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Advances in
pulmonary management of
the critically ill infant

 **bunnell**
INSPIRED INFANT CARE

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What Does Your
Vent Tell You?

Is Easier Better?

Every year we are fascinated by changes in Life Pulse High-Frequency Jet Ventilator usage. At some hospitals usage goes up 200%. At others it goes down that same amount. And the question we have to ask ourselves is why?

When usage goes up the answer is usually, "we've gone back to using the Jet for treating airleaks" or "we use the Jet to rescue patients that don't respond to other ventilation therapies."

When usage goes down the answer is usually, "we are using our conventional ventilators better and don't see as many airleaks" or "we use the oscillator as our primary high-frequency because it's easier."

It's this last answer that worries us a little. Is easier better? Better for clinicians maybe because there is only one ventilator to

manage and a few controls to manipulate. But is it better for the patient?

Is there a basic difference in gas delivery mechanisms that benefits patients or is it simply a matter of using the appropriate strategy. There is no question that the oscillator is easier to

the Jet to support patients with airleaks at lower peak and mean airway pressures; the classic low volume strategy.^{1,2,3} Monitoring PEEP independently via the LifePort adapter can identify gas trapping without the need for repeated chest films.⁴ Trending changes in Servo

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use but at what cost? The Jet provides clinicians with more information about the patient and the ventilator, and it offers a greater variety of ways to adjust the ventilator therapy to meet the patients changing pathophysiology.

Having sigh-breaths and the ability to control PEEP independently through the tandem conventional ventilator allows

Pressure can alert the clinician to changes in the patient's resistance or compliance so adjustments can be made before the patient is adversely affected.

Are we trying to say the oscillator is a bad ventilator because it's easy to use? NO! Ease of use is fine unless it lulls you into a false sense of security. If the ventilator doesn't provide you with information

about changes in your patient, then you have to get that information from other sources: xrays, blood gases and ultrasounds.^{5,6}

The Jet provides more information and gives you immediate feedback on your patient. It also allows you the flexibility to fine tune the ventilator to your patient's changing needs. If this gives clinicians the perception that the Jet isn't as easy to use, we'll accept that criticism. With busy NICU's that are under-staffed but still need to be effecient, we want to provide clinicians timely information to care for their patients safely.

Difficult or easy, one thing we know for sure is the Jet is being used more every year and more patients will be treated on the Jet in 2000 than in any year since its creation. To receive additional training or educational information please contact, Evan Richards at 800-800-4358, ext. 37 or evan@bunl.com.

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3. Keszler M, Donn SM, Bucciarelli RL, et al. Multicenter controlled trial comparing high-frequency jet ventilation and conventional mechanical ventilation in newborn infants with pulmonary interstitial emphysema. *J Peds.* 1991; 119:85-93

4. Loughnan PM. High-frequency jet ventilation in mature infants with non-homogeneous lung disease and severe gas trapping. Presented at the 17th Conference on HFV of Infants and Children, Snowbird, UT 2000. (Abstract)

5. Morison D, Derdak S. High-frequency oscillatory ventilator parameter changes in response to simulated clinical conditions using a mechanical test lung. Presented at the 17th Conference on HFV of Infants and Children, Snowbird, UT 2000. (Abstract)

6. Acherman RJ, Siassi B, deLemos R, Lewis AB, Ramanathan R. Cardiovascular effects of high-frequency oscillatory ventilation with optimal lung volume strategy in term neonates with adult respiratory distress syndrome. Presented at the 12th Conference on HFV of Infants and Children, Snowbird, UT 1994. (Abstract)

Do You Have Any Interesting Case Study?

We frequently hear amazing stories about how a patient has been saved using the Life Pulse. We have encouraged clinicians to write-up these cases and send them to us or submit them to a conference. Unfortunately, many clinicians now days are too busy at work to have time to write-up a case study.

We would like to know what we could do to help. Case studies are a great way to share information and increase understanding, not to mention get exposure for you and your hospital.

