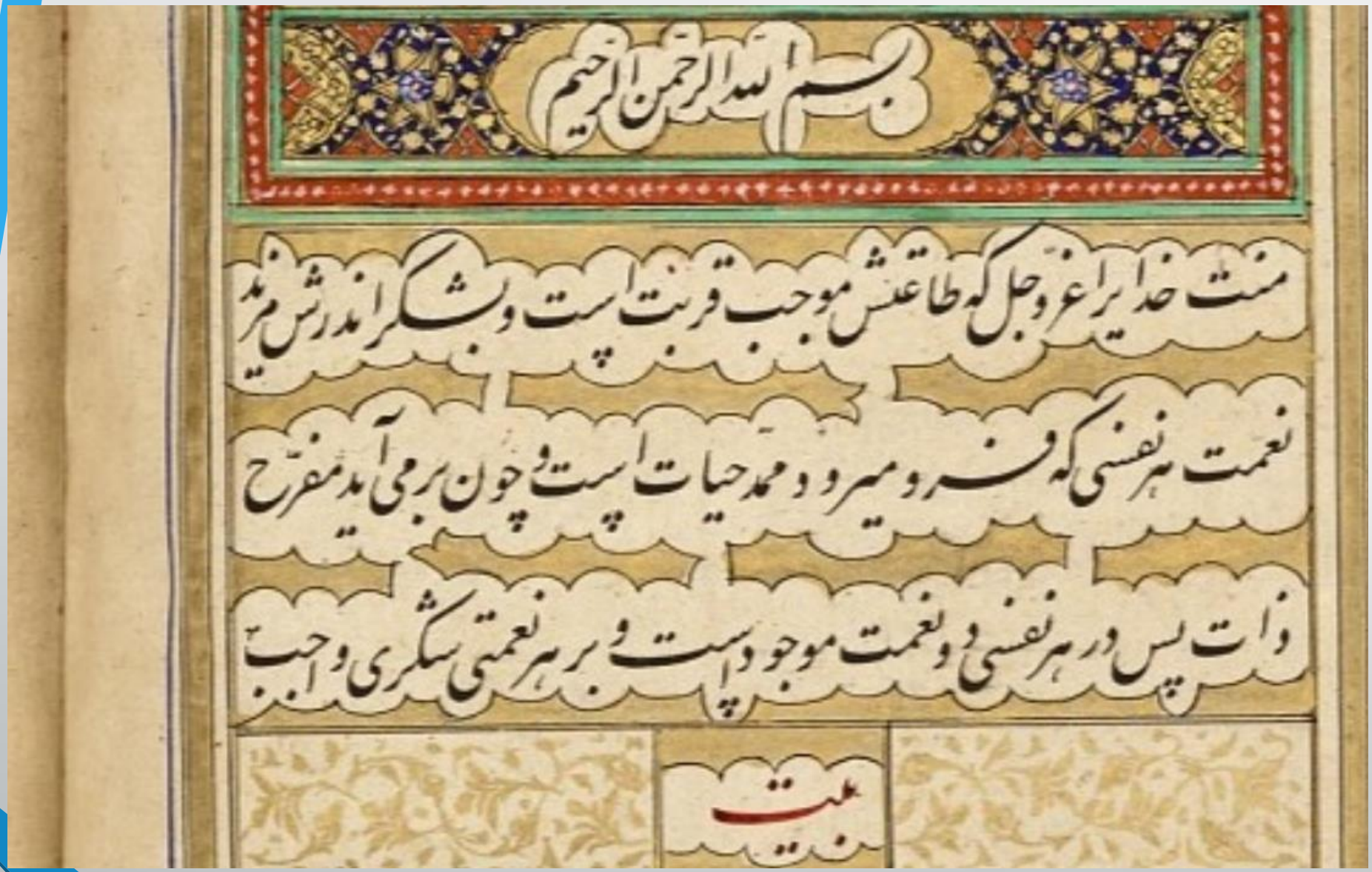

بسم الله الرحمن الرحیم

منت خدایرا عزوجل که طاعتش موجب قربت است و بشکر اندرش مزید

نعمت هر نفسی که فرو میرود ممد حیات است و چون برمی آید مفرح

ذات پس در هر نفسی دو نعمت موجود است و بر هر نعمتی شکری واجب

