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Original Article:

Physiotherapy Practice Patterns for Acute Respiratory Distress Syndrome in Intensive Care Unit in India – A Survey

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Abstract: Objective: To determine the practice patterns of physiotherapists for acute respiratory distress syndrome (ARDS) in the Intensive care unit in India. Materials and methods: A cross sectional survey was conducted across India, in which 600 questionnaires were sent via email to cardio-pulmonary physiotherapists. The questionnaire addressed assessment and treatment techniques of ventilated and non-ventilated ARDS patients. Results: A total of 252 completed questionnaires were returned with a response rate of 42%. The assessment and treatment techniques used were almost similar for ventilated and non-ventilated patients. More than 75% of the responders monitored vital and ventilatory parameters and respiratory impairments for both ventilated and non-ventilated patients. An objective measure of dyspnea was taken by less than 70% responders with minimal attention given to functional exercise capacity, measures of function and health related quality of life measures. Supine Positioning (81.7%)was used more in ventilated patients whereas upright position (75%) was used more in non-ventilated patients. 75% of responders use secretion clearance and manual techniques for both ventilated and non-ventilated patients. In non-ventilated patients, breathing strategies were used by 85% responders, 86.1% performed ambulation and more than 60% physiotherapists used strength training. Conclusion: Assessment predominately focuses on monitoring vital signs and ventilator parameters, and taking impairment measures for ventilated and non-ventilated patients, with little attention given to functional exercise capacity, measures of function and health related quality of life measures. Treatment predominately focuses on body positioning, airway clearance techniques, manual techniques and range of motion exercises for ventilated patients and in addition to all aforementioned breathing strategies and functional training for non-ventilated patients.

Key Words: Acute respiratory distress syndrome, Intensive care unit, Physiotherapy, Survey

Introduction:

Acute respiratory distress syndrome (ARDS) is a rapidly progressive form of respiratory failure characterised by severe hypoxemia and non hydrostatic pulmonary edema.[1] It is a life threatening acute clinical syndrome of pulmonary insufficiency with high mortality and the common reason for admission to Intensive Care Unit (ICU).[2]

Several etiological factors associated with the development of Acute Respiratory Distress Syndrome are identified with sepsis, pneumonia, aspiration of gastric contents, severe trauma and multiple transfusions accounting for most cases.[3]

Pathologically Acute Respiratory Distress Syndrome is characterised by diffuse alveolar damage, alveolar capillary leakage and protein rich pulmonary oedema leading to clinical manifestation of dyspnea, poor lung compliance, severe hypoxemia and diffuse bilateral infiltrates on chest radiograph.[4]

Recent development in the therapeutic approach to ARDS include refinements of mechanical ventilator support with emphasis on protective lung ventilation using low tidal volumes, increased Positive End Expiratory Pressure with use of recruitment manoeuvres to promote reopening of collapsed lung alveoli.[5]

Role of physiotherapy in ARDS is to decrease patient dependence on the ventilator, to improve residual function, to restore physical independence, to decrease the risk of complications, and to improve the quality of life.[6]

Basic Physiotherapy interventions consists of Chest Manipulations which include vibration, percussion, suctioning (Open and Close) to clear the retained pulmonary secretions, positioning (supine, prone, alternate side-lying) to improve oxygenation, to decrease the incidence of ventilator associated

pneumonia and to improve ventilation-perfusion mismatch and Active or Passive mobilisation to prevent deconditioning.[7,8]

The "European Respiratory Society and European Society of Intensive Care Medicine Task Force on Physiotherapy for Critically ill Patients" highlighted the need for standardised guidelines and pathways for management of such patients.[7] They proposed the following targets for Physiotherapy management: avoiding atelectasis, impaired airway clearance, general deconditioning, intubation, and weaning failure where possible.[7]

Recommended Physiotherapy treatment strategies for patients with ARDS in ICU are unclear reflecting the lack of well designed studies to guide clinical decision making. Several studies have been published in western literature on incidence, prevalence, clinical course, intervention, outcome and mortality in patients with ARDS.[9] But no study has been conducted on practice patterns adopted by Physiotherapist for ARDS patients in the ICU.

