

## BILEVEL POSITIVE AIRWAY PRESSURE (Bipap)

Bilevel positive airway pressure (BiPAP) allows the clinician to apply independent positive airway pressures to both inspiration and expiration. IPAP (inspiratory) and EPAP (expiratory) are used to define when the positive airway pressure is present. IPAP provides positive pressure breaths, and it improves ventilation and hypoxemia due to hypoventilation. EPAP is in essence CPAP, and it improves oxygenation by increasing the functional residual capacity and reducing intrapulmonary shunting

### Indications for BiPAP

BiPAP appears to be of value in preventing intubation of the end-stage COPD patient and in supporting patients with chronic ventilatory failure. Other indications of BiPAP include patients with restrictive chest wall disease, neuromuscular disease, and nocturnal hypoventilation “Noninvasive Positive Pressure Ventilation

### Initial Settings

The BiPAP system may be used in one of three modes: spontaneous, spontaneous/ timed, and timed. Mode selection depends on a patient’s needs and ability to breath spontaneously. In general, if the patient is breathing spontaneously, the IPAP and EPAP may be initially set at 8 cm H<sub>2</sub>O and 4 cm H<sub>2</sub>O, respectively. The pressures are titrated based on needs, generally with a target of 5 to 7 mL/kg. Refer to Table 7-7 for titration of bilevel positive airway pressure. The spontaneous/timed mode is used as a backup mechanism and the frequency per min (f/min) is set two to five breaths below the patient’s spontaneous frequency. In the timed mode, set IPAP and EPAP as above and the f/min slightly higher than the patient’s spontaneous frequency. The % IPAP may be set at 33% or 50% for an I:E ratio of 1:2 or 1:1, respectively

### Adjustments of IPAP and EPAP

IPAP levels are generally determined by monitoring the patient’s clinical and physiologic response to gradual changes of IPAP, rather than by directly measuring the volume delivered. When the cardiopulmonary responses are positive, the IPAP may be increased in increments of 2 cm H<sub>2</sub>O to enhance the “pressure boost” to improve ventilation, normalize PaCO<sub>2</sub>, and reduce the work of breathing. Since IPAP does not provide volume controlled ventilation, the volume delivered by IPAP is directly related to the IPAP and EPAP pressure gradient and the compliance characteristics of the lung/thorax system. The volume delivered is inversely related to the airflow resistance. In other

words, a larger delivered volume may be obtained by (1) increasing the IPAP level, (2) decreasing the EPAP level, (3) increasing the compliance, and (4) reducing the airflow resistance. The EPAP should be increased by 2 cm H<sub>2</sub>O increments to increase functional residual capacity and oxygenation in patients with intrapulmonary shunting. When the EPAP is the same as the IPAP, CPAP results. It is not possible to increase the EPAP higher than the IPAP. Since IPAP and EPAP are methods to manipulate the airway pressures, all adverse effects of positive pressure ventilation and PEEP should be monitored. The patient should be advised to report any unusual chest discomfort, shortness of breath, or severe headache when using the BiPAP system. There are other similar modes that provide two CPAP or pressure levels (high pressure and low pressure), and the patient is allowed to breathe spontaneously without restriction. See airway pressure release ventilation (APRV) and biphasic positive airway pressure (biphasic PAP)

## References

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