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Physiotherapy practices when treating patients with COVID-19 during a pandemic: A survey study



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ABSTRACT

Background Specific details pertaining to the clinical and other challenges faced by physiotherapists managing patients with COVID-19 during the pandemic are still largely unknown.

Objectives To determine how physiotherapists clinically managed patients with COVID-19 in a hospital-based setting during the pandemic and to identify the personal and professional effects of working as a physiotherapist at this time.

Methods Self-administered electronic cross-sectional survey. Participants included physiotherapists from around the world involved in the clinical management of patients with COVID-19.

Results Of the 204 participants who returned the questionnaire, 39% worked as senior physiotherapists, 29% as consultant or specialist physiotherapists, 23% as general physiotherapists and 4% as graduate physiotherapists. Seventy-two percent of participants worked in the intensive care unit. The largest barrier to treating patients with COVID-19 was a lack of intensive care trained physiotherapists (70%). Eighty-three percent of participants reported performing activities outside of their typical work duties, including proning patients (55%), tutoring and advising other staff in the intensive care unit (55%) and adjusting or changing ventilator settings (52%). Almost all participants (90%) reported being aware of physiotherapy specific guidelines for treating patients with COVID-19, yet most participants performed techniques that were not recommended.

Conclusions The experience of the pandemic highlighted the need for specialist training and availability of experienced cardiorespiratory physiotherapists to manage patients with COVID-19, specifically in intensive care. Furthermore, clear guidelines on the management of patients with COVID-19 should be established to ensure optimal management of patients and ensure the safety of physiotherapy staff.

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Introduction

On 11 March 2020, the World Health Organisation declared the novel coronavirus-19 disease (COVID-19) a pandemic due to the rapid growth and large number of cases around the world.¹ COVID-19 is a virus that primarily affects the respiratory system,² along with other body systems,³ with 300 million cases and 5.5 million deaths globally (cases recorded as at 09/01/2022).⁴ The severity of illness ranges from mild disease (81%), severe disease requiring oxygen therapy (14%), and critical disease (5%) requiring intensive care management.⁵ Generally, cardiorespiratory physiotherapy has not been recommended for patients with mild or asymptomatic COVID-19⁶ however it has been reported that approximately 20% of all patients

infected with COVID-19 will require regular chest physiotherapy treatments.⁷ Despite this, the necessity for cardiorespiratory physiotherapy has been controversial with diverse recommendations and management between and within nations.^{7,8}

Respiratory physiotherapy often uses aerosol generating procedures when treating patients with COVID-19.⁹ Initially there appeared to be some global conjecture on which techniques were considered optimal and safe and as a result multiple physiotherapy recommendations and guidelines on the management of patients with COVID-19 were published.^{6,10} It has previously been identified that adherence to these guidelines has been suboptimal during the pandemic.¹¹ However, specific details pertaining to the clinical and other challenges faced by physiotherapists managing patients with COVID-19 during the pandemic are still largely unknown.

The aims of this study were to determine how physiotherapists clinically managed patients with COVID-19 in a hospital-based

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setting during a pandemic and to identify the effects of undertaking the clinical management of patients with COVID-19 on physiotherapists both personally and professionally.

Method

Design

An internationally distributed questionnaire examined hospital-based physiotherapy practice among clinicians treating patients with COVID-19 and identified associated challenges. The survey instrument comprised of 44 questions and included three sections: (1) demographics, (2) management of patients with COVID-19, (3) personal and professional effects on physiotherapists. The questions were predominantly closed-ended, including yes/no and multiple choice, with some open-ended questions limiting answers to 5 words or less.

The content and internal validity of the questionnaire were assessed to determine understanding and interpretation of questions, clinical relevance, and acceptance to a global network. This was performed via pilot testing of the questionnaire by two senior physiotherapists and three consultant physiotherapists working in an intensive care unit (ICU) (including an international clinician) ensuring content, construct, and face validity. The questionnaire was amended accordingly twice in response to feedback. The questionnaire was developed in English and Spanish to encourage worldwide distribution. The Spanish version of the survey underwent translation by two Spanish speaking physiotherapists using the forward-backwards method¹² to increase the validity of the questionnaire. Ethical approval was granted by the Griffith University Human Research Ethics Committee, Queensland, Australia (GU2020-598).

Participants

Physiotherapists were eligible for inclusion in the study if they worked as a clinician treating patients with COVID-19 during the pandemic. Recruitment was a three-step process. Firstly, professional contacts of the research team were contacted to distribute the survey to a maximum of 10 clinical physiotherapists, in their respective hospitals/COVID-19 clinics. Secondly, an international physiotherapy association collected contact details of members interested in participating and forwarded the survey to this group. A response rate was recorded at this point and snowball recruitment followed. Recruitment occurred between July 2020 and April 2021. Potential participants received a digital link that led to a welcome page with participant information. Indication of consent to participate was required on this welcome page before access was provided to the questionnaire. The questionnaire took approximately 10–15 min to complete. One reminder email was sent, monetary or other compensations were not provided, and involvement was entirely voluntary.