بیت

Mechanical ventilation

Positive Versus Negative Pressure Ventilation

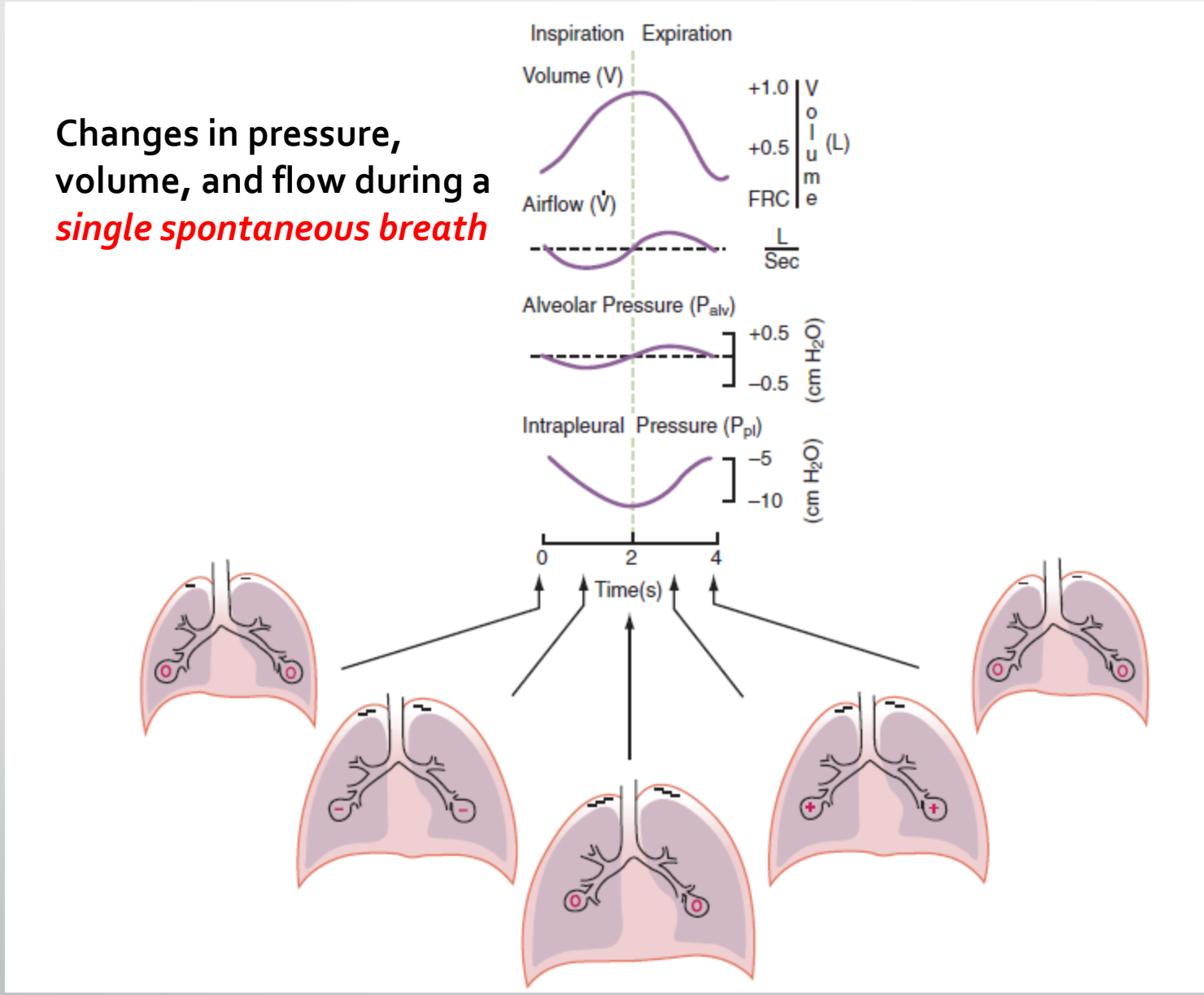
Dr zeinab naderpour

Assissant professor of Tehran University of Medical Sience