Clinical practice surveys do not provide "evidence" in the standard sense of term, however they can be useful for accurate description of practice patterns when based upon a representative sample of care providers. So it can be of use for the therapist, to know whether their practice trends are in accordance with the most common or standard practice in this field.[10] Therefore we undertook the survey to determine the current practice patterns among Indian Physiotherapists regarding the assessment and treatment techniques for patients with ARDS in the ICU. The Statement of problem is there is lack of retrievable data available regarding assessment, treatment techniques for ARDS patients in Intensive Care Unit which is adopted by the Physiotherapists in India.

The Aim of the study is to document the current practice patterns of Physiotherapists for Acute Respiratory Distress Syndrome patients in the Intensive Care Unit in India. The Objective of the study is to determine the present clinical practice patterns of Indian Physiotherapists for the assessment and treatment of Acute Respiratory Distress Syndrome patients in the Intensive Care Unit.

Material and Methods

Content validation

A total of 7 physiotherapists working in Intensive Care Units, experts in the field of Respiratory Physiotherapy were given the "Physiotherapy Practice Patterns for Acute Respiratory Distress Syndrome in Intensive Care Units in India" questionnaire for content validation and accordingly final questionnaire was prepared based on their reviews and suggestions.

Questionnaire

The questionnaire included questions regarding assessment measures and treatment techniques used by physiotherapists for ARDS patients. The assessment and treatment techniques that were asked depended on whether the patient was on ventilator or not. Answers had to fall into grades: "Always", "Frequently" "Sometimes", "Seldom", or "Never".

Assessment measures were divided into monitoring vitals and ventilatory parameters, impairment measures, functional exercise capacity and health related quality of life. Treatment techniques were divided into positioning strategies, traditional treatment techniques, use of devices for airway clearance, mobilisation and strength training.

Study procedure

A written approval was obtained from the Institutional Ethics Committee and Scientific committee. A list of hospitals was obtained from the NABH [National Accreditation Board of Hospital and Healthcare Providers] and the MCI [Medical Council of India] websites and a cross-sectional survey was conducted two year (July 2013 – July 2015) across India, in which 600 questionnaires were emailed to the physiotherapists who were involved in the management of pulmonary conditions in Intensive Care Units. This email included a hyperlink which directed the participants to a webpage with the informed consent form (Appendix A) and those consenting to participate could access the questionnaire.

A period of 2 weeks was given to the physiotherapist to fill in the questionnaire in an attempt to ensure a good response rate. If no response was obtained within the stipulated period, telephonic or e-mail reminders were sent and the response was awaited until another 2 weeks after which non-responders were excluded from the study.

Data Analysis

The responses were numerically coded to allow for descriptive summaries and frequency analysis of the data using SPSS version 13. Frequency variables regarding assessment and treatment for ARDS patients were merged in order to create three responses; "always or frequently", "sometimes" and "rarely or never".

Results

A total of 600 questionnaires were emailed to physiotherapists across India, with a total of 252 completed and returned. This made for a response rate of 42%. The responses were received from 12 states including Andhra Pradesh, Delhi, Kerala, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu, Bihar, Chhattisgarh, Rajasthan and Punjab. The majority of responders were from Karnataka (n=88 [34.92%]), Maharashtra (n=88 [34.92%]) and Gujarat (n= 27 [10.71%]) [Figure 1].

