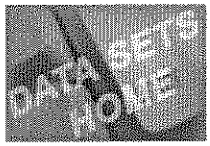

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Clinical Study of Intermittent Positive Pressure Breathing (IPPB)

Objectives: To evaluate the efficacy of long-term intermittent positive pressure breathing (IPPB) treatment when used as an adjunct to the overall care of ambulatory outpatients with chronic obstructive pulmonary disease. The evaluation compared the use of IPPB with use of a powered nebulizer.

Background:

Design: Multicenter randomized controlled clinical trial. Criteria for inclusion: Men and women, ages 30 to 74, who were ambulatory and had symptomatic chronic bronchitis or emphysema.

Results: Compliance with treatment, lung function, and quality of life were evaluated at regular intervals during follow-up, and records were kept of hospitalizations and vital status. Treatment compliance was less than optimal; only half of the patients used their devices for the prescribed amount of time or 10 minutes at least three times a day. Although this was disappointing, it was probably the best compliance that could be attained. There was no statistically significant difference between the treatment groups in mortality, rate and duration of hospitalizations, or change in lung function or life quality with time, overall or for clinically relevant subgroups. The trial group saw no advantage of IPPB over compressor nebulizer therapy and concluded that, if an advantage existed, it must be marginal.

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American Association for Respiratory Care

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Position Statement

Guidelines for The Use of Intermittent Positive Pressure Breathling(IPPB)

Prepared by the Respiratory Care Committee of the American Thoracic Society Approved by the AARC Board of Directors

The Respiratory Care Committee of the American Thoracic Society recognizes that intermittent positive pressure breathing (IPPB) has been overused and misused in the past, and that currently there is considerable controversy regarding this modality of therapy. Despite the fact that investigation is now in progress to attempt to resolve some of the questions relative to IPPB, it is likely that definitive data will not be available for at least several years. The Respiratory Care Committee believes that it is appropriate to offer guidelines for the use of IPPB based on existing information and expert opinion. These guidelines may be of assistance to the practicing physician and also to anyone interested in attempting to define standards for respiratory care.

In these guidelines, "IPPB treatments" refer to the use of a pressure-limited respirator to deliver a gas with humidity and/or aerosol to a spontaneously breathing patient for periods of time that are generally no greater than 15 to 20 minutes each. The overuse of this modality, and the inadequate foundation of scientific validity underlying its application, have led to a general belief that there are few genuine needs for IPPB. In many centers alternative modalities have been introduced without sufficient proof that they are more effective or offer meaningful cost-benefit advantages. However, it is essential for the physician to ensure that IPPB is not prescribed when less expensive modalities can be used with equivalent effect.

Appropriate IPPB Treatment
Major difficulties exist in evaluating the effectiveness of IPPB because standard methods of providing IPPB therapy have not been developed and valid comparisons of results obtained by different sets of workers cannot be made. It is, therefore, necessary to describe a rational approach to IPPB therapy. The term "intermittent positive pressure breathing" emphasizes the least appropriate component, "pressure." The critical requirement in IPPB is augmentation of the inhaled volume of gas, which the patient allows to enter the lungs once the breath has been initiated. Advantages may be obtained when a pressure breathing device is used to provide an inspired volume significantly greater than that which the patient derives by spontaneous breathing. The protocol for such augmented breathing should be as follows:
1. The patient's spontaneous tidal volume and the maximal volume that can be voluntarily inspired should be measured, so that the volume provided by the use of IPPB can be compared.
2. The pressure breathing device and its use should be explained, and the patient should be familiarized with the set-up and the appropriate pattern of breathing that is required. The patient must learn how to initiate the inspiration and then allow the machine to assist in filling the lungs, while avoiding premature exhalation or excessive work during the inspiratory cycle. For effective therapy, the patient must be encouraged to relax by the therapist or nurse who

administers the IPPB.
3. The delivered volumes must be monitored to ensure that the one provided by the device exceeds the patient's spontaneous inspired volume, preferably by more than 25%. The therapist or nurse should strive to achieve a delivered volume that exceeds the patient's maximal voluntary inspired volume, as long as undue distress is not caused by the procedure. The upper limit of pressure to be allowed may be defined by the prescribing physician whenever there are contraindications to the use of high pressure, but volume rather than pressure should be the major consideration in prescribing and administering the therapy.
4. The breathing rate during an IPPB treatment is usually less than the patient's spontaneous rate because of longer inspiratory and expiratory times. An inspiratory pause at the end of inhalation is often desirable, particularly when an aerosolized medication is administered during the IPPB treatment.
5. The objectives of therapy must be defined, and the course of each treatment should be individually tailored to the patient's needs. Different approaches may be needed to achieve objectives such as management of postoperative atelectasis or re-expansion of atelectatic lung, in contrast to those required to produce bronchodilatation or to decrease the arterial PCO2 (PaCO2). Bronchodilatation in some patients can be achieved by using an IPPB machine to deliver 2 to 4 deep breaths of undiluted bronchodilator, whereas in other cases a longer treatment using a larger volume of the diluted bronchodilator may be more appropriate.
6. The therapist or nurse should make appropriate observations to evaluate the patient's response and to determine whether the therapeutic objectives are being attained without complications. Recommendations for changes in therapy based on these observations should be communicated to the prescribing physician. Therapeutic benefit should be demonstrated by using measurements of pulmonary function, blood gases, or sputum production, or by other objective evidence of improved expectoration or decreased respiratory symptoms.
7. Whenever a course of IPPB is prescribed, the patient's condition and response to therapy must be reevaluated periodically, and, when feasible, a change to a simpler or less costly treatment modality should be prescribed.
8. Before self-therapy or domiciliary therapy with IPPB is instituted, the patient must demonstrate competency in using the modality. If the continued use of domiciliary IPPB therapy is contemplated, the physician should advise the patient to delay the permanent acquisition of a machine until its therapeutic value has been clearly demonstrated.
9. A well-defined program for monitoring, cleaning, and servicing the machine is required to prevent malfunctions and the transmission of infection. Domiciliary IPPB should be evaluated periodically by a suitably trained respiratory therapist or nurse.
10. Whenever IPPB is used, there should be awareness of the possible hazards and contraindications to this form of therapy. Precautions should be taken to prevent the introduction of infection, and to avoid aerosol drug complications. The possibilities of causing hyperinflation, pneumothorax, and circulatory disturbances must be recognized.

