

# Intrapulmonary Percussive Ventilation Application Guide

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# Intrapulmonary Percussive Ventilation (IPV) Application Guide

## Overview Of Therapy

Intrapulmonary percussive ventilation (IPV) is a form of chest physical therapy administered to the airways by a pneumatic device. Using a breathing circuit called a Phasitron, mini bursts of gas are delivered into the lungs at rates between 100 – 300 breaths per minute (bpm). A high output nebulizer provides a dense aerosol to deliver medications and hydrate secretions. Percussive bursts of gas are delivered throughout the entire respiratory cycle which loosen and mobilize secretions towards the upper airways and oral pharynx. To many, IPV is seen as a superior method of secretion removal compared to traditional chest physical therapy, vibratory therapy and other forms of oscillatory airway clearance. IPV can be utilized on patients via a mouth piece or mask interface, and can also be used inline during mechanical ventilation.

## Patients Who Will Benefit From IPV

- Those with acute and chronic pulmonary disease secondary to consolidative lung infections.
- Patients with chronic obstructive lung disease (COPD)
- Patients with restrictive or those with neurologically induced pulmonary disorders.
- Patients with compromised cardiopulmonary functions secondary to trauma, burns, post-operative complications and sepsis
- Patients who would normally receive PEP, CPT, Oscillatory PEP, or external vibratory therapies will benefit from IPV.
- IPV can be used on all patients including, infants, pediatrics and adults.

## The Benefits Of IPV

- Delivery of deep penetrating aerosol to the lower airways
- Loosening of thick cohesive and adhesive secretions
- Mobilization and clearance of retained secretions

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- Resolution of diffuse patchy infiltrates

### Contraindications For IPV

- The same as any positive pressure breathing therapy

### **IPV Therapy Procedure (Non-artificial airway)**

1. Introduce yourself and explain procedure to patient.
2. Connect IPV unit to a 50 psi air or oxygen source. Make sure master switch is in the OFF position.
3. Place the patient in an upright, comfortable position if possible.
  - a. Assess breath sounds, heart rate, respiratory pattern and neurologic status.
4. Connect short end of harness assemble to IPV unit using correct color coding.
5. Connect long end of harness assemble to Phasitron and nebulizer using correct color coding.
6. Fill nebulizer with prescribed medications and dilute to 15 – 20 ml. IPV therapy should not be administrated without normal saline or other medications.
7. Rotate frequency control knob full counterclockwise to the “easy” position.
8. Rotate source pressure control knob to a driving pressure of 15 – 20 psi.
9. Have the patient breathe aerosol from the nebulizer for approximately 1 to 2 minutes. This is termed the “passive breathing cycle”.

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10. When the patient is comfortable with breathing the aerosol have them depress the push button on the manual remote switch located on the nebulizer to begin percussions.
  
11. Instruct the patient to inhale and exhale during the percussions. This is termed the “active breathing cycle”. **Maintain percussions during inspiration and expiration.**
  - a. Instruct the patient to keep their lips sealed tightly around the mouthpiece.
  - b. Encourage slow deep breaths and assess for signs of hyperventilation.
  - c. Gradually increase the driving pressure to achieve effective percussions by assessing chest wiggle/chest wall motion. Once an effective driving pressure has been selected, gradually rotate the frequency control knob clockwise towards the “hard” position until the arrow mark matches the “12 Noon” calibration position. Assess the patient make sure that they are comfortable and not experiencing any difficulty during the breathing cycle. Rotate the frequency control counterclockwise if the patient experiences any discomfort. (continued on the next page)
  - d. These settings are referred to as the “Hard Settings”. Maintain the patient at these setting for approximately 5 minutes.
  - e. After five minutes at the hard setting, gradually turn the frequency control knob fully counterclockwise towards the easy position. Assess the patient and maintain the patient at the “Easy Settings” for 5 minutes.
  - f. During the course of a 15 – 20 minute treatment rotate the frequency control knob between the “easy and hard settings” at 5 minute intervals.
  - g. An alternative is to find the rate most comfortable for the patient; use this for the majority of the treatment and then scan through the rates (usually getting harder) for the last 5 minutes of the treatment.
  
12. Break the active breathing cycle, allowing the patient to rest.  
Encourage the patient to cough and clear any mobilized secretions.