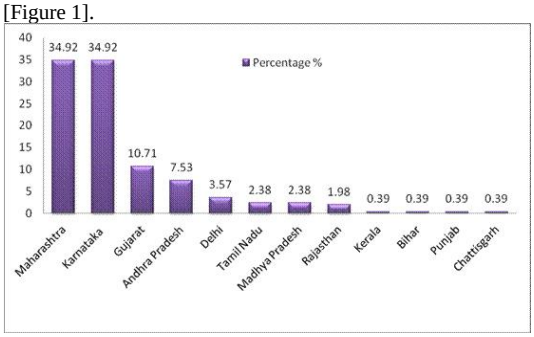

Figure 1: Response Rate obtained from different States

Assessment measures

The frequency with which different assessment measures were used for ventilated patients are given in Table 1, Figure 2, and for non-ventilated patients are given in Tables 2, Figure 3.

Table 1: Assessment Measures used for ventilated patients

Assessment measures	Always or frequently [n (%)]	Sometimes [n (%)]	Seldom or Never [n (%)]
Monitoring Vitals			
Heart Rate	246 (97.6)	5 (2.0)	1 (0.4)
Respiratory Rate	239 (94.8)	11 (4.4)	2 (0.8)
Blood Pressure	225 (89.3)	21 (8.3)	6 (2.4)
Oxygen saturation	242 (96.0)	7 (2.8)	3 (1.2)
Ventilatory parameter			
Mode	223 (88.5)	25 (9.9)	4 (1.6)
Tidal Volume	205 (81.3)	36 (14.3)	11 (4.4)
Peek End Expiratory Pressure	209 (82.9)	34 (13.5)	9 (3.6)
Fraction of Inspired Oxygen	215 (85.3)	26 (10.3)	11 (4.4)
Peak Inspiratory Pressure	160 (63.5)	62 (24.6)	30 (11.9)
PaO2/FiO2	192(76.2)	42 (16.7)	18 (7.1)
Assessment measures			
Physical Examination	208 (82.5)	40 (15.9)	4 (1.6)
Chest X-rays	238 (94.4)	8 (3.2)	6 (2.4)
Arterial Blood Gas Analysis	214 (84.9)	31 (12.3)	7 (2.8)
Peripheral Muscle Strength	141 (56.0)	79 (31.3)	32 (12.7)

Table 2: Assessment Measures used for non-ventilated patients			
Assessment techniques	**Always or frequently [n (%)]**	**Sometimes [n (%)]**	**Seldom or Never [n (%)]**
Monitoring			
Heart Rate	222 (88.1)	25 (9.9)	5 (2)
Respiratory Rate	212 (84.1)	32(12.7)	8(3.2)
Blood Pressure	189 (75.0)	48 (19)	15(6)
Oxygen Saturation	212 (84.1)	26 (10.3)	14 (5.6)
Assessment measures			
Physical Examination	196 (77.8)	51 (20.2)	5 (2)
Chest X-rays	227 (90.1)	19 (7.5)	6 (2.4)
Arterial Blood Gas Analysis	147 (58.3)	82(32.5)	23 (9.1)
Peripheral Muscle Strength	134 (53.2)	77 (30.6)	41 (16.3)
Measures of dyspnoea			
Medical Research Council dyspnoea scale	167 (66.3)	56 (22.2)	29 (11.5)
Modified Borg Scale	143 (56.7)	77 (30.6)	32(12.7)
Functional exercise capacity			
6 Minute Walk Test	128 (50.8)	71 (28.2)	53 (21)
12 Minute Walk Test	16 (6.3)	56 (22.2)	180(71.4)
Self paced walk test	41 (16.3)	50 (19.8)	161(63.9)
Measures of Function			
Barthel Index	88 (34.9)	67 (26.6)	97 (38.5)
Berg Balance Scale	52 (20.6)	57 (22.6)	143(56.7)
Functional Independence Measure	85 (33.7)	67 (26.6)	100(39.7)
Health related quality of life measures			
Chronic Respiratory Questionnaire	51 (20.2)	60(23.8)	141(56)
Short Form-36	54 (21.4)	51(20.2)	147 (58.3)
Health related quality of life	48 (19)	56 (22.2)	148 (58.7)
St. George questionnaire	33 (13.1)	51 (20.2)	168(66.7)

