Exploring ***Non-Traditional Settings*** in Mechanical Ventilation: Fine-Tuning Beyond Ordered Parameters

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Objectives

1. Understand the **concept of non-traditional**, “boutique” **ventilator settings** and how they differ from conventional ventilator settings in managing patient care.
2. Identify key parameters of non-traditional ventilator modes and settings, including **their indications and benefits** for specific patient populations.
3. Apply critical thinking to **determine when to consider** and implement boutique ventilator settings in clinical practice to optimize respiratory support and patient outcomes.

Have you ever been here?

We **will not** be addressing special maneuvers or respiratory mechanics acquisition functions

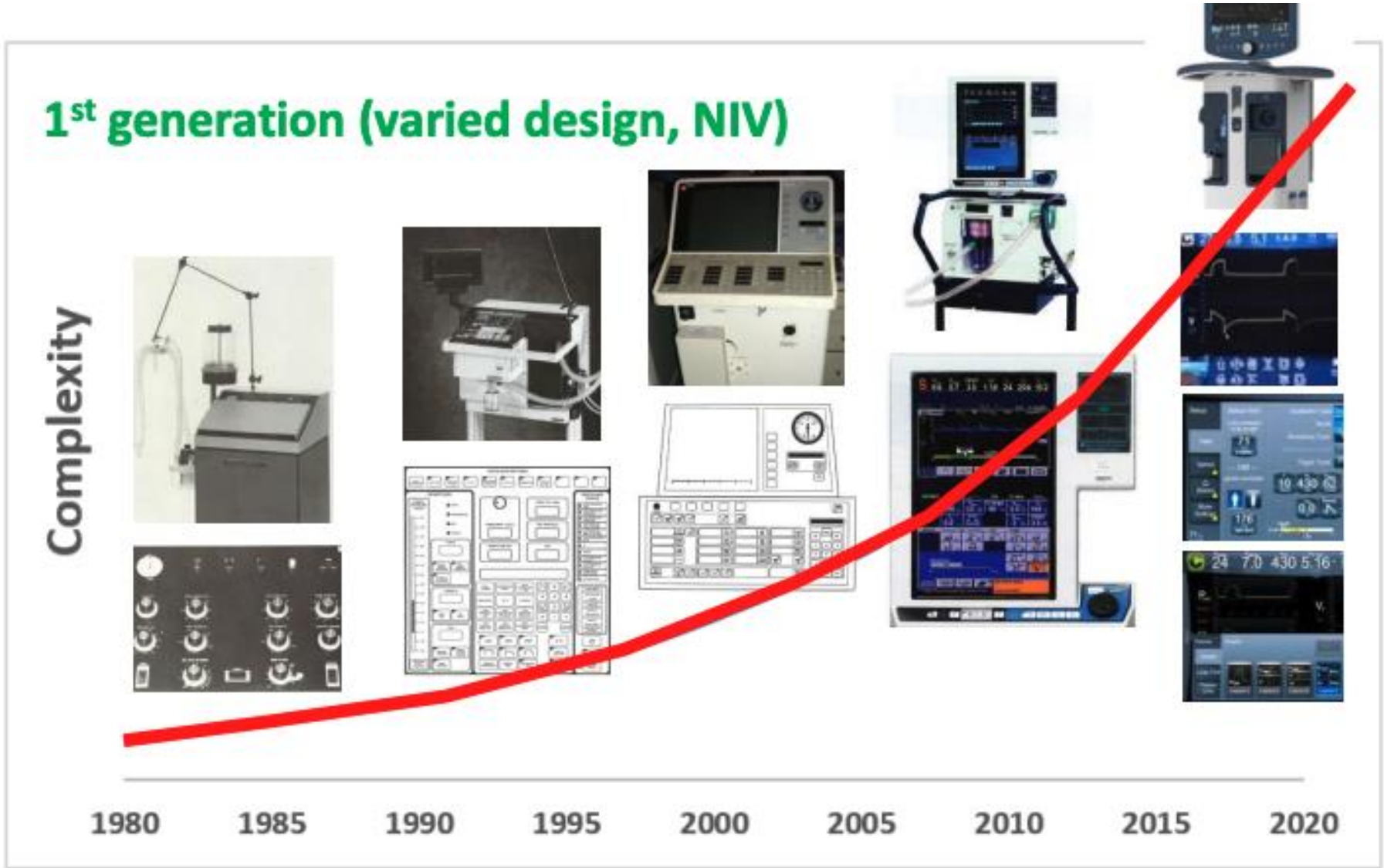
- Inspiratory Pause = Plateau Pressure Measurement
- Expiratory Pause = Total PEEP (Auto-PEEP) Measurement
- NIF Maneuver = Maximum Inspiratory Pressure Measurement
- $P_{0.1}$ Maneuver = Occlusion Pressure Measurement
- VC Maneuver = Vital Capacity Measurement