Data analysis

Data were exported from the online questionnaire software, Typeform™ [Barcelona, Spain] to Microsoft® Excel® for Microsoft 365 [Washington, USA]. Multiple submissions from the same network were identified and removed and the analyses were performed using SPSS version 26.0 [IBM, USA]. Non-English responses were translated using the forward-backwards method,¹² grouped and coded manually. Pre-snowball and post-snowball responses were analysed using a t-test to determine if there were any differences between the datasets.¹³ Once it was determined that there were no statistically significant differences between the two, the pre- and post-snowball datasets were combined for analysis. Descriptive statistics were calculated for demographic information and presented as frequencies and percentages.¹³ Medians and interquartile ranges were reported

for one non-normally distributed variable. Seventy-five variables were presented as frequencies and percentages calculated from the responses.

Results

Participants

Prior to the snowball sampling, the survey was distributed to 485 contacts (29 professional colleagues and 445 members of Division de Kinesiología Sociedad Chilena de Medicina Intensiva) across Europe, Latin America, Africa, Oceania and Asia. A total of 176 responses were received (37% response rate). Two reminders were given to the 29 professional colleagues and one reminder was sent to the members of Division de Kinesiología Sociedad Chilena de Medicina Intensiva. A further 28 responses were received via snowball recruitment bringing the total number of responses to 204. The records per country can be seen in Table 1.

Level of hospital, level of employment and area worked

Table 2 reports the demographic information of the participants. Of the 146 participants working in ICU, 46 (32%) reported that ICU was not their area of work pre-COVID and 16 (11%) of these participants working in ICU had not previously worked as cardiorespiratory physiotherapists.

Working conditions

Participants reported the number of hours worked per day treating patients with COVID-19 and five cases were excluded due to their responses exceeding 24 h. The total median (interquartile range) number of hours worked per 24 h was 12 (16). Responses are further reported in Table 3 categorised by number of patients and hours worked. Sixty-four participants (31%) reported working only dayshifts, 68 (33%) reported working nightshifts, 40 (20%) reported working on call shifts and the remaining 32 participants (16%) reported working nightshift and on call.

Activities performed outside of typical duties

Of the one hundred and seventy participants (83%) that were required to perform tasks that they considered outside of their typical work duties (Fig. 1), 88 participants (52%) reported that they felt supported by their registration board, union, or professional society,

Table 1
Participants by country.

Continent	World Bank region	Country	Frequency	%
America	Latin America	Argentina	18	8.8
		Bolivia	2	1
		Chile	116	56.9
		Colombia	3	1.5
		Costa Rica	2	1
		Ecuador	5	2.5
		El Salvador	1	0.5
		Mexico	11	5.4
		Paraguay	13	6.3
		Peru	7	3.3
		Uruguay	1	0.5
		Asia	East Asia and Pacific	Singapore
Thailand	2			1
Africa	Middle East and North Africa	Israel	4	2
	Sub-Saharan Africa	South Africa	1	0.5
Europe	Europe and Central Asia	Belgium	1	0.5
		United Kingdom	12	5.8
Oceania		Australia	1	0.5

Table 2
Number (%) of participants by level of hospital, area worked treating patients with COVID-19 and level of employment as a physiotherapist.

Level of Hospital, Area Worked and Level of Employment	Participants (n = 204)	
Level of Hospital ³⁷	Frequency	%
First level hospital – District, rural, community.	22	11
Second level hospital – Regional, provincial e.g., county general.	36	17
Third level hospital – National, central, university affiliated.	130	64
Specialised COVID-19 Hospital/Clinic – Specially constructed to support surrounding hospitals in the event of a surge of COVID-19	14	7
Not stated	2	1
Level of Physiotherapy	Frequency	%
Consultant OR Specialist physiotherapist – Physiotherapist who is recognised as having the highest level of expertise in their particular field of physiotherapy	60	29
Senior physiotherapist – Physiotherapists who demonstrate high level of knowledge, skills, experience, and clinical leadership. These physiotherapists are required to exercise independent professional judgement	79	39
General/Rotational physiotherapist - Physiotherapist who demonstrate at least a competent level of professional knowledge and skill and should be able to independently undertake routine clinical practice	47	23
Entry level/Graduate physiotherapist – Physiotherapist within first year of work	8	4
Not stated	10	5
Work Area	Frequency	%
ICU	146	71
Ward	41	20
Emergency	6	3
Rehabilitation Ward	8	4
Home	2	1
Not stated	1	<1

Abbreviations: ICU=intensive care unit

59 (35%) reported that they did not feel supported, and 23 (13%) preferred not to disclose. Close to half of the participants required to perform tasks outside of their normal duties felt confident and positively challenged by the different duties performed during the pandemic (n = 80, 47%), with 38 (22%) of these reporting that ICU was their main area of work prior to the pandemic. Thirty-five participants (21%) reported that they coped with duties outside their normal ones during the pandemic but had no desire to continue with these duties and 32 (19%) reported feeling stressed and anxious.