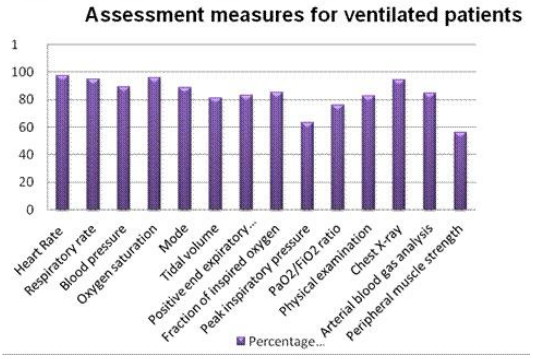

Figure 2: Assessment of measures for ventilated ARDS Patients.

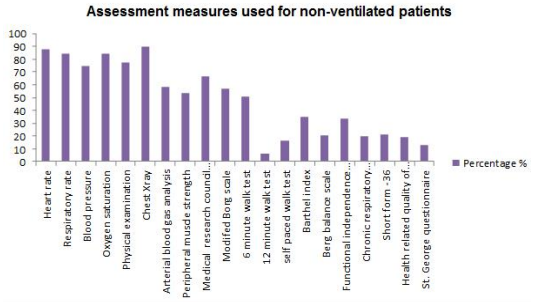

Figure 3: Assessment measure used for ventilated ARDS patients

Treatment Techniques

The frequency with which individual treatment techniques used for ventilated patients are given in Table 3, Figure 4 and for non-ventilated patients are given in Table 4, Figure 5.

Table 3: Treatment Techniques used for ventilated patients			
Treatment Techniques	**Always or frequently [n (%)]**	**Sometimes [n (%)]**	**Seldom or never [n (%)]**
Positioning			
Supine	206 (81.7)	32 (12.7)	14 (5.6)
Prone	39 (15.5)	30 (11.9)	183 (72.6)
Side lying	178 (70.6)	51 (20.2)	23 (9.1)
Upright	118 (46.8)	63 (24.6)	72 (28.6)
Kinetic Therapy	21 (8.3)	43 (17.1)	188 (74.6)
Secretion clearance			
Nebulization	221 (87.7)	23 (9.1)	8 (3.2)
Humidification	190 (75.4)	49 (19.4)	13 (5.2)
Postural Drainage	188 (74.6)	53 (21.0)	11 (4.4)
Open Suctioning	200 (79.4)	32 (12.7)	20 (7.9)
Close Suctioning	120 (47.6)	77 (30.6)	55 (21.8)
Manual Hyperinflation	120 (47.6)	82 (32.5)	50 (19.8)
Manual Techniques			
Vibration	223 (88.5)	24 (9.5)	5 (2.0)
Percussion	190 (75.4)	36 (14.3)	26 (10.3)
Range of motion exercise			
Active Range of Motion	175 (69.4)	58 (23.0)	19 (7.5)
Passive Range of Motion	194 (77.0)	46 (18.3)	12 (4.8)
Active assisted Range of Motion	185 (73.4)	47 (18.7)	20 (7.9)