13. Continue the treatment until all medication has been delivered. Periodically assess the patient and encourage slow deep breaths during the active breathing cycle.
14. At the completion of the treatment turn the master switch to the off position, disconnect the breathing circuit and harness, rinse any unused medication from the nebulizer/Phasitron and assess the patient.
15. Additional Notes:
  - a. Active exhalation during the percussion will enhance secretion mobilization. These should be encouraged at the Hard Settings.
  - b. Additional diluents may be added to the nebulizer to extend the time of a treatment.
  - c. If the patient cannot understand or follow instructions the therapist should replace the mouthpiece with a mask.

**IPV Therapy Procedure**  
**(Artificial Airway – use nebulizer with failsafe provision A50010-3)**

**Follow the general guidelines for patient assessment, positioning and assembling the IPV unit/circuit as listed in the “Non-artificial airway” section. Use the following additional guidelines for patients with artificial airways. (It is recommended that patients with artificial airways have an audible leak around the cuff during an IPV treatment.)**

1. Attach the Phasitron to the artificial airway with a short length of flex tubing and elbow adapter. Support the Phasitron as needed to avoid any drag or pulling of the artificial airway.
2. For patients with copious secretions the cuff on the artificial airway should be slightly deflated (audible leak) to facilitate secretions moving into the oral airways.
3. Adjust percussion frequency and driving pressure as outlined in the ‘non-artificial airway’ section. Monitor the patient and perform airway suctioning as required.

4. At the conclusion of the treatment remove the Phasitron from the airway, **re-inflate the airway cuff** and reconnect any aerosol/oxygen delivery devices. Assess the patient and perform airway clearance procedures as needed.

### **IPV Therapy Procedure (Ventilator Protocol)**

**General Guidelines For Most Ventilators\*(Please refer to the special considerations notes at the end of this section prior to initiating this procedure) (It is recommended that patients with artificial airways have an audible leak around the cuff during an IPV treatment.)**

1. Place the ventilator in the SIMV or CPAP mode. **Assist-control/CMV mode is NOT recommended.** Pressure support can either be turned off (recommended) or left at pre-treatment setting. Either volume or pressure modes may be used.
2. PEEP levels should be maintained, however during the treatment mean airway pressures will increase slightly. The practitioner needs to be aware of these changes and monitor the patient closely. A rise of 15 cm H<sub>2</sub>O in peak airway pressure is often require to administer effective airway percussions.
3. Increase high minute and tidal volume alarm levels to avoid alarm violations.
4. Fill the medication nebulizer with normal saline or other prescribed medications. The IPV treatment **Should Not** be administered without normal saline or other medications.
5. Place the IPV inline manifold (A50018-3) with pressure relief valve (50388-2) inline on the inspiratory limb of the ventilator circuit. Observe the location of the one-way valves on the manifold making sure that gas flow to the patient is not occlude by incorrect placement of the manifold. (See diagram #1). **Do not place the manifold between the patient wye and ET tube.** The pressure relief valve should be completely closed (turned all the way clockwise) prior to starting the therapy. (Alternatively see diagram #2 for use of A50474-2, IPV Cone interface.)

## 6. Starting The IPV Treatment

1. Activate the IPV Phasitron manually with the percussion rate set at the EASY level (completely counter clockwise) and increase the driving pressure until appropriate chest wiggle is noticed. For patients with copious amounts of secretions lowering the artificial airway cuff pressure is suggested to facilitate secretion mobilization around the airway and prevent possible obstruction of the airway. If necessary, fine tune the rise in airway pressures by adjusting the pressure relief valve counterclockwise.
2. Once an adequate level of driving pressure is established rotate the percussion rate clockwise towards the HARD setting, observing the patients chest movements especially during exhalation. Continue to rotate the percussion rate knob so that the “arrow” is facing the “12 O’clock” setting, if tolerated by the patient. This becomes the HARD setting for the treatment.
3. Keeping the driving pressure constant, rotate the percussion rate between the EASY and HARD settings at 5 minute intervals.  
(continued on the next page)
4. Monitor the patient’s cardiopulmonary status, check for the migration of secretions into the oral pharynx, and perform airway suctioning when needed.
5. A typical IPV treatment should last approximately 20 minutes.

## At The Completion Of The Treatment

1. Reset cuff pressure
2. Remove IPV inline manifold and restore all ventilator controls to pre-treatment settings.
3. Assess patient and perform airway suction when indicated.