Cardiorespiratory physiotherapy techniques

One hundred and twenty-six participants (62%) reported independently assessing and treating patients with COVID-19 without waiting for a medical referral. Specific cardiorespiratory techniques that physiotherapists used when treating patients can be found in Table 4.

Guidelines

Ninety percent of participants were aware of various guidelines regarding the management of patients with COVID-19. Of these 183 respondents, 163 participants (89%) were aware of physiotherapy specific guidelines and 97 (53%) only performed activities that were recommended in the guidelines. However, 66% of all participants reported using auscultation as a form of assessment despite this being considered a high infection risk. As seen in Table 4, participants appeared to adhere to the guidelines and did not use Manual hyperinflation (MHI) or open suction whilst the patient was ventilated, and similarly non-invasive ventilation (NIV) was utilised post-extubation. Additionally, 75% of participants reported being directed not to use NIV due to risk of virus dispersion (46%), high failure rate and early intubation being preferable (12%), or both reasons combined (39%), and 6 participants did not comment. Despite this, 70% of participants used NIV for deteriorating patients. Lastly, 94% of participants reported that they believed that physiotherapy has a higher profile and is more valued in the ICU since the COVID-19 pandemic began.

Barriers to treatment

Fig. 2 details the barriers experienced by physiotherapists to treating patients with COVID-19 with the largest barrier a lack of ICU trained staff (70%) (See Fig. 2).

Table 3
The number of patients each physiotherapist (%) was responsible for treating and the median (IQR) number of hours worked during a shift.

	Frequency	%	Number of hours worked - Median (IQR)
1 on 1	5	3	8 (17)
2-5 patients	45	22	10 (4)
6-10 patients	89	45	12 (14)
10+ patients	60	30	12 (8)

Abbreviations: IQR=interquartile range

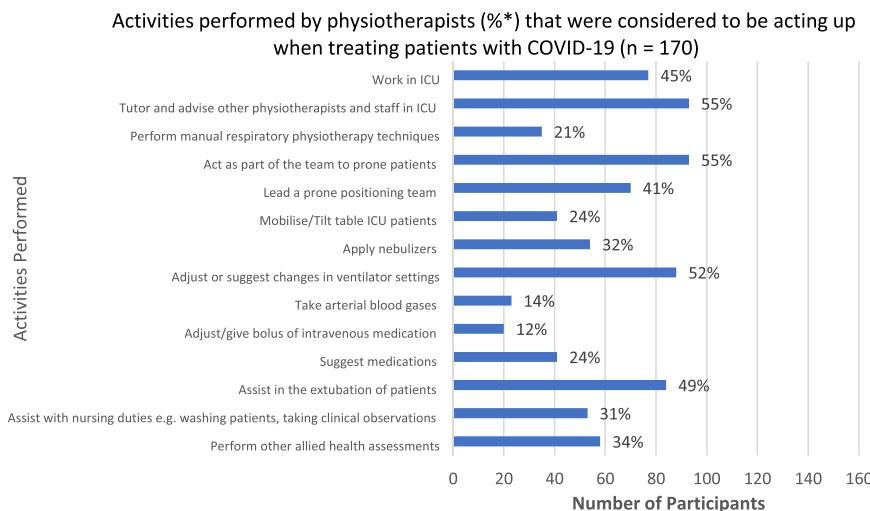


Fig. 1. Activities performed outside of typical work duties during COVID-19 pandemic. *Multiple answers were provided by each individual, % does not add to 100.

Table 4

Methods used by physiotherapists for the cardiorespiratory assessment and treatment of patients with COVID-19 on a ventilator, with a tracheostomy, and post-extubation: Number (%).