Table 4: Treatment techniques used for non-ventilated ARDS patients			
Treatment techniques	**Always or frequently [n (%)]**	**Sometimes [n (%)]**	**Seldom or Never [n (%)]**
Positioning			
Supine	180 (71.4)	53 (21)	19 (7.5)
Prone	50 (19.8)	42 (16.7)	160 (63.5)
Side lying	183 (72.6)	53 (21)	16 (6.3)
Upright	189 (75)	32 (12.7)	31 (12.3)
Kinetic Therapy	39 (15.5)	40 (15.9)	173 (68.7)
Airway clearance techniques			
Nebulisation	169 (67.1)	67 (26.6)	16 (6.3)
Humidification	157 (62.3)	69 (27.4)	26 (10.3)
Postural Drainage	201 (79.8)	44 (17.5)	7 (2.8)
Coughing	213 (84.5)	28 (11.1)	11 (4.4)
Active Cycle of Breathing Technique	188 (74.6)	44 (17.5)	20 (7.9)
Autogenic Drainage	114 (45.2)	91 (36.1)	47 (18.7)
Suctioning	105 (41.7)	93 (36.9)	54 (21.4)
Forced Expiratory Technique	151 (59.9)	65 (25.8)	36 (14.3)
Manual techniques			
Vibration	188 (74.6)	53 (21)	11 (4.4)
Percussion	157 (62.3)	68 (27)	27 (10.7)
Breathing strategies			
Pursed Lip Breathing	217 (86.1)	25 (9.9)	10 (4)
Diaphragmatic Breathing	231 (91.7)	15 (6.0)	6 (2.4)
Segmental Breathing	219 (86.9)	25 (9.9)	8(3.2)
Devices			
Flutter	69 (27.4)	61 (24.2)	122(48.4)
Acapella	42 (16.7)	48 (19.0)	162 (64.3)
RC Cornet	27 (10.7)	45 (17.9)	180(71.4)
Functional training			
Bed Mobility	197 (78.2)	32 (12.7)	23(9.1)
Transfer Training	177 (70.2)	52 (20.6)	23 (9.1)
Sitting	217 (86.1)	27 (10.7)	8(3.2)
Ambulation	217 (86.1)	22 (8.7)	13(5.2)
Strengthening exercise			
Upper Limb Strengthening	173 (68.7)	51 (20.2)	28(11.1)
Lower Limb Strengthening	167 (66.3)	54 (21.4)	31(12.3)
Inspiratory Muscle Training	141 (56)	51 (20.2)	

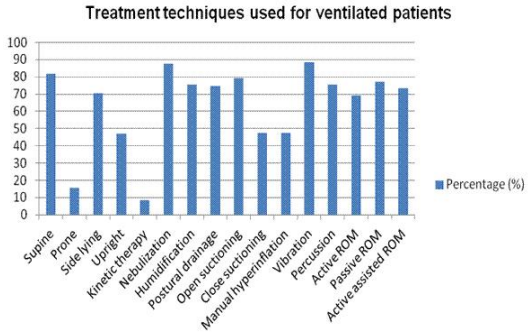

Figure 4: Treatment techniques used for ventilated ARDS patients

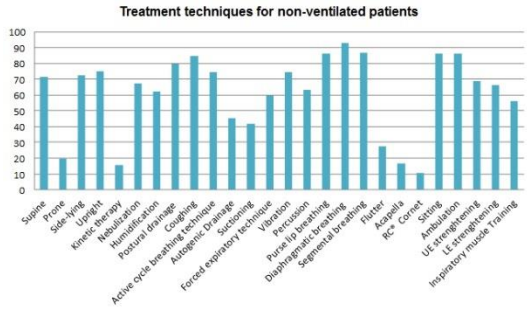

Figure 5: Treatment techniques used for non-ventilated ARDS patients

Discussion

To the best of our knowledge, this is the first study reporting on practice patterns by Indian physiotherapists for Acute Respiratory Distress Syndrome (ARDS) patients in Intensive care units.

Assessment measures for ventilated patients

Acute Respiratory Distress Syndrome presents with tachycardia, tachypnea and hypoxemia refractory to oxygen therapy.[11] So monitoring vital parameters is an important component in assessment of these patients. According to our survey, 94.4% responders noted their patient's vital parameters which included Heart Rate, Respiratory Rate, Blood Pressure and Oxygen Saturation. An Indian study on physiotherapy practice patterns in adult ICUs showed that response rate for vital parameter assessment was 98%.[12] This indicated that regular vital parameter monitoring is a standard practice pattern followed by most physiotherapists in India.