## **\*Special Considerations for Various Mechanical Ventilators**

### Puritan Bennett 7200 Ventilator (or PB 840)

1. Turn off Pressure Support and Flow-By
2. A rate of greater than 8 bpm must be set, use SIMV only. CPAP may be used without PSV and flow-by. If rates less than 8 bpm are used a 4205 error code may occur which if allowed to happen more than 3 times in 24 will result in the ventilator going in-operative and requiring an EST. (This last problem does not occur with the 840, although high *calculated* tidal volumes will be reported by the ventilator)

### Siemens 300/300A or Servo I Ventilator

1. Turn off Automode. PRVC and VS can be used for inline IPV; however the extra flow from the IPV unit will cause an initial drop in delivered tidal volume with a resulting increase in pressure from the ventilator. After several breaths, pressure will return back to where it was prior to IPV treatment.

### Dragger Ventilators

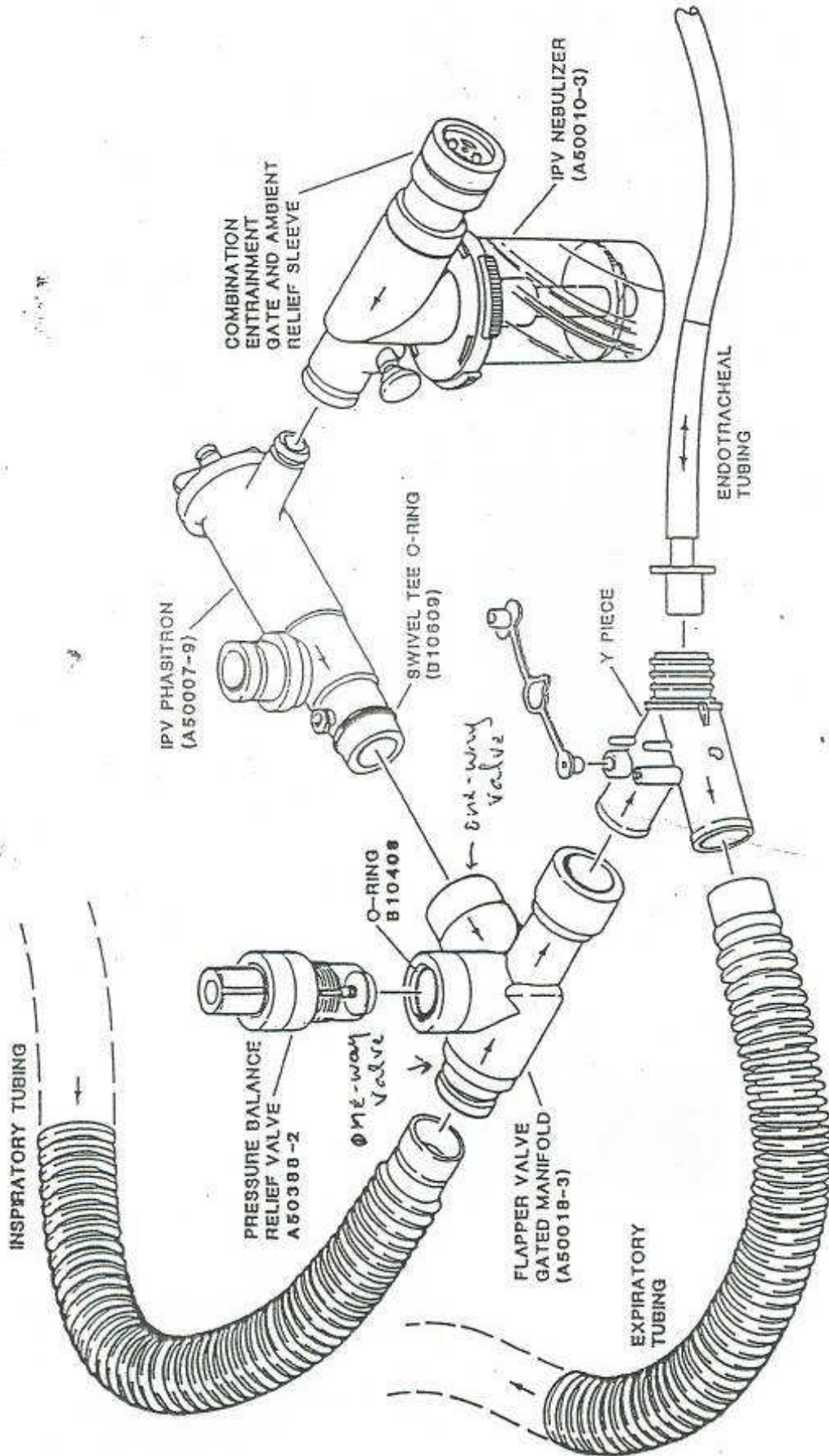
1. Disabling the expiratory flow sensor will reduce the number of alarm violations during a treatment.