Box 4.1 The Four Phases of the Respiratory Cycle

1. Changeover from expiration to inspiration
2. Inspiration
3. Changeover from inspiration to expiration
4. Expiration

Changes in pressure, volume, and flow during a *single spontaneous breath*

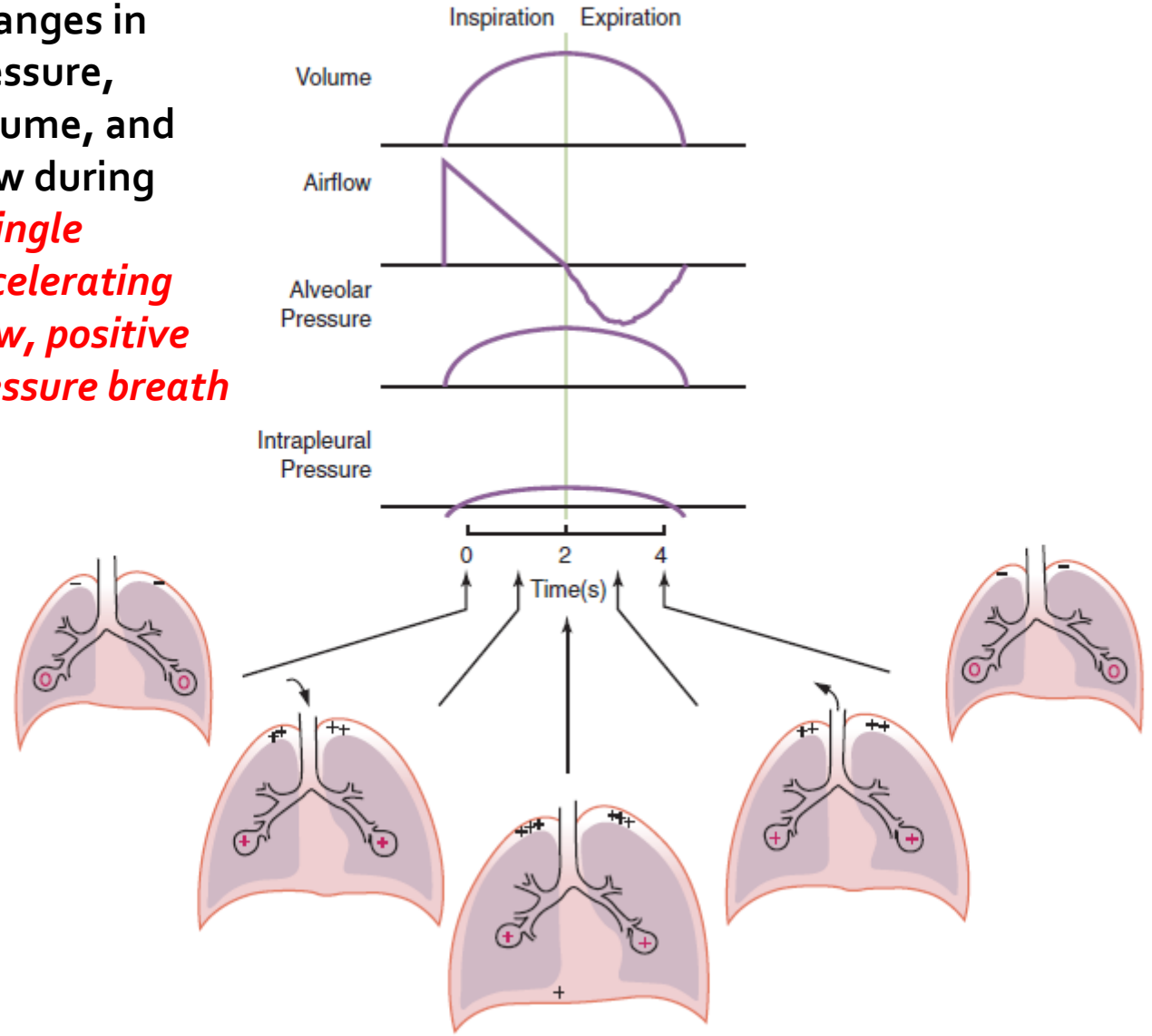


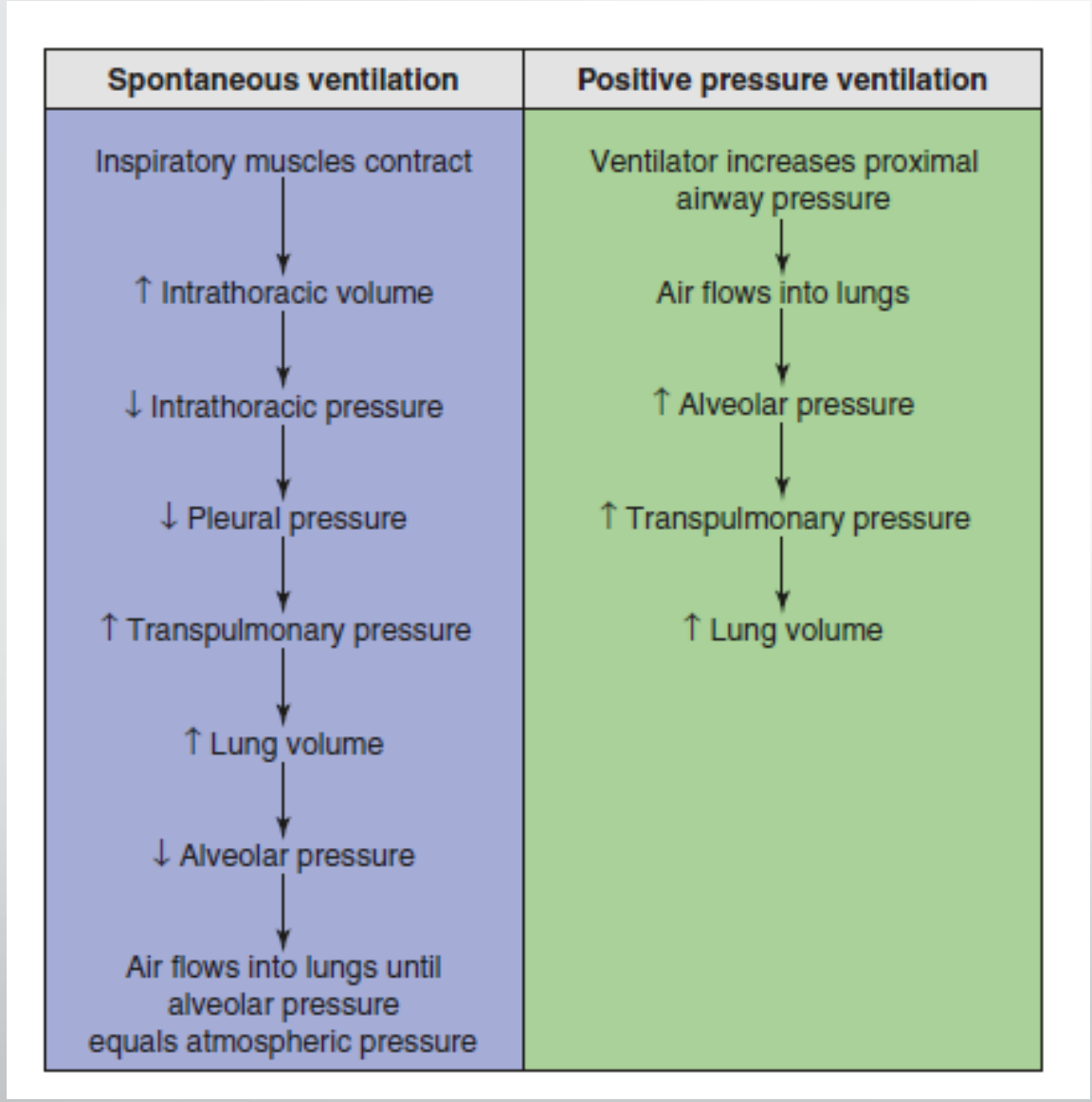
Children in iron lungs during a polio outbreak in the US in the 1950s.
Photograph: Science History Images