Indications for IPPB
Although scientifically validated proof of the value of IPPB is sparse, it is believed that IPPB treatments may offer therapeutic advantages in some acute and chronic respiratory disorders. The American Thoracic Society Respiratory Care Committee does not recommend that IPPB be considered as the treatment of choice under the following circumstances, but the Committee does believe that IPPB can be efficacious in each situation if the prescribing physician has evidence that simpler modalities are less effective.
1. To provide large inspiratory volumes in the therapy of pulmonary atelectasis. When administered by the methods previously described, IPPB may be effective in inflating the lungs to a larger volume than can be achieved by voluntary efforts of some patients. This can be beneficial in the management of atelectasis when alternative techniques are not effective and

when objective assessment of inspired volume indicates a therapeutic advantage. The administration of an inspiratory pause at the end of inhalation may also be helpful to allow better distribution of the inhaled gas to areas of the lung with low compliance.

2. To improve delivery of medications. Some patients may be unable to coordinate their breathing pattern so as to obtain maximal benefit from aerosols delivered by simple devices. In these patients, the use of IPPB may allow more effective aerosol therapy; this may be the case in patients with bronchospasm who fail to respond to their customary bronchodilator regimes. In general, the delivery of inhaled medications can be adequately provided by simple aerosol generators, and IPPB devices should be used for this purpose only when simpler approaches prove to be suboptimal.

3. To improve coughing and expectoration. Aerosolized medications can be provided by IPPB to help stimulate productive coughing. Patients with sputum retention, particularly those with atelectasis or bronchial obstruction, may benefit from the application of IPPB to provide augmented volumes and aerosol therapy. The IPPB therapy should be supervised by a qualified health professional, and treatment should be interrupted periodically to encourage coughing. Other modes of therapy designed to improve expectoration, such as increased fluid intake, chest percussion, postural drainage, and active breathing and coughing exercises may be indicated.

4. To decrease inceasing PaCO2. In patients with chronic obstructive lung disease, IPPB therapy may be of benefit in helping to decrease or control unstable or increasing PaCO2. In the treatment of the hospitalized patient, the use of IPPB for 5 to 10 minutes every 0.5 to 1 hour may help to alleviate the need for endotracheal intubation, provided that IPPB results in bronchodilation and improved mucociliary clearance in addition to augmented breathing as part of the over-all management of ventilatory failure.

5. Domiciliary use. Patients with chronic pulmonary disease who obtain measurable physiologic benefit as a result of bronchodilation and mobilization of secretion from the use of IPPB may also derive additional benefit from the relief of anxiety and the decrease in panic reaction that the treatment offers. However, the purchase or rental of an IPPB device is not warranted for such patients unless physiologic benefit can be demonstrated.

6. Special situations. The Committee recognizes that several additional uses for IPPB may be appropriate.

a. Acute pulmonary edema. IPPB as an adjunctive or supplementary form of therapy may provide relief for a patient with acute pulmonary edema while attention is directed to bringing the underlying abnormality under control by means of standard drugs and procedures.

b. Weak patients with pulmonary problems who cannot effectively use simpler modes of administering aerosol therapy may benefit from IPPB. Such patients include those who have been weaned from ventilatory support, those who have neurologic or musculoskeletal disease, and elderly or chronically debilitated persons.

c. Kyphoscoliosis. The use of IPPB for 5 to 10 minutes has been demonstrated to improve pulmonary mechanics for several hours in patients with kyphoscoliosis. Chronic maintenance therapy can be of value for such patients when respiratory insufficiency occurs. They may need to use IPPB as frequently as every 2 to 3 hours to produce significant effect.

d. Sputum induction for diagnostic studies can be achieved by IPPB in patients who do not respond successfully to their modalities.

e. To deliver drugs. IPPB may be used to deliver therapeutic agents for special purposes, such as local anesthetics for bronchoscopy.

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