Disclaimer

Various ventilators, products, and similar items may be displayed **solely for discussion and illustrative purposes**. There is no intention to suggest that any specific device is preferred or superior to others. The images are provided for reference and to support the learning experience.

Non-traditional, “boutique” settings may not be acutely impactful over ABG’s as much as potentially impactful over patient synchrony & comfort


VCV
15
6
2
5.0
418
28
1
12
43
1.8
2.0
0.9
53
57
Air
1.5
N2O
0.0
O2
1.5
Total Flow
3.0
FiO2 %
61
VCV
400
12
1:2
Off
Off
30
300
600
900

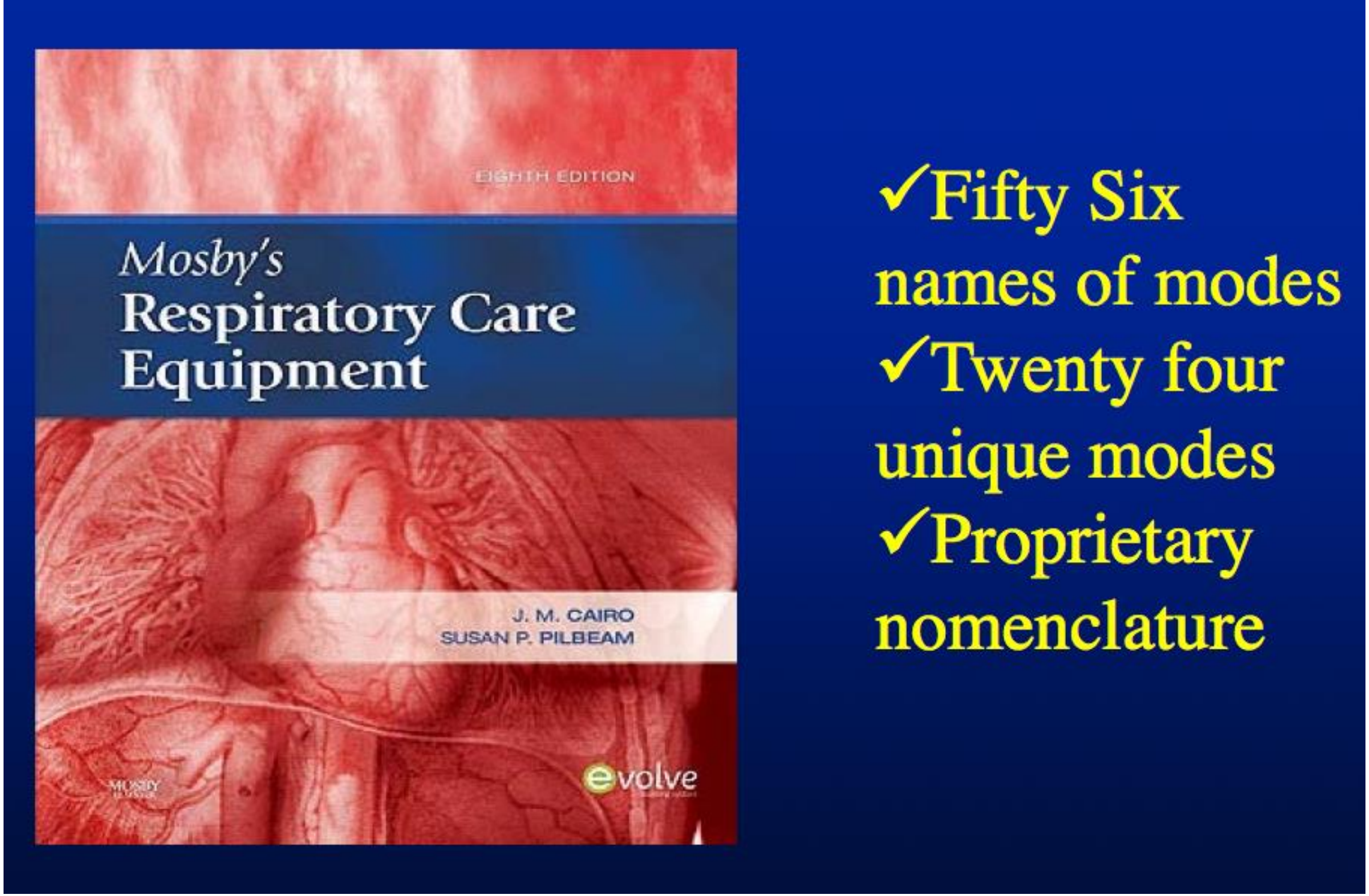


Source: (with permission) Prof. R. Chatburn, Respiratory Institute, Cleveland Clinic

NOMENCLATURE

- Non-universal
- Vague

- Categorical vs. Actual Mode



Courtesy: Dr. Jeffrey L. Johnson, Denver Health

The Complexities of Mechanical Ventilation: Toppling the Tower of Babel

Robert L Chatburn

RESPIRATORY CARE • JUNE 2023 VOL 68 NO 6

most recent equipment book[4] lists almost 500 unique names for modes on 55 different ventilators. It is not uncommon for ICU ventilators to have dozens of modes. (Indeed, on one ventilator I have documented 75 different names for modes, whereas the operator's manual only identifies 16.) And yet there are certainly not over 500 modes that are actually distinct according to a formal classification scheme. In this textbook, which classifies all modes on all ventilators according to a formal taxonomy, there are only 74 unique modes. A taxonomy is a classification system. I intend to convince the reader that mode classification is the first step in bridging the knowledge gap created by advanced technology.

PAUCEK AND LAGE RESTAURANT

FOOD MENU

Grilled Salmon

$18.99