Paul Alexander in his iron lung

- The iron lung uses a negative pressure system. Powered by a motor, its bellows suck air out of the cylinder, creating a vacuum around the patient's body and forcing the lungs to expand and take in air. When the air is let back in, the same process in reverse makes the lungs deflate. The device needs a source of energy to function.

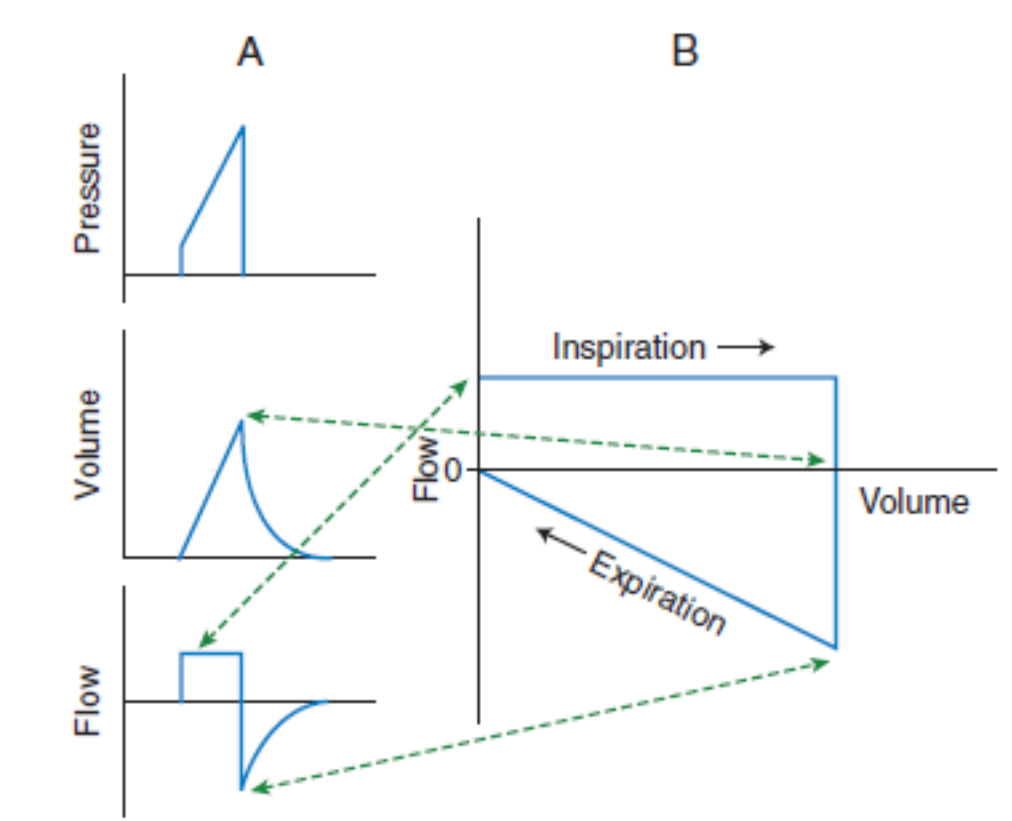
Changes in pressure, volume, and flow during *a single decelerating flow, positive pressure breath*