Assessment Techniques	Frequency	%				
Auscultation	135	66				
Suctioning	114	56				
Palpation	140	69				
Analysis of Ventilator Waveforms	170	83				
Secretions visible in ETT	20	10				
Chest X-Ray	191	94				
Arterial Blood Gases	189	93				
CT Scan	149	73				
Portable Ultrasound	50	25				
Electrical Impedance Tomography	18	9				

Treatment Techniques	Mechanical Ventilation		Tracheostomy		Post-Extubation	
	Frequency	%	Frequency	%	Frequency	%
Proning	188	92				
Side to Side Positioning	135	66				
Manual Respiratory Techniques	150	74	150	74	159	78
Ventilator Hyperinflation	97	48				
High Frequency Chest Wall Oscillation	14	7				
Closed Suction	172	84				
Open Suction		65	32	132	65	
Saline Lavage	31	15				
Manual Hyperinflation		65	32			
NIV		54	27	118	56	
IPPB		10	5	4	2	
Cough Assist		36	18	20	10	

Abbreviations: ETT= endotracheal tube, CT=computed tomography, NIV=non-invasive ventilation, IPPB=intermittent positive pressure breathing

*Multiple answers were provided by each individual, % does not add to 100

Discussion

Many hospitals around the world are facing intermittent waves of COVID-19 infection and increasing workloads with a high burden of care on healthcare professionals. Physiotherapists in this study most commonly worked 12 h or 24 h shifts and longer working hours were associated with higher caseloads. These results are consistent with previous reports that physiotherapists were required to change (increase) their working hours during the pandemic.¹⁴ The increased demand for physiotherapists within the ICU and increasing work hours was further complicated by the lack of ICU trained staff. Insufficient practical education in ICU is a previously identified barrier to the provision of physiotherapy treatment¹⁵ that has been amplified by the pandemic. Furthermore, participants were required to perform tasks outside of their typical duties which, if unsupported, caused increased stress. When considering this information, it is understandable that the prevalence of healthcare worker burnout during this pandemic has been high.^{16–18}

Barriers to treating patients with COVID-19 (%*)

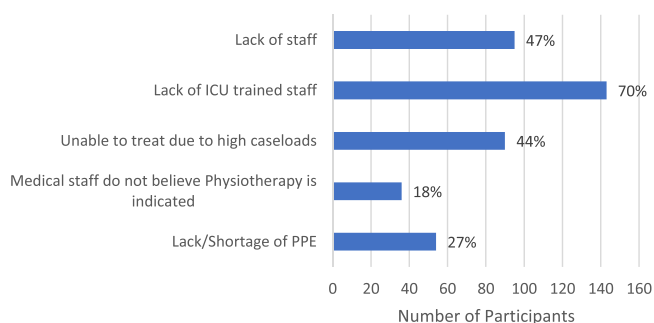


Fig. 2. Percentage of respondents reporting barriers to treating patients with COVID-19
*Multiple answers were provided by each individual, % does not add to 100.

The cardiorespiratory techniques employed were similar to those performed in a study that investigated techniques used in ICU,¹⁵ however they also used ventilator hyperinflation (VHI). VHI is preferred in situations involving severe infection because the ventilator circuit remains connected¹⁹ and it is not considered an aerosol generating procedure. However, the use of this treatment technique usually requires additional training. Many tasks performed were within the scope of physiotherapy practice however most participants were required to perform tasks outside of their typical duties including taking arterial blood gases, giving boluses of intravenous medications, and performing assessments for other allied health professionals. In Italy, physiotherapists managed the increase in demand for treatment by providing training sessions on basic respiratory care to nursing and other allied health professionals to try and address the insufficiency in the number of physiotherapy trained staff.¹⁴ During the first wave of infection in Italy, one in seven physiotherapists tested positive for COVID-19²⁰ which increased the workload for the remaining staff. The Ministry of Education in Brazil campaigned to allow physiotherapy students who had completed 75% of their degree to begin practising clinically to manage the large influx of patients into hospitals.²¹ Recently, the core competencies required to be a working clinical physiotherapist in the ICU have been identified, with many of these skills acquired post-graduation.²² With almost half of the participants reporting that they were required to tutor and advise other physiotherapists/staff in the ICU, one possible consideration is that ICU training should be considered a core undergraduate competency in physiotherapy programs.

Most participants reported that they were aware of physiotherapy specific guidelines for the management of patients with COVID-19. Respiratory physiotherapy often involves the use of techniques such as NIV, suctioning of airways, MHI and VHI, but guidelines have recommended that the use of these techniques should be avoided due to the risk of contamination and used only when the risk versus benefit is considered worthwhile.⁶ It has also been suggested that the use of stethoscopes for respiratory assessment should be avoided due

to the added risk of exposure to the virus and yet 66% reported the use of these during patient assessments.²³ A recent systematic review reported that COVID-19 specific recommendations and guidelines from various jurisdictions were inconsistent.²⁴

NIV is often used by physiotherapists in acutely deteriorating patients. Many participants reported using NIV for deteriorating patients despite being directed not to use it due to the risk of dispersion and a high failure rate. Some guidelines recommend avoiding these types of therapies altogether.²⁵ A publication from Italy reported that NIV is insufficient in the management of respiratory failure in patients with COVID-19 and therefore the risk of viral transmission to healthcare workers outweighed the possible benefits.²⁶ Healthcare workers who provided nebulizer or NIV therapy were considered more likely to contract COVID-19 from their patients.²⁷ Emerging evidence suggests avoiding the use of prolonged NIV as a rescue strategy to prevent intubation,^{6,24,26,28,29} whereas other research has demonstrated that NIV can prevent intubation in some patients.³⁰ It was unknown whether participants used NIV under the directive of medical staff, due to lack of equipment such as ventilators (in the context of using NIV as a rescue strategy) or as a 'last-ditch' effort with severely unwell patients. With ongoing research and more robust protocols, clinicians will be able to make more informed choices when choosing which techniques are appropriate (or inappropriate) for patients with COVID-19.