**It is recommended that the practitioner set up a working model of an inline treatment, using a test lung, prior to performing the therapy on a patient.**

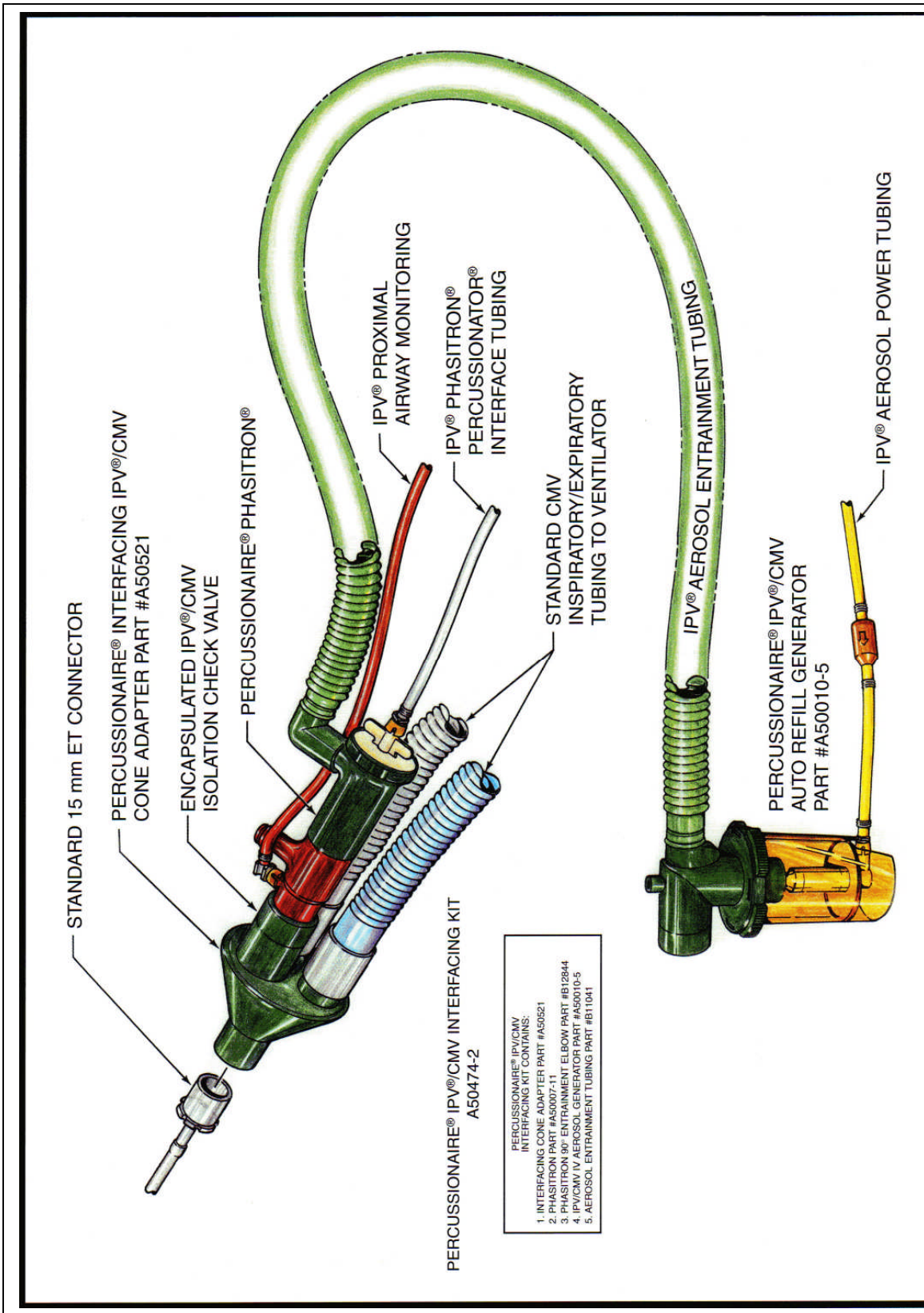
#### **Notes**



Diagram 1



GENERAL SCHEMATIC OF A  