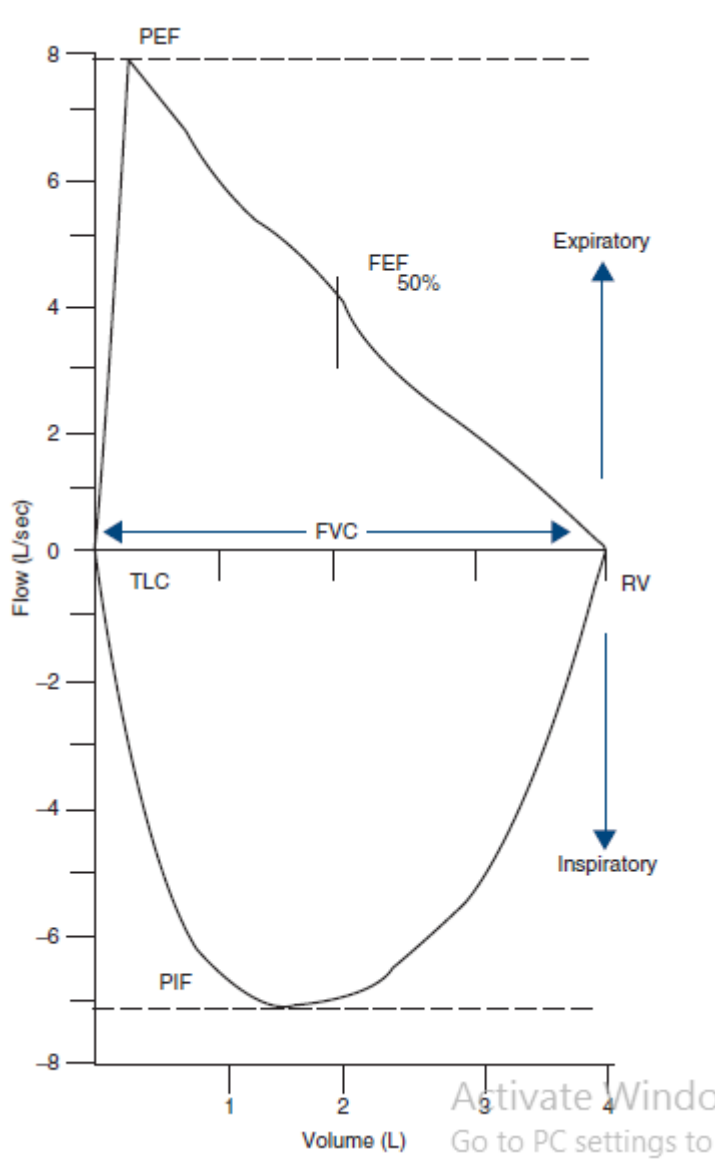

Spontaneous ventilation
Positive pressure ventilation
Inspiratory muscles contract
↑ Intrathoracic volume
↓ Intrathoracic pressure
↓ Pleural pressure
↑ Transpulmonary pressure
↑ Lung volume
↓ Alveolar pressure
Air flows into lungs until alveolar pressure equals atmospheric pressure
Ventilator increases proximal airway pressure
Air flows into lungs
↑ Alveolar pressure
↑ Transpulmonary pressure
↑ Lung volume