One barrier to treatment was that medical staff did not deem physiotherapy necessary, despite current evidence contradicting this view.^{28,31–36} Over half of the participants in our study also reported treating COVID-19 patients 'without a medical referral'. Levels of autonomy regarding physiotherapy referral and intervention vary between and within countries. This can range from a blanket referral for all patients in ICU with the physiotherapist exercising their own clinical judgement as to the appropriateness and actual intervention, to a strict referral system with a didactic prescription. It is hypothesized that many physiotherapists working in ICU had increased autonomy during the pandemic as there were more non-ICU medical and nursing staff working in ICU, and the extreme situation resembled a "battlefield" setting. This further necessitates the need for increased numbers of appropriately trained cardiorespiratory physiotherapy staff who are confident to recommend and provide treatment for critically ill patients.

The main limitation of this study was the unequal number of responses from countries or continents. Therefore, the results cannot be considered truly representative of all physiotherapists' interactions with patients with COVID-19. Despite this, clinical evidence suggests that globally, physiotherapists faced very similar challenges¹¹ and common themes were raised in informal online meetings about COVID-19 management hosted by cardiorespiratory physiotherapy associations. It is assumed that responses were low from particular countries due to secondary and tertiary waves of the pandemic, and resultant large caseloads. It may be beneficial to repeat the study with aim of obtaining more diverse responses and potentially different results following second and third waves of the pandemic. A small portion of responses (from Latin America) were

received via snowball recruitment, however statistical analyses revealed that these responses were not statistically different from the other responses and therefore this was not considered a limitation to this study. Another limitation was that there was a longer than expected recruitment period to allow participants to have time to respond to the survey. This may have resulted in recall bias.

Conclusion

Our study demonstrated that during a wave of COVID-19 infection, there was a significant requirement for adequately trained cardiorespiratory staff who could work in an ICU. As the pandemic evolved, it appears that the role of physiotherapy has also evolved, along with its perceived value. Departments should focus their efforts on preparations for further waves of COVID-19 cases. An important consideration is limiting staff exposure to the virus by sharing the load amongst experienced staff, which requires an adequate number of trained staff. This study provided some context to the situation faced by physiotherapists during the pandemic and shines a light on why healthcare workers may be experiencing occupational burnout. Lastly, there appears to be a requirement for more robust guidelines to allow physiotherapists to achieve consensus when choosing certain treatments that may benefit patients with COVID-19 and outweigh potential risks.

Ethics

The Griffith University Human Research Ethics Committee approved this study (GU2020-598). All participants gave written informed consent before data collection began.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability: Data will be made available on request.

Declaration of Competing Interest

The authors of this manuscript have no conflicts of interest to disclose. Additionally, This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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Appendix A: COVID-19 survey

1. QUESTIONS REGARDING INTENSIVE CARE SETTING (ICU)/HOSPITAL

Date _____ Country of residence _____
 Number of Beds in ICU pre COVID-19 _____ Number of beds in ICU occupied during COVID-19 _____
 What level is the hospital you worked at during COVID-19

First level Hospital – District, rural, community. Few specialties—mainly internal medicine, obstetrics and gynecology, pediatrics, and general surgery

Second Level Hospital – Regional, provincial e.g. county general 5-10 clinical specialties

Third Level Hospital – National, central, university affiliated Highly specialized staff and technical equipment—for example, cardiology, intensive care unit, and specialized imaging units.

Specialised COVID-19 Hospital/Clinic - Specially constructed to support surrounding hospitals in the event of a surge of COVID-19.

2. QUESTIONS REGARDING MANAGEMENT OF COVID-19 PATIENTS

2aa Have you treated patients with COVID-19? Yes No

2ab If no, Why No medical referral Other, please specify _____

2ac JUMP FROM 2ab Thank-you for your participation in this survey. At this point, based on your answers you are not required to progress any further.

