

(223.2±63.2 ml/min vs. 243.5±71.1 ml/min), minute ventilation (13.6±6.1 L/min vs. 15.4±6.1 L/min), and energy expenditure (1836.7±685.8 kcal/day vs. 2055±749.7 kcal/day). With respect to hemodynamic parameters, consistent decreases were observed in heart rate (93±13.1 bts/min vs. 98.2±17.1 bts/min) and systolic blood pressure (131.3±20.4 mm Hg vs. 141.2±27.1 mm Hg). No change was noted in arterial saturation. **CONCLUSION:** These preliminary results support the use of the upright position as a primary noninvasive intervention to reduce metabolic demand and hemodynamic stress in critically-ill patients. **RELEVANCE:** Noninvasive physical therapy interventions including upright positioning to optimize oxygen transport needs to be exploited in the management of critically ill patients to maximize cost-effective treatment in this expensive case area, and to minimize the need for more invasive, high risk interventions.

THE RELATIONSHIP BETWEEN OXYGEN SATURATION AND DYSPNEA DURING A SIX MINUTE WALK TEST IN PATIENTS WITH COPD.

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PURPOSE: The purpose of this study was to determine if a relationship exists between dyspnea and O₂ saturation in patients with Chronic Obstructive Pulmonary Disease (COPD). A secondary purpose was to assess if dyspnea or O₂ saturation levels differed in patients using supplemental oxygen to patients breathing room air. **SUBJECTS:** Twenty-nine subjects with (COPD), 14 males and 15 females, M age 68.17 ± 8.5 years participated in a six minute walk test (6MWT) as part of an out-patient pulmonary rehabilitation program. Subjects utilized supplemental O₂ and medications as prescribed by their physicians. **METHODS AND MATERIALS:** Dyspnea, measured via a Visual Analogue Scale (VAS), and oxygen saturation percentage (SpO₂%), measured with a Criticare CSI503 pulse, oximeter, were recorded at the start and end of a 6MWT. Distance walked was measured in feet. **ANALYSIS:** A Pearson's product moment correlation was used to determine relationships between dyspnea and O₂ saturation levels. A one way ANOVA was performed between subject groups based on the amount of change in oxygen desaturation and between groups based on the amount of dyspnea recorded. Unpaired T-tests were used to analyze differences between subjects using supplemental oxygen to those subjects on room air. **RESULTS:** A significant inverse relationship ($r = -.372$, $p = .0463$) was found between an increase in dyspnea and a decrease in O₂ saturation during the 6MWT. A significant difference ($p = .042$) in the amount of change in the VAS score was found among groups based on the amount of O₂ desaturation (Group 1, less than 1 SD of change or < 4%; Group 2, 1 to 2 SD or change of 4 to 8%; Group 3, > 2 SD or change of > 8%). There was a sig. difference found among groups (Group 1, less than 1 SD of change or < 23mm; Group 2, 1 to 2 SD of change or 23 to 46mm; Group 3, >2 SD of change or > 46mm) in the SPO₂% at the end of the 6MWT ($p = .014$). The distance walked based on the amount of change in dyspnea was also sig. difference. between groups ($p = .0135$). The only sig. difference ($p = .006$) found between subjects using O₂ to those on room air was in the distanced walked, 716.4 ft on O₂, 1056.6 ft.

not on O₂. **CONCLUSION:** A relationship may exist between dyspnea experienced by people with COPD and oxygen saturation levels as measured by pulse oximetry during a 6MWT. Subjects in this study that experienced an increase in their VAS score of 23mm or more had a SpO₂% < 90%.

A PILOT CLINICAL INVESTIGATION COMPARING THE EFFECTS OF THE MECHANICAL IN-EXSUFFLATOR TO SUCTIONING AND CHEST PHYSICAL THERAPY IN PERSONS WITH DIFFICULTY MOBILIZING PULMONARY SECRETIONS.