On Physical examination of ARDS patients usually presents with increased work of breathing, altered breathing pattern, prominent use of accessory muscles.[11] Auscultation reveals scattered crackles and occasional wheeze.[11] The current study shows that 82.5% responders focused on physical examination of ARDS patients. A similar study carried out to determine physiotherapy practice patterns for COPD patients in ICU reported 87.7% of responders performed a physical examination.[12]

Mechanical ventilation forms the cornerstone in the management of ARDS. The fundamental concept in ventilatory support of ARDS is firstly the prevention of over-distension of the alveoli by limiting tidal volume or inspiratory pressure and secondly, delivering high positive end expiratory pressure to prevent derecruitment of alveoli at end expiration.[11] Monitoring ventilator parameters on mechanical ventilator is important for physiotherapists to determine the progression of the disease. In our survey, 79.6% responders regularly monitored ventilator parameters.

The chest radiograph of ARDS patients shows typical bilateral infiltrates.[11] Blood gas estimation typically shows

respiratory alkalosis in the initial stages.[11] Chest X-ray and Arterial Blood Gas Analysis (ABG) should be observed routinely to make initial diagnosis and for subsequent monitoring. In our study, 94.4% responders focused on Chest X-ray and 84.9% responders on Arterial Blood Gas analysis (ABG). A similar study done on COPD patients admitted in ICU concluded that 91.8% focused on Chest X-ray but only 61.1% focused on arterial blood gas analysis.[12]

Patients admitted to the Intensive Care Unit (ICU) can develop a condition referred to as "ICU-acquired weakness." resulting from prolonged bed rest, infections and long-term steroid administration.[13] These individuals have significant activity limitations, requiring physical assistance for even the most basic activities associated with bed mobility.[13] Rehabilitation at appropriate time has the potential to restore lost function hence it is essential to assess the muscle strength in the ICU.[13] But in our study, we found that 56% physiotherapists assess peripheral muscle strength.

Assessment for non-ventilated patients

Our study results showed that the assessment for non-ventilated patients is predominantly focused on the same respiratory impairment issues as employed for ventilated patients. Along with the other impairment measures, measures of dyspnea, functional exercise capacity, measures of function and health related quality of life were also assessed for non-ventilated patients

Respiratory impaired patients experience dyspnea as a symptom and ARDS manifests as acute onset worsening dyspnea.[12,14] Dyspnea is assessed in accordance with activities of daily living and during exercises using the Medical Research Council (MRC) dyspnea scale and Modified Borg Scale respectively. In our study, 66.3% responders assessed dyspnea using MRC dyspnea scale and 56.7% responders used Modified Borg scale. This is in accordance with the similar study done on COPD patients where Medical Research Council dyspnea scale and Borg scale were used by 41.8% and 54.1% responders respectively.[12]

Though progress of medical and ventilatory therapy has improved survival of critically ill patients in ICUs, survivors of critical illness have impaired exercise capacity, persistent weakness, suboptimal quality of life and high costs of health care utilization.[15] Hence it is important to assess functional exercise capacity. Our study results showed that 50.8% of responders assessed functional exercise capacity with 6 minute walk test whereas only 6.3% responders did it with 12 minute walk test and 16.3% with self paced walk test.

Patients requiring prolonged mechanical ventilation are frequently deconditioned this further impairs their function.[16] Several tests and measures provide insight into patient's activity limitations and ability which is assessed by Functional Independence Measure, Barthel index and Berg balance scale as it gives the level of independence and balance respectively.[13] The current study shows that nearly 30% of physiotherapists assess the functional status of the patient.

ICU-acquired weakness in critically ill patients results in poor long term health related quality of life, indicating that improving the quality of life of such individuals should be the major goal in the rehabilitation process.[12,13] Thus, quality of life of patients should be assessed using a specifically designed questionnaire.[12] It can be measured using generic health measures (Short form-36) and disease specific measures (Chronic Respiratory Questionnaire) and St.George questionnaire. In our study, we found that less than 20% responders use health related quality of life measures.