Positive pressure ventilation

Waveforms and Loops



Negative pressure ventilation



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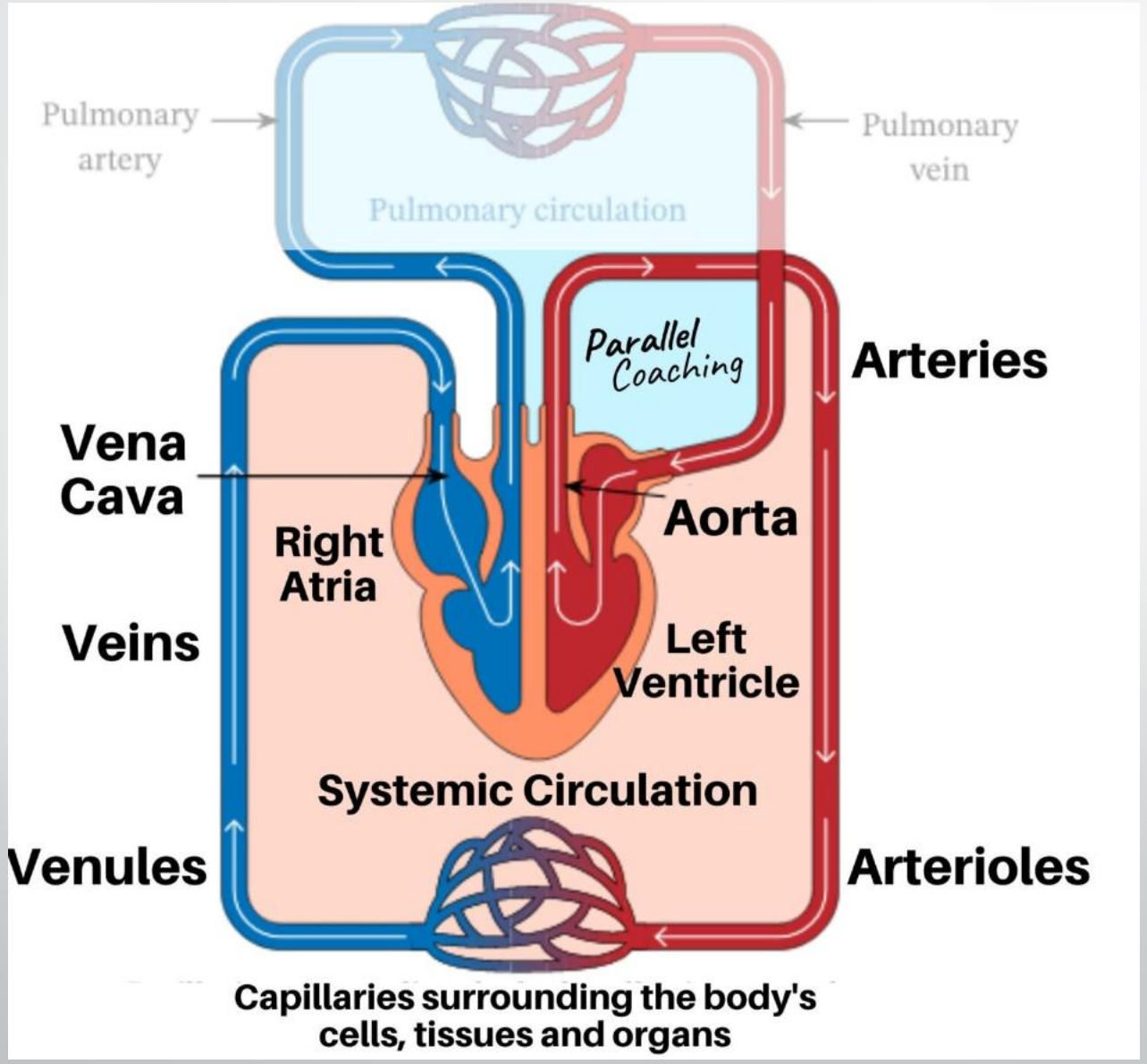
The effect of PPV on hemodynamics



The effect of PPV on hemodynamics

- During spontaneous inspiration, decreased intrathoracic pressure augments venous return and preload. Cardiac output is increased, and there is an increased pressure gradient between the left ventricle and aorta.

- With the initiation of positive-pressure ventilation (PPV), the opposite occurs: venous return is diminished, cardiac output falls, and there is a decreased pressure gradient between the left ventricle and aorta. Hypotension can occur after ventilatory support has been initiated and may be exaggerated in patients with clinical hypovolemia or vasodilatory states.