisture exchangers (HMEs) (Fig-2) and respiratory filters must also be used to enhance inspired humidity in breathing system. [26-27]

3.3 ACTIVE CYCLE OF BREATHING TECHNIQUES (ACBT)

This technique is performed by the patient actively to loosen and mobilize the secretions and improve lung functions with effectiveness of cough. [28] Procedures are first taught by the therapist, and then the patient is encouraged to perform it. The ACBT technique is performed in 3 phases. [29]

Procedure

1) ***Breathing Control (BC):*** A maneuver is performed by breathing slowly with a relaxed shoulder. Breathe in gently through the nose allowing the abdomen to rise and then breathe out through mouth descending the abdomen.

2) Deep breathing Exercises (DBE): Breath-in (long, slow, and deep) through the nose, hold it for 2-3 seconds, and then breathe out gently and relaxed (repeat 3-5 times).

3) Huffing or Forced Expiratory Technique (Huff or FET): Exhaling through open mouth and throat to move sputum up in the airways.

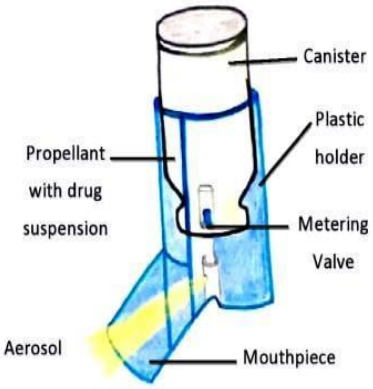

Figure No. 1: Metered-dose inhaler (MDI) **Figure No. 2: HMEs (Passive Humidification)**

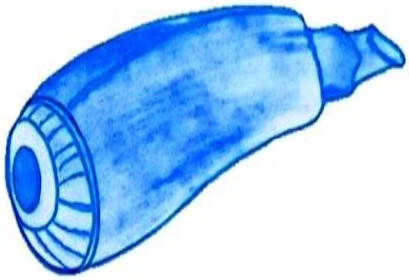

Figure No. 3: Acapella device **Figure No. 4: Face Shield with PPE**

3.4 CHEST PHYSIOTHERAPY

Evidence suggests that the effectiveness of chest physical therapy can be determined by reduced pulmonary infection, improved pulmonary function, and decreased mechanical ventilation duration and tracheotomy prevention. There are little evidences on the percussion, expiratory vibrations, and manually assisted coughing techniques for mobilizing secretions for improving cough effectiveness among COVID-19 patients. Nancy D Ciesla (1996)

demonstrated that the patient in acute settings may respond to chest physiotherapy without antimicrobial therapy if they are diagnosed with symptoms of pneumonia like fever, purulent expectoration, and leukocytosis with the presence of polymorphic nucleic cells in gram staining. [30] It is highly recommended to wear PPE prior application of chest Physiotherapy to COVID-19 patients. [31]

3.5 POSITIVE EXPIRATORY PRESSURE (PEP)

Evidence suggests that PEP would be an effective tool for improving tracheobronchial clearance, reducing pulmonary infections, improving bronchodilatation with shorter hospital stays. PEP is breathing against expiratory resistance, which temporarily increases the Functional Residual Capacity and Tidal Volume by means of expiratory clearance techniques such as the Forced Expiratory Techniques, Huffing, and Coughing. The PEP device comes in many varieties, among them; PEP-mask and Acapella devices are therapeutically used. (Fig-3) The PEP-mask comes with a mouthpiece, a one-way valve, and an expiratory resister to monitor the pressure between 10-20cmH_20 during mid-expiration. [32] The Acapella device is a hand-held airways clearance device that produces positive expiratory pressure and cyclic oscillation of the airways during expiration to move mucus out from the surface.

Procedure

In an upright position, patients inspires to vital capacity and hold it for 3 seconds, then slowly exhales with the help of mouth-piece through the fixed orifice resister between 10-20cmH_20. This maneuver is repeated for 10-20 times followed by expiratory clearance technique. The full expiration must be avoided during the procedure. It is necessary to maintain a period of rest for about 1-2 min.

3.6 PRESSURE SORES

It is recommended that the patient be turned every 2 hours in order to prevent pressure sores in ICU-oriented COVID-19 patients. The ward patient must be actively mobilized from time to time [5].