Treatment for Ventilated Patients

There is a growing need for recognition of the role of physiotherapy in short-and long term care of ICU patients including those of ARDS. Nevertheless, the current availability of physiotherapists and the quality of intervention in ICU is insufficient.[15]

The aim of body positioning in ARDS is to use gravity to optimise the ventilation-perfusion ratio, increase lung volumes, reduce the work of breathing, minimize the work of heart and enhance mucociliary clearance.[17] A review of prone positioning showed a significant reduction in mortality in patients with ARDS and it also showed significant and persistent improvement in the PaO2/FiO2 ratio.[7] Hence there is a quite strong evidence of enhanced oxygenation in ARDS patients placed in the prone position.[17] In our study, supine positioning (81.7%) was most practiced by physiotherapists followed by side lying(70.6%) and upright (46.8%) while the least performed position was prone (15.5%). This indicates that in spite of good recommendation of prone position it is not used by physiotherapists.

Kinetic therapy includes systematic mechanical rotation of patients with 400-600 turns on each side for 10 minutes and supine for 5 minutes.[7,15] It has reported that kinetic therapy decreases the incidence of ventilator-associated pneumonia and lobar atelectasis, prevents pooling and stagnation of pulmonary secretions.[7] Our study showed that 74% physiotherapists never practice kinetic therapy, though there is a strong evidence that it decreases the incidence of pulmonary complications.[17]

Patients on the ventilator are at a risk for retained secretions from several causes. Endotracheal intubation deranges the mucociliary mechanism enhancing the susceptibility to infections and increasing the volume and tenacity of mucus.[18] Management of secretions in the mechanically ventilated patient requires adequate humidification, nebulisation and chest physiotherapy. The American Association for Respiratory Care suggested that humidification should performed in all patients on mechanical ventilation.[15] According to our study, majority of responders used humidification (75%) and nebulisation (87.7%). Similar study done on COPD patients admitted in ICU reported 54.4% physiotherapists use of humidification and 57.1% use nebulisation.[12]

Secretion clearance techniques included postural drainage, manual techniques (percussion and vibration), and suctioning. Postural drainage helps in mobilizing secretions from one or more lung segments to the central airways by placing the patient in various positions so that gravity assists in the drainage process.[19] In our study, 74% of physiotherapists use postural drainage. Another study done on physiotherapists in ICU reported that 98% of physiotherapists used postural drainage.[20]

Percussion is used to augment mobilization of secretions by mechanically dislodging viscous or adherent mucus from airways by the transmission of an energy wave through the chest wall.[19] Our study showed that, 75% of responders used percussion as secretion clearance technique. A similar study on ICUs in India showed that 93.6% of responders used percussion.[20] Vibration is used in conjunction with percussion to help move secretions to larger airways manually by vibrating the chest wall during expiration.[19] According to our survey, 88.5% of responders performed vibrations. In another study done in ICU, 96.2% of responders perform vibrations.[20]

Manual hyperinflation is aimed at preventing pulmonary collapse, improving oxygenation and lung compliance and facilitating movement of secretions towards the central airways.[21] In ARDS patients, positive end expiratory pressure is set high to recruit alveolar units, manual hyperinflation technique may result in complications like reduction in cardiac output, arrhythmias and increased central venous pressure.[21] Our survey study showed that, only 47.6% of physiotherapists performed manual hyperinflation.

Open suctioning is performed with the disconnection of the patient from the ventilator whereas closed suctioning involves introduction of the suction catheter into the airways without

disconnecting the patient from the ventilator.[22] Since ARDS patients are hemodynamically unstable, and require higher positive end expiratory pressure, closed suctioning is helpful in preventing the loss of lung volume and the alveolar de-recruitment associated with open suctioning. In our study, 79.4% performed open suctioning while only 47.6% performed closed suctioning.