ONE ON ONE INTERMITTENT IPV<sup>®</sup> THERAPY INTERFACE  
KIT NO. A50474

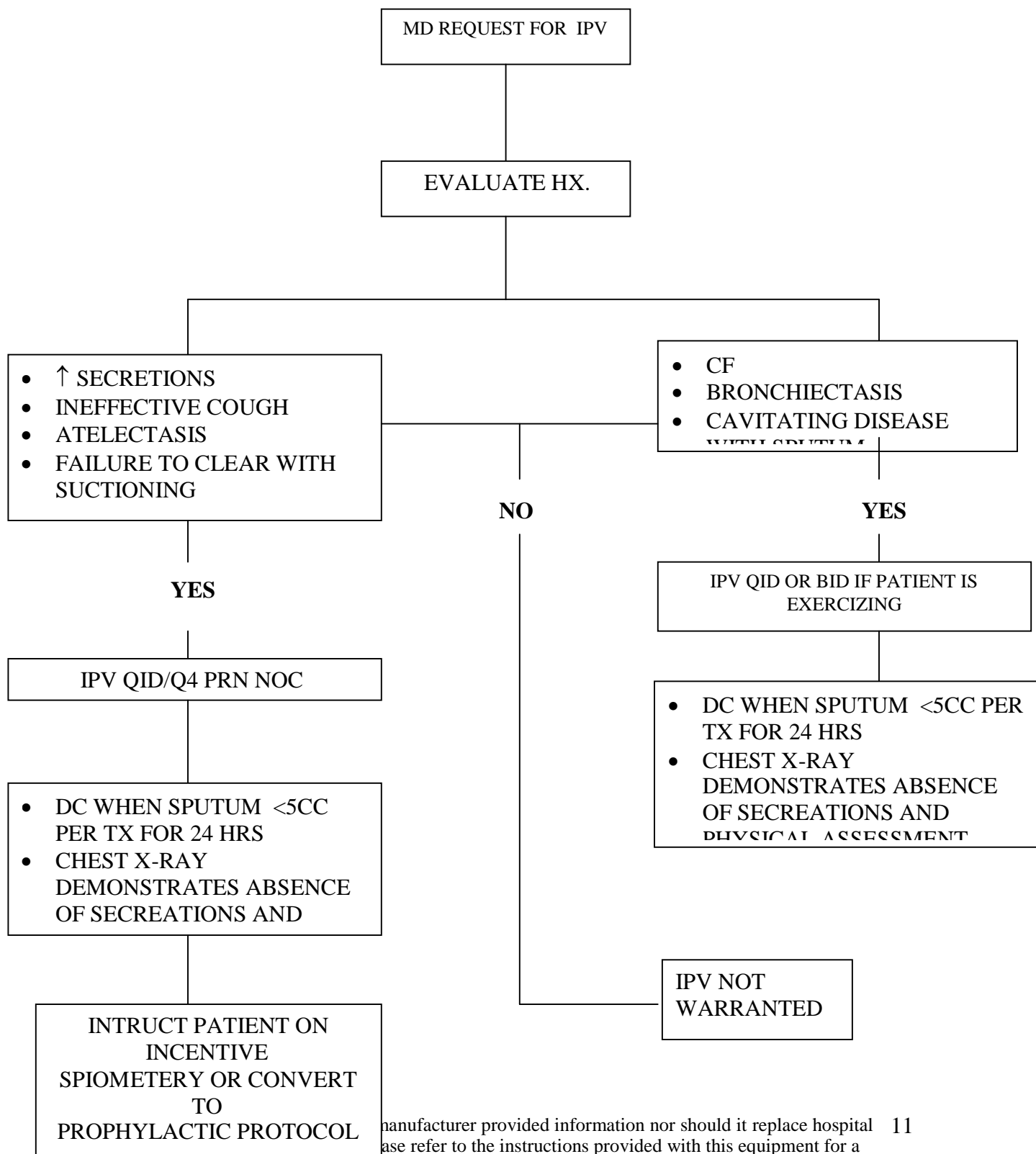


**Diagram 2**

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## IPV ALOGORITHM



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