3.7 CHILDREN

Timothy Roberton and colleagues have demonstrated a potential increase in maternal and child mortality in low-and middle-income countries due to the disruption of essential health

services caused by COVID-19 outbreak. [33] Children may be affected by COVID-19 either by infection through the virus itself or by direct socio-economic impact, According to United Nations policy guidelines, [34]

CHILD RESPIRATORY INTERVENTION [33-34]

a) High-flow oxygen or nebulized therapy.

b) Maintain the Airborne precautions.

c) Frequent monitoring of breathing/respiratory distress, and cyanosis.

d) Severity assessment including severe respiratory distress, hypoxemia, cyanosis, tachycardia, and mental health.

3.8 PATIENT ETIQUETTE

The patient must be instructed to turn his/her head to the other side while coughing or spitting, during any respiratory maneuver. It is advisable for the physical therapist to stand ≤ 2m away from the patient during the cough expectoration process. [21]

3.9 NEGATIVE PRESSURE ROOM

During aerosol generating procedures (AGPs), negative pressure rooms must be available otherwise single rooms with doors closed with a minimum number of personnel shall be used to prevent the risk of airborne transmission. [19]

RISK-FACTORS DURING RESPIRATORY INTERVENTION

The physiotherapists are at high risk during the delivery of physiotherapy services due to direct contact with the COVID-19 patients in acute hospital settings. **Table-5** demonstrates the high-risk factors during respiratory intervention techniques.

COMPREHENSIVE SAFETY MEASURES

According to the recommendations of the WHO, safety measures should be included in 2 policy steps: **1) Administrative policies** which include (a) adequate infrastructure; (b) easy access to laboratory testing; (c) a suitable triage system for COVID-19 patients; (d) an appropriate personnel-to-patient ratios; and (e) staff training. **2) Environmental and**

Engineering Control Policies includes (a) Social distance, (b) 2-meter distance maintenance between patient and between patient and health care professionals, (c) Well ventilated isolation room for COVID-19 patients, etc.

EQUIPMENT DISINFECTION

1. Equipment must be sterilized by neutral detergent than with a chlorine-based disinfectant.

2. Eliminate single-use equipment as per clinical waste-policy inside a room area.

3. The ventilators and mechanical devices should be protected with a high-efficiency viral-bacterial filter such as breathing System filter (BSEN 13328-1). [42]

4. Water humidification should be avoided, and a heat and moisture exchanger should be used in ventilator circuits. [43]

5. In addition, disposable crockery and cutlery should be used in the patient's room as much as possible to minimize the quantity of products that require decontamination.

6. Regarding whether there has been direct contact with the patient or not, it is necessary to disinfect the stethoscopes, pulse oximeter, or ultrasound probe due to the risk of environmental contamination within the isolation room. [42]

PREVENTIVE MEASURES

According to the WHO, the risk of contamination can be minimized at the community level by applying face mask, regular hand washing with either soap or disinfectant containing 0.5–1.0% chlorhexidine gluconate in 80% ethyl alcohol solution [43, 19], frequent disposal of the tissues used after coughing and sneezing, and avoiding contact of both the eyes, nose or mouth with unwashed hands.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Donning the Personal Protective Equipment (PPE) is the only protective measure for epidemic-pandemic-prone acute respiratory infections among health care professionals. The personal protection includes **a)** gloves for handling body fluid of the infected patients which must be changed between each contact with different patients during outpatient procedures **b)** Medical masks **c)** Visor goggles with Anti-fog features to improve clarity [44] **d)** Face shield

that must be covering the forehead, extends below the chin and wrap-around side of the face (Fig-4) **e)** Surgical gowns (water repellent or water-resistant gown) **f)** Shoe leggings **g)** Head mask **h)** Respirators for specific procedures like [(N95) where N= Not resistant to oil based aerosols; and 95 refers to efficiency removing 0.3µm particles] or [filtering face-piece respirator (FFP2) standard or equivalent]. [45] Concern should also be given with regards to PPE doffing procedures, such that its outer surface should not touch any part of the skin while removing it.

AIRBORNE PRECAUTIONS AND DROPLET PRECAUTIONS

Physical therapist with direct contact with the patient needs airborne protection during maneuvers by donning a full PPE protection. During Intervention procedures, to avoid the risk of droplet transmission, droplet precautions are sufficient to employ which includes surgical mask, eye protection, gloves, and apron.