2ba If yes, where did you treat COVID-19 patients (click all that apply) ICU Ward Rehabilitation ward Other, please specify _____

2bb If ICU, Was ICU your area of work pre-COVID-19. Yes No

2ca Was respiratory physiotherapy your primary area of work before the COVID-19 pandemic? Yes No

2cb What level of Physiotherapist are you? (term may vary according to country) (please click one) Consultant OR Specialist physiotherapist – Physiotherapist who is recognised as having the highest level of expertise in their particular field of physiotherapy Senior physiotherapist – Physiotherapists who demonstrate high level of knowledge, skills, experience and clinical leadership. These physiotherapists are sole practitioners required to exercise independent professional judgement. General/Rotational physiotherapist who demonstrate at least a competent level of professional knowledge and skill, and should be able to independently undertake routine clinical practice. Entry level/Graduate physiotherapist – Physiotherapist within first year of work Other _____ (depending on your place of work's level system)

2da Do you have postgraduate qualifications in respiratory or ICU? (term may vary according to country) (please click one) Consultant or Specialist – Title as given to you by your college or relevant registration board or place of work PhD Master's degree - by coursework Master's - by research Post graduate diploma Titled – At least five years clinical practice, recognized Master's degree by coursework and completed pre-requisite courses for the Title as given by your relevant National Group.

2db How many years have you been practicing as a physiotherapist?

2ea Were you required to act up/work outside your normal duties or skill set during the COVID-19 pandemic. (please click all that apply) Work in ICU Tutor and advise other physiotherapists and staff in ICU Assist with nursing duties e.g. washing patients, taking observations Adjust/give bolus of intravenous medication Suggest medications Apply nebulizers Take arterial blood gases Adjust or suggest changes in ventilator settings outside of applying VHI Act as part of the team to prone patients Lead a prone positioning team Mobilize/Tilt table ICU patients Assist in the extubation of patients Perform ventilator hyperinflation as a method of treatment Perform other allied health assessments (such as swallow assessment) at time of physiotherapy treatment to reduce staff contact time with infected patients I was not required to act up

2eb If you did act up or work outside of your normal duties during COVID-19 pandemic did you feel supported by your registration board/union/professional society? Yes No

- 2ec If you did act up or work outside your normal duties, how did this affect you?
- Stressed and anxious
 I coped with it but have no wish to continue
 Felt confident and challenged by the different duties
- 2f Were you aware of the various guidelines regarding COVID-19?
- Yes
 No
- 2ga Were you aware of any guidelines specific to the role of physiotherapy in COVID-19?
- Yes
 No
- 2gb Which guidelines did you follow?
- Hospital Specific Guidelines
 Physiotherapy Specific Guidelines
 Both
- 2h During your management of patients with COVID-19, did you perform any activities that were not part of the guidelines?
- Disconnecting from Ventilator (for treatments such as Manual Hyperinflation)
 Administering aerosol-based treatments
 Non-invasive Ventilation
 Open suction
 Other, please specify _____
- 2i How many patients with COVID-19 was each physiotherapist responsible for managing in a day?
- 1 on 1
 2 – 5 patients
 6-10 patients
 10+ patients
- 2j Hours worked per day in COVID-19 crisis?
- _____ Hours
- 2k Was there any after hours care such as nightshift or oncall at your workplace?
- Nightshift
 On call physiotherapy
 Nightshift and On call
 Neither
- 2l Pre COVID-19 did you independently assess and treat ICU patients without waiting for a medical referral?
- Yes
 No
- 2m During the COVID-19 crisis did you independently assess and treat ICU patients without waiting for a medical referral?
 NB Discussion with the medical team may have occurred
- Yes
 No
- 2na Did you have limited resources when it comes to personal protective equipment (PPE)?
- Yes
 No
- 2nb What resources were limited (tick all that apply)
- Surgical Mask – P2/N95
 Face shield
 Gloves
 Protective eyewear
 Gowns
 Hair cover
- 2oa What are you using for your respiratory assessment of COVID-19 patients? (please click all that apply)
- Stethoscope
 Chest / ventilator tubing
 Palpation
 Ventilator waveforms
 Chest x-ray
 Portable Ultrasound
 Electrical Impedance Tomography
 Arterial Blood Gas
 CT scan
- 2ob Other (please specify)
- 2pa Have you adopted any methods of treatment specific to treating patients with COVID-19?
- Yes
 No
- 2pb If yes, what?
- 2qa Were COVID-19 patients in your unit receiving mucolytics?
- Yes
 No
- 2qb If so, please list the mucolytics
- N-acetylcysteine
 Carbocisteine
 Bromhexine hydrochloride
 Normal Saline
- 2qc Were the mucolytics suggested by the physiotherapist or medical staff or others?
- Physiotherapist
 Medical staff
 Pharmacist
 Nursing staff
 Other
- 2r Did you use a nebulizer with a storage system which limited the amount of aerosol dispersion e.g. Mizer
- Yes
 No
 I did not use nebulizers at all