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PURPOSE: The purpose of this study was to determine if the Mechanical InExsufflator (MI-E) is at least as effective as traditional airway clearance techniques such as tracheal suctioning (TS) and chest physical therapy (CPT) in persons with difficulty mobilizing pulmonary secretions. The MI-E was originally developed by Barach, Beck, and Smith (termed "The Cof-flator": O.E.M. Co., Norwalk, Conn.) in the 1950's as a non-invasive method to assist airway secretion clearance for persons with poliomyelitis. The MI-E directs positive air pressure into the lungs (insufflation) and removes the air (and secretions) from the lungs via a change from positive to negative pressure (creating a vacuum effect: exsufflation). Our hypothesis was that the MI-E would be at least as effective as TS and CPT in persons with difficulty mobilizing pulmonary secretions. **SUBJECTS:** 17 persons (13 males, 4 females; mean±SD: age=42±20 years) with a variety of neurological and medical/surgical conditions (number of patients with tracheostomies= 11) in a rehabilitation setting who had impairments in airway clearance or lung expansion as determined by one or more of the following: 1) decreased pulmonary function, 2) decreased oxygen saturation, 3) abnormal breath sounds, and 4) patient complaints of congestion or breathing difficulty. **METHODS:** The MI-E (JH Emerson, Cambridge, MA) was attached to patients via tubing attached to a face mask or a tracheostomy adapter. The insufflation and exsufflation phase durations were approximately 3-5 seconds each with therapeutic pressures between 30-45 cm H₂O. The phase durations and pressures were adjusted for each patient based upon patient comfort and secretion clearance effectiveness. Each treatment session lasted approximately 20 minutes. TS was performed using standard sterile techniques. CPT consisted of deep breathing exercises, assisted coughing techniques, exercise, or increased functional activity. Patient comfort and effects MI-E, TS, and CPT were evaluated (via oxygen saturation, heart rate, blood pressure, auscultation, and pulmonary function) before, during, and after treatments. **ANALYSIS:** Statistical analyses consisted of calculation of means and standard deviations as well as analysis of variance (ANOVA) and Tukey's test to determine if differences existed among the effects of MI-E, TS, or CPT upon the study outcome measures (oxygen saturation, heart rate, blood pressure, and pulmonary function). The means and the mean percent change of each outcome measure from each method to mobilize secretions for each patient were

used in the ANOVA. **RESULTS:** 84 treatments were performed with the MI-E in 17 patients, 27 TS treatments were performed in 9 of the 17 patients, and 56 CPT treatments were performed in 15 of the 17 patients. No significant difference was found among the different methods to mobilize pulmonary secretions for all of the outcome measures. **CONCLUSION:** Treatment with the MI-E produced changes in oxygen saturation, heart rate, blood pressure, and pulmonary function that were not significantly different from the changes produced by TS or CPT. Furthermore, 100% of patients who were able to compile a questionnaire after the study preferred MI-E rather than suctioning. The preference for MI-E may be due to its non-invasive nature, the ability of the patient to participate in the MI-E treatment, and the patients perceptions that their secretions were not completely cleared with MI-E. **RELEVANCE:** The MI-E was effective and well tolerated by the patients in this study and has the potential to be less expensive since it does not require sterile techniques and uses reusable components, all of which make MI-E a viable alternative for secretion removal. However, future study of a larger population of persons with difficulty mobilizing pulmonary secretions is needed.

CLINICAL CONSIDERATIONS WHEN USING THE SIX MINUTE WALK TEST (6MWD) TO EVALUATE POTENTIAL LUNG TRANSPLANT CANDIDATES.

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PURPOSE: There were three purposes for this study: 1) to examine the effects of rest periods on the 6MWD results, 2) to determine the impact of the disease pathology on 6MWD results, and 3) to examine the variability of the 6MWD based on level of functional impairment. **SUBJECTS:** 180 patients who were evaluated for lung transplant at the University of Pittsburgh Medical Center over a 10 month period completed this study. **METHODS:** The subjects were placed into groups according to pulmonary disease pathology (hypertensive n=33, obstructive n=71, septic n=25, fibrotic n=36, other n=16). Within these groups, subjects were randomly assigned to two test groups. The first group rested 20 minutes between 6MWD trials. The second group rested a minimum of 24 hours between 6MWD trials. The 6MWD tests were done by one PT with standardized instruction and procedures. To look at variability based on level of functional impairment, subjects were divided into groups based on the result of the first 6MWD trial (< 900 feet n=56; > 1100 feet n=99). **ANALYSIS:** Repeated measures ANOVA and post hoc comparisons (alpha = .05) were used to analyze the effects of length of rest period, differences among disease pathologies and variability based on level of impairment. ANCOVA was used to adjust for age differences among pathologies. SEM was used to determine the clinical significance from a repeated measure design. **RESULTS:** The sample (n = 180) performed significantly better on the second trial (1162 +/-408 feet) of the 6MWD than on the first (1093 +/- 385 feet) at p<.001. There were no main effects for length of rest period (p<.064). There was no in-

teraction between rest period and pathology. Subjects with a septic process, primarily cystic fibrosis, demonstrated a higher level of physical capacity than the other groups (p<.001). When age was considered as a covariant, the septic group demonstrated a higher level of physical capacity than the other groups (p<.015). There was no statistical difference in variability based on functional impairment level. A difference between 6MWD trials of 170 feet or more is necessary to show significance. **CONCLUSION:** Most transplant centers have a minimal distance for the 6MWD to meet the criteria for candidacy. It is suggested to perform the 6MWD at least twice to maximize performance. Upon follow up evaluations, it was found that a difference in 6MWD of 170 feet or greater is necessary to establish that there is a physiological change in the patient's performance. **RELEVANCE:** It is critical to establish reliable testing procedures and accurate interpretations of clinical tests like the 6MWD when the results directly contribute to decisions by transplant centers to list a patient as a potential candidate. Further work needs to be done to determine whether exercise tests like the 6MWD may be used to predict mortality during the waiting period and predict quality of life which includes functional mobility post transplant.

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