

What Triangle Waveform Does

- At peak pressure, delivers a **brief, intense thump** on the chest that helps **shear mucus**,¹ **aiding transport** out of the airways
- 20% increase in sputum production with triangle waveform (vs. sine)²

How Triangle Waveform is Produced

- A **unique air chopping valve** creates the sharp, brief peak air pressure pulses/spikes
- Sine wave systems use a diaphragm that squeezes air back and forth within the system; the resulting waveform is not as sharp

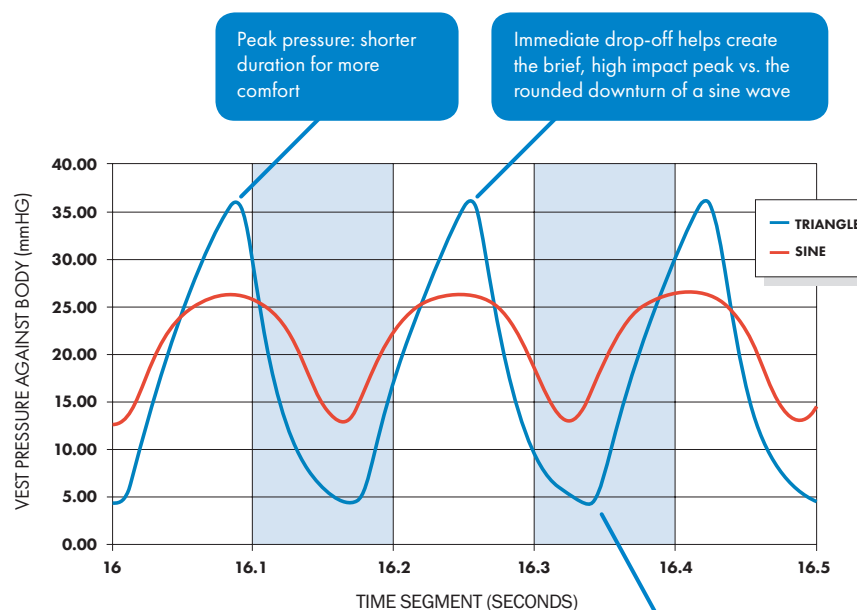
Why the inCourage® System Works Well

- **Comfort/Active Venting:** immediate release of air in response to user's breath; feels less constricted; allows deeper inhale¹
- **Deeper breath > allows more airflow > more mucus clearing²** (shearing and out through airways)
- **The only Airway Clearance Therapy (ACT) vest with triangle waveform benefits**

Pressure Graph

Vest Therapy Triangle & Sine Waveforms @ 6Hz

Fig. Vests applied to stationary mannequins using each system's own vest, hoses and waveform generator. Pressure oscillations measured inside the vests (a proxy for pressure against the body) with waveform devices set to maximum output and oscillating at 6 beats per second. Plots begin at point of steady-state pressure operation, approximately 16 seconds from startup. 6Hz frequency allows the waveform shape differences to be clearly depicted.



- Larger triangle wave amplitude (measure of the starting point to peak) and immediate drop-off delivers greater pulse pressure¹
- The triangle wave system does not feel as constricting as sine wave systems. Sine wave systems operate with higher base pressures

How Triangle Waveform Differs

- **Triangle** wave: more like CPT "thump"; **sine** wave: more like a squeeze or compression; easier to breathe with triangle waveform than with sine waveform¹
- **Triangle** wave amplitude (measure of wave base point to maximum) and immediate drop-off yield the quick thump
- **Triangle** wave: **highest airflows and largest volumes** in the lungs occur **over the same frequency** range; best frequencies for flow and volume are **concordant**¹
- Sine wave: highest airflows occur at one end of the frequency range and largest volumes at the other; best frequencies for flow and volume are **discordant**¹

REFERENCES

1. Milla CE, Hansen LG, Weber A, Warwick WJ. High-frequency chest compression: effect of a third generation compression waveform. *Biomed Instrum Technol* 2004;38:322-328.
2. Milla CE, Hansen LG, Warwick WJ. Different frequencies should be prescribed different high frequency chest compression machines. *Biomed Instrum Technol* 2006;40:319-324.