- 2s What barriers have you faced in the management of COVID-19 patients? (please click all that apply)
- Lack/Shortage of PPE
 - Medical staff do not believe physiotherapy is indicated
 - Unable to treat all patients due to high case loads
 - Lack of staff
 - Lack of ICU trained staff
3. QUESTIONS REGARDING OXYGEN DELIVERY AND VENTILATION
- 3a When patients with COVID-19 deteriorate are the medical staff or physiotherapists using non-invasive ventilation (NIV).
- Yes
 - No
- 3ba Have you been directed not to use NIV on COVID-19 patients?
- Yes
 - No
- 3bb If yes, why?
- Risk of aerosol dispersion
 - There is a high failure rate and intubation is preferable
 - Other: _____
- 3c What have you been using to assist the patient post extubation? (please click all that apply)
- Manual respiratory physiotherapy techniques e.g. assisted cough
 - Cough assist machine
 - IPPB (Alpha or other)
 - NIV
 - Suction (Nasopharyngeal or oral)
- 2d If the patients received a tracheostomy which techniques were you using? (please click all that apply)
- Manual hyperinflation
 - Open suction
 - Manual respiratory physiotherapy techniques e.g. percussions, vibrations
 - NIV
 - IPPB
 - Mechanical Insufflation-Exsufflation
- 2e Please indicate the forms of oxygen delivery your hospital setting used with non-ventilated patients with COVID-19?
- Masks only
 - Nasal Prongs (low flow or high flow as indicated)
- 2f Did your hospital use humidification for non-ventilated patients requiring O2 therapy?
- Yes
 - No
- 2g What techniques have you used in ventilated COVID-19 patients tick all that apply
- Proning
 - Side to side positioning
 - Manual respiratory physiotherapy techniques e.g. percussions, vibrations
 - Ventilator hyperinflation (VHI)
 - Percussion vest
 - Closed suctioning
 - Saline lavage
 - Other: _____
- 2h If you used VHI during the pandemic were you using this in your ICU unit prior to COVID-19
- Not at all
 - With specific patients
 - Regularly
- 2i Do you believe physiotherapists should be wearing PPE such as full-face shields when encouraging patients to cough post extubation?
- Yes
 - No
- 2j Overall do you consider that physiotherapy has a higher profile and is more valued in ICU since the COVID-19 pandemic began?
- Yes
 - No
- Thank-you for your participation in this survey.

References

- 1 World Health Organisation. *Coronavirus Disease 2019 - Situation Report 51*. Geneva, Switzerland: World Health Organization; 2020.
- 2 Alhazanni W. *Surviving Sepsis Campaign: Guidelines on the Management of Critically Ill Adults with Coronavirus Disease 2019 (COVID-19)*. European Society of Intensive Care Medicine and the Society of Critical Care Medicine; 2020.
- 3 Zheng KI, et al. Extrapulmonary complications of COVID-19: a multisystem disease? *J Med Virol*. 2021;93(1):323–335.
- 4 World Health Organisation. WHO Coronavirus (COVID-19) Dashboard. 2021 [cited 2022 7th January]; Available from: <https://covid19.who.int/>.
- 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.
- 6 Thomas P, et al. Physiotherapy management for COVID-19 in the acute hospital setting: clinical practice recommendations. *J Physiother*. 2020;66(2):73–82.
- 7 Casella, M., et al. Features, Evaluation and Treatment Coronavirus (COVID-19). 2020 [cited 2020 27/03]; Available from: <https://www.ncbi.nlm.nih.gov/books/NBK554776/>.
- 8 Abdullahi A. Safety and efficacy of chest physiotherapy in patients with COVID-19: a critical review. *Front Med*. 2020;7(454).
- 9 Katz SL, Greer MK, Sahni AS. Aerosol generation risk of chest physiotherapy and airway clearance techniques in patients with COVID-19. *Chest Am Coll Chest Phys*. 2021.
- 10 Kolb M, Dinh-Xuan AT, Brochard L. Guideline-directed management of COVID-19: Do's and Don'ts. *Eur Respir J*. 2021;57(4): 2100753.
- 11 Ezema CI, et al. Knowledge, attitude and adherence to standard precautions among frontline clinical physiotherapists during the COVID-19 pandemic: a cross-sectional survey. *Eur J Physiother*. 2021:1–9.
- 12 Epstein J, et al. Cross-cultural adaptation of the health education impact questionnaire: experimental study showed expert committee, not back-translation, added value. *J Clin Epidemiol*. 2015;68(4):360–369.
- 13 Barton B, Peat JK, Ebooks C. *Medical Statistics a Guide to SPSS, Data Analysis and Critical Appraisal*. 2nd ed. Chichester, West Sussex Hoboken, NJ: John Wiley & Sons, Ltd.; 2014.
- 14 Lazzeri M. How Italian respiratory physiotherapists have faced and are facing the coronavirus disease 2019 pandemic. *Arch Physiother*. 2020;10(1):15.
- 15 Çakmak A, et al. Physiotherapy and rehabilitation implementation in intensive care units: a survey study. *Turk Thorax J*. 2019;20192019:114–119.
- 16 Gualano MR, et al. The burden of burnout among healthcare professionals of intensive care units and emergency departments during the COVID-19 pandemic: a systematic review. *Int J Environ Res Public Health*. 2021;18(15):8172.
- 17 Matsuo T, et al. Health care worker burnout after the first wave of the coronavirus disease 2019 (COVID-19) pandemic in Japan. *J Occup Health*. 2021;63(1):e12247.
- 18 Pniak B, et al. Occupational burnout among active physiotherapists working in clinical hospitals during the COVID-19 pandemic in south-eastern Poland. *Work*. 2021;68(2):285–295.