CONCLUSION

Physical therapy acts as an adjunct therapy in managing various symptoms in patient with COVID-19 infection. The physiotherapists moreover specialized in cardio-respiratory with updated knowledge on the current COVID-19 situations must be given more emphasis, followed by treatment of acute respiratory conditions in the ICU/IPD for COVID-19 patients. During the delivery of physiotherapy services, emphasis must be given on the task force designing and planning with proper screening program, physical therapy interventions along with the complication that arises from immobility. The respiratory intervention needs to be followed concurrently with other medication procedures to assist coughing, to mobilize and remove secretions, and also to improve lung volumes and cough effectiveness among COVID-19 patients in acute care hospital settings. The direct physical contact with patient enables a therapist to follow a stringent barrier method regarding the screening process, complete knowledge, safety measures, donning and doffing of personnel protective equipment, workplace disinfection, airborne and droplet precautions, risk of workplace exposure during the delivery of interventions to COVID-19 patients in the acute care hospital settings.

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Table No. 1: Clinical Symptom of COVID-19 Patients in Acute Hospital Settings [14]

Manifestation	**Description**			
Mild illness	**General patient**		Upper respiratory tract infection with non-distinct symptoms of fever, fatigue, cough, anorexia, malaise, muscle pain, sore throat, dyspnoea, nasal congestion, or headache, sometimes diarrhea, nausea,& vomiting, etc.	
	Elderly and Immunosuppressed patients		Atypical symptoms that may be related to COVID-19 symptoms like dyspnoea, fever, Gastrointestinal symptom, or fatigue during pregnancy.	
Pneumonia	**Adult**		**Children**	
	No sign of severe pneumonia, Artificial oxygen not required		Pneumonia with cough, Difficulty in breathing, and sometimes fast breathing, etc.	
Severe pneumonia	**Adult and adolescent**		**Children**	
	Fever and/ or suspected respiratory infection (featuring one symptom either high respiratory rate > 30 breath/min, or severe respiratory distress or $SpO_2 \leq$ 93% at room temperature).		Cough and dyspnoea followed by one feature (Central cyanosis, SpO2 ≤ 90%, Severe respiratory distress, lethargy, convulsions, etc).	
Acute respiratory distress syndrome (ARDS) Onset 5-7 days post early respiratory symptoms	**Adults oxygen impairment**		**Children oxygen impairment**	
	Mild ARDS	200 mmHg < PaO2/FiO2 ≤ 300 mmHg	Bi-level	Non invasive ventilation pressure ≥ 5 cmH2O. Through full face-mask PaO2/FiO2 ≤ 300mmHg or SpO2/FiO2 ≤ 264mmHg.
	Moderate ARDS	100 mmHg < PaO2/FiO2 ≤ 200 mmHg	Mild ARDS	Invasively Ventilated (4 ≤ OI < 8 or 5 ≤ OSI < 7.5)
	Severe ARDS	PaO2/FiO2 ≤ 100 mmHg	Moderate ARDS	Invasively Ventilated (8 ≤ OI < 16 or 7.5 ≤ OSI < 12.3)
			Severe ARDS	Invasively Ventilated (OI ≥ 16 or OSI ≥ 12.3)
Sepsis	**Adult**		**Children**	
	Altered Mental Status; Difficult or Fast breathing; low oxygen saturation; reduced urine output; fast heart rate; weak pulse; cold extremities; low blood Pressure; skin mottling; acidosis, high lactate, etc.		Suspected or proven infection, Inflammatory response syndrome criteria based on abnormal temperature.	
Septic shock	**Adult**		**Children**	
	Persisting Hypotension, Requiring vasopressors.		Hypotension with some of following symptoms like altered Mental State; Tachycardia or Bradycardia, Heart-rate <90 bpm or > 160 bpm in	

		Infants or Heart rate <70 bpm or > 150 bpm in Children; Prolonged Capillary Refill (>2 sec), etc.
Where: ***bpm*** *(beat per minute);* ≤ *is (less than or equals to);* ≥ *is (greater than or equal to);* < *(less-than);* > *(more-than);* ***SPO₂:*** *Saturation of Peripheral Oxygen;* ***PaO2:*** *Partial pressure of oxygen;* ***FiO₂:*** *fraction of inspired oxygen;* ***OSI:*** *Oxygen saturation Index;* ***OI:*** *Oxygenation Index.*		