If you have any ideas or suggestions about how we could help, please contact Evan Richards, our Clinical and Educational Specialist, at 800.800.4358 ext. 37 or evan@bunl.com

Does Your Ventilator Tell You When Your Patient Isn't Doing Well?

Does your favorite ventilator alarm when your patient blows a pneumothorax? Does it tell you when your patient needs to be suctioned? Does it "notice" when a baby is getting inadvertent PEEP? Does it alert you when your patient improves?

If your favorite ventilator is the Jet, the answers to these questions are: **Yes!**

The Jet provides clinicians with valuable information about their patients automatically. The three key Monitor displays to watch are Servo Pressure, Mean Airway Pressure, and PEEP.

Servo Pressure is the driving pressure inside the Life Pulse Ventilator. When the Enter button is pressed to begin HFJV, the Jet's pinch valve opens for the typical 20-msec inspiration. Gas behind the opened pinch valve develops airway pressure as it rushes into the patient's ET tube. If the airway pressure (monitored just downstream from the jet nozzle in the LifePort adapter) fails to reach the set PIP, Servo Pressure rises. If monitored PIP exceeds set PIP, Servo Pressure is reduced. Thus, tidal volume is automatically increased or decreased to maintain set PIP.

When monitored PIP is stable, the little Ready light comes on and the alarm limits are set. Then if the patient's lung mechanics change, Servo Pressure will change to keep the monitored PIP equal to set PIP.

Servo Pressure Alarms

Suppose your patient develops a pneumothorax. Initially, the Servo Pressure goes up as gas escapes into the extrapulmonary space but as this gas accumulates compliance goes down as the lungs undergo compression. The smaller lung volume results in a higher PIP, so Servo Pressure is reduced to keep monitored

PIP equal to set PIP. If Servo Pressure drops enough to hit its lower limit, an alarm is activated. Once a chest tube is inserted, Servo Pressure will rise to compensate for the gas being drained by the chest tube and the subsequent improvement in compliance.

Upper and lower limit alarms are manually adjustable. If you know your patient is prone to air leaks or atelectasis, it may be prudent to tighten Servo Pressure alarm limits. If your patient is "fighting the ventilator", causing Servo Pressure nuisance alarms, alarm limits may be loosened. You can manually fine-tune limit alarms using the up and down arrow buttons adjacent to the upper and lower limit button/displays.

A high Servo Pressure limit alarm is usually good news, meaning lung mechanics have improved. It may be important to wean set PIP at that time in order to avoid hyperventilation.

Low Servo Pressure limit alarms can be an indication of either decreased lung compliance or increased

airway resistance. Decreased compliance may be due to a tension pneumothorax, atelectasis, or the ET tube slipping into the right mainstem bronchus. Increase airway resistance may be due to accumulated secretions at the tip of the ET tube or bronchospasm. If Servo Pressure drops slowly over several hours, it is usually an indication that the patient needs suctioning.

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Mean Airway Pressure Alarms

Changes in Mean Airway Pressure may indicate accidental changes in conventional ventilation settings or inadvertent PEEP. Increased conventional ventilator settings increase mean airway pressure, decreased settings reduce mean airway pressure, and alarm limits are automatically set at ± 1.5 cm H₂O.

The Jet monitors PEEP either at the tip of

the LifePort ET tube adapter or Mallinckrodt Hi-Lo Jet tube. Thus, gas trapping is indicated whenever monitored PEEP becomes higher than that set by the conventional ventilator. Since a 2 cm H₂O rise in PEEP will cause a 2 cm H₂O rise in Mean Airway Pressure, an alarm will sound relatively quickly in such cases.

The information provided by the Jet is only valuable if you understand how to interpret it and know how to respond to it appropriately. If you have any questions about how to do that, please call us on our 24-hour Hotline (800.800.4358) or check out our website: www.bunl.com.

In the Clinical section under Patient Management reference General Guidelines and Understanding Servo Pressure.

We would be happy to schedule a visit to your hospital to discuss this topic or other topics of interest to you, related to the Jet. To schedule training or a lecture please contact Evan Richards at 800.800.4358 ext. 37 or evan@bunl.com.