- 19 Dennis D, Jacob W, Budgeon C. Ventilator versus manual hyperinflation in clearing sputum in ventilated intensive care unit patients. *Anaesth Intensive Care*. 2012;40(1):142–149.
- 20 Wentzel A. COVID-19 Cases in the US Surge by 55% in the Wake of the 'Pandemic of the Unvaccinated'. 2021.
- 21 Pegorari MS, et al. Barriers and challenges faced by Brazilian physiotherapists during the COVID-19 pandemic and innovative solutions: lessons learned and to be shared with other countries. *Physiother Theory Pract*. 2020;36(10):1069–1076.
- 22 Twose P, Jones U, Cornell G. Minimum standards of clinical practice for physiotherapists working in critical care settings in the United Kingdom: a modified delphi technique. *J Intens Care Soc*. 2019;20(2):118–131.
- 23 Patel L, Gandhi D, Beddow D. Controversies on the Stethoscope during COVID-19: a necessary tool or an unnecessary evil? *Am J Med Sci*. 2021;361(2):278–280.
- 24 Wang Z, et al. The use of non-invasive ventilation in COVID-19: a systematic review. *Int J Infect Dis*. 2021;106:254–261.
- 25 Cook TM, et al. Consensus guidelines for managing the airway in patients with COVID-19. *Anaesthesia*. 2020;75(6):785–799.
- 26 Carter C, Aedy H, Notter J. COVID-19 disease: non-invasive ventilation and high frequency nasal oxygenation. *Clin Integr Care*. 2020;1. 100006-100006.
- 27 Heinzerling, A., et al., Transmission of COVID-19 to Health Care Personnel During Exposures to a Hospitalized Patient—Solano County, California, February 2020, in Morbidity and Mortality Weekly Report. 2020. p. 472+.
- 28 Battaglini D, et al. Chest physiotherapy: an important adjuvant in critically ill mechanically ventilated patients with COVID-19. *Respir Physiol Neurobiol*. 2020;282. 103529-103529.
- 29 Qiu Haibo, et al. Intensive care during the coronavirus epidemic. *Intensive Care Med*. 2020;46(4):576–578.
- 30 Sivaloganathan AA, et al. Noninvasive ventilation for COVID-19-associated acute hypoxaemic respiratory failure: experience from a single centre. *Br J Anaesth*. 2020;125(4):e368–e371.
- 31 Battaglini D, et al. An experimental pre-post study on the efficacy of respiratory physiotherapy in severe critically ill COVID-19 patients. *J Clin Med*. 2021;10(10).
- 32 Jiandani MP, et al. Preliminary observations and experiences of physiotherapy practice in acute care setup of COVID 19: a retrospective observational study. *J Assoc Phys India*. 2020;68(10):18–24.
- 33 Kiekens C, et al. Rehabilitation and respiratory management in the acute and early post-acute phase "Instant paper from the field" on rehabilitation answers to the COVID-19 emergency. *Eur J Phys Rehabil Med*. 2020;56(3):323–326.
- 34 Lalwani L, et al. Chest physiotherapy in patients admitted to the intensive care unit with COVID-19: a review. *Open Public Health J*. 2021;14(1):145–148.
- 35 Lazzeri M, et al. Respiratory physiotherapy in patients with COVID-19 infection in acute setting: a position paper of the italian association of respiratory physiotherapists (ARIR). *Monaldi Arch Chest Dis*. 2020;90(1).
- 36 Righetti RF, et al. Physiotherapy care of patients with coronavirus disease 2019 (COVID-19) - a Brazilian experience. *Clinics*. 2020;75:e2017.. (Sao Paulo).
- 37 Debas HT, et al. *Essential Surgery: Disease Control Priorities, Third Edition (Volume 1)*. Washington (DC): The International Bank for Reconstruction and Development /The World Bank© 2015 International Bank for Reconstruction and Development / The World Bank; 2015. Essential Surgery: Disease Control Priorities, Third Edition (Volume 1).