Prolonged bed rest and immobility is associated with skeletal muscle dysfunction and atrophy in antigravity muscles.[15,23] Passive, active assisted and active limb movements may preserve joint motion, improve soft tissue length, muscle strength and function and decrease the risk of thromboembolism.[15,21] According to our survey, limb movements were found to be given by 73.26% of responders. In a study done on COPD patients in ICU, limb exercises was found to be given by 90.4% of the responders. [12]

Treatment for Non-ventilated patients

As stated earlier positioning is used with the aim of improving ventilation-perfusion mismatch, thus improving oxygenation. In our study, upright position was used by 75% of responders for non-ventilated patients which was followed by side lying and supine positioning. The least used was prone position and kinetic therapy.

Airway clearance techniques used for non-ventilated patients include postural drainage, active cycle of breathing technique, autogenic drainage, forced expiratory technique. Our results showed 79.8% responders performed postural drainage; active cycle of breathing was performed by 74.6%; and autogenic drainage was performed by 45.2%. Coughing was used by 84.5% responders. Another study done on ICU reported 95% physiotherapists used coughing as an airway clearance technique.[20] Suctioning (41.7%), vibrations (74.6%) and percussion (62.3%) were also performed for airway clearance. Similar study done in ICU reported 91% of responders perform chest manipulation (percussion, vibration and suctioning).[20]

Mechanical devices for airway clearance used were flutter, acapella and RC® cornet. Among them flutter was found to be used by 27.4%, acapella by 16.7% and RC® Cornet by 10.7% responders. A similar study done to determine practice patterns in COPD, found flutter was used by 25.7%, acapella by 11.7% and RC ® cornet by 10.8% of responders.[12]

Breathing strategies such as pursed lip breathing can relieve dyspnea, as it slows down the respiratory rate and decreases expiratory resistive loading and diaphragmatic breathing improves diaphragm mobility and promotes lung volume.[24] In our study, more than 85% responders use breathing strategies whereas a study done in ICU reported 100% responders use breathing exercises.[20]

The legacy of ICU survival can be significant with prolonged immobility, resulting in deconditioning, muscle atrophy and weakness that may cause limitations in physical function.[18] Early mobilisation includes activities ranging from moving around the bed to standing and walking.[25] This aims at reducing post-ICU physical morbidity and enhances oxygen transport. In our study, more than 70% of physiotherapists practice bed mobility and transfer training exercises and 86.1% of responders practice sitting and ambulation.

Prolonged inactivity results in the reduction of peripheral muscle strength and progressive resisted exercise can lead to an increase in muscle strength and improves quality of life.[12,13,21] Our study showed that, strength training was given by 67.3% of responders. Another study done on COPD patients in India reported 50% of physiotherapists perform strength training.[12]

Excessive use of controlled mechanical ventilation may lead to rapid diaphragmatic atrophy and dysfunction, and positive end-expiratory pressure can further reduce muscle strength by adversely shifting the diaphragm length-tension curve resulting in respiratory muscle weakness.[15,21] Inspiratory muscle training is aimed at improving the strength and endurance in respiratory muscles.[15,26] In our study, 56% of responders use inspiratory muscle training.

The limitation of the study was that majority of the responders were from Maharashtra and Karnataka followed by Gujarat and this is not truly representative of India. Another possibility that participants responded to the survey questionnaire with what they considered to be the best or most appropriate answer to each question. Therefore, their responses may not reflect the actual practice patterns of physiotherapists in Indian ICUs. Other limitation of study is we didn't assess the Mobilization of ventilated patients and whether patients is on endotracheal tube or tracheostomy tube. Future research can be on more specific assessment and treatment measures by physiotherapists employed for different pulmonary conditions in Intensive Care Unit.

Conclusion

The assessment and treatment techniques were similar for certain measures for both ventilated and non-ventilated acute respiratory distress syndrome patients.

Assessment predominately focuses on vital signs and ventilator parameters monitoring and impairment measures for ventilated and non-ventilated patients with little attention given to functional exercise capacity, measures of function and health related quality of life measures.

Treatment predominately focuses on body positioning, airway clearance techniques, manual techniques and range of motion exercises for ventilated patients and in addition to all those breathing strategies and functional training for non-ventilated patients.

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