Table No 2: Task force Designing and Planning In Acute-Care Hospital Settings

Framework	Suggestions/ Guidelines	Application/ Practice
Design a physiotherapy Taskforce	Increase the number of physiotherapy staff.	1. Additional shifts for part-time staff. 2. Recruitment of academic, research, and Casual staff. 3. Extended work hour shifts for employees.
Identification and Prioritization	Physiotherapists must be specialized in cardio-respiratory stream, highly skilled, and efficient in decision making with previous working experience of Intensive care unit, critical care, and its related domains for managing COVID-19 patients.	
	The physiotherapist expertise in advanced Intensive Care Unit, Intensive Critical Care Unit, High Dependency Unit must be identified and support to screen patient with COVID-19.	
	Those with specialization in other areas must support and work under the additional services as recruited by the hospital authorities.	
Provision of e-learning resources for critical care exposure	The task force identified to work in the ICU and its related domains must be regularly updated by the current affairs/ scenario of the COVID-19 outbreak.	a. E-learning packages include 1) Critical care management 2) Clinical skills development services (CSDS). b. Staff orientations. c. Personal Protective Equipment Training [15]
Communication within the physiotherapist and staff	A proper communication must be within the physiotherapist and staff assigned in the critical care unit for proper conduction of physiotherapy services to COVID-19 patients.	It must be practiced via e-media, e-meetings, etc.
Staff Exclusion based on higher risk	According to Australia and New Zealand Intensive care society guidelines, there is a need to exclude those staff who are at higher risk when designing a schedule/ or roster for the task force.	
	Risk Factors	
	1. Liu Y (2020); Dong L (2020) reported that pregnant females with significant respiratory infections during their 3rd trimester can become unwell and can also lead to pre-term birth of the baby [16-17-18]. 2. Immuno-compromised patients. [19] 3. Above 60 years of age. [19] 4. Immunodeficiency. [19] 5. Chronic health conditions like heart disease, lung disease, diabetes, etc.	
Senior Consultation	Prior treatment of COVID-19 patients; discussion with the senior medical staff is mandatory regarding the pre-designed exercise protocol, patients status, etc	
Awareness	The task force must be aware of the guidelines when COVID-19 infection is suspected/ confirmed. [20]	
Minimization of	The risk of cross-infection can be minimized by identifying additional physical resources	

Cross-infection	during the intervention period for example respiratory equipment, exercise equipment, chest mobilization techniques, and equipment storage, etc.
Boosting Morale of Staff[20]	The physiotherapists in close contact with COVID-19 patients must be psychologically supported and encouraged by proper counseling and by delivering employees assistance program during and beyond the active phases of treatment.
	If the task force assigned for treatment is not supported then it can lead to 1) Increase Anxiety (Work+ Home). 2) Increase Stress and conflicts 3) A decrease in quality delivery.

Table No 3: Primary Screening Process during Admission in Acute Hospital Settings

Thermal screening to identify symptoms of fever followed by assessing cold and coughs.
If present, advice for RT-PCR testing (Reverse transcription-polymerase chain reaction).
Assessing the patient travel-history within the last 2-3 weeks in any hotspot areas of COVID-19 infections.
Any contact with the identified COVID-19 patient or suspects.

Table No 4: Contraindicated Respiratory Therapies and Modalities

Diaphragmatic breathing.	Manual mobilization of stretching rib cage.
Pursed lip breathing	Nasal washing
Bronchial hygiene/lung re-expansion techniques	Respiratory muscle training.
Incentive spirometer.	Mobilization during clinical instability

Table No 5: Risk-Factors during Specific Respiratory Interventions

Aerosols Generating Procedures	It produces higher concentrations of infectious respiratory aerosols as compared to coughing, sneezing, talking, or breathing. [35] The Saudi MOH guidelines indicated a high risk of airborne transmission of COVID-19 infections among workforce staff during aerosols generating procedure (AGPs) that includes bronchoscopy, Extubation [36], High flow nasal oxygen with oxygen flow rate of 60% and 100% [36], Non-invasive ventilators [37], tracheotomy, etc. Alhazzani W and colleagues (2020) reported a high risk of transmission by cardiopulmonary resuscitation prior to intubation. [21, 38]
Endotracheal Intubation	Weissman DN (2020) report revealed that approximately 8% of COVID-19 patients require endotracheal Intubation (ET) and mechanical ventilation. The metanalysis report (SARS-CoVID-1) explains that proceduralist performing ET are at risk of 10-15% for transmission of (SARS-CoVID-1) associated infections due to close contact with the patient's airways before, during, and after the procedure. [39-40-41]
Cough Generating Procedures	Cough generating procedures during huff or forced respiratory intervention includes Bubble Positive expiratory Pressure (BPEP), Inspiratory muscle training (IMT), Nasopharyngeal, or oropharyngeal suctioning; etc increases the risk of aerosolization.
Fend off	
If patient are over acute infection with tracheotomy avoid training of the inspiratory muscles until the transmission is subsided.	
A single patient with disposable options must be used during the application of respiratory equipment	

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