Fresh salmon fillet seasoned with herbs and grilled to perfection, served with a side of roasted vegetables and lemon-butter sauce.

Vegetable Pad Thai

$13.99

Stir-fried rice noodles with a medley of fresh vegetables, tofu, bean sprouts, and peanuts, tossed in a tangy tamarind sauce and garnished with cilantro and lime wedges.

Mushroom Risotto

$14.99

Creamy rice cooked with savory mushrooms, garlic, shallots, and Parmesan cheese, finished with a drizzle of truffle oil and fresh parsley.

Grilled Chicken

$12.99

Grilled chicken breast served atop crisp lettuce, tossed with dressing, shaved cheese, garlic croutons, and cherry tomatoes.

Classic Beef

$16.99

Layers of rich tomato sauce, seasoned ground beef, lasagna noodles, and creamy béchamel sauce, baked to bubbly perfection and topped with melted mozzarella cheese.

Eggplant Parmesan

$15.99

Slices of breaded eggplant, fried to a golden crisp, layered with marinara sauce, mozzarella, and Parmesan cheese, then baked until bubbly and served with spaghetti marinara.

Beverage

Classic Margarita	$3.99
Mango Mocktail	$2.99
Iced Caramel Macchiato	$4.99
Green Tea Frappuccino	$3.99
Pineapple Coconut Smoothie	$5.99
Raspberry Mojito	$3.99
Blackberry Ginger Sparkler	$2.99

Dessert

Chocolate Mousse	$5.99
Apple Pie	$7.99
Strawberry Shortcake	$6.99
Fruit Tart	$5.99
Tiramisu	$8.99
Chocolate Lava Cake	$6.99
Cheesecake	$5.99

DECISIONS IN SEQUENTIAL ORDER

1. Invasive vs. Non-invasive
2. Ventilator availability (i.e., type, model, brand)
3. Mode of PPV & Breath Type/s Needed
4. Primary Settings (main control variables: volume or pressure, etc.)
5. Secondary Settings (‘boutique’ settings, ‘fine tune’ parameters)
6. Alarm Settings

2 Main Categories of Settings

Most Important, Need to Set:

- **Mode Type**
  - Mandatory, Spontaneous or Hybrid
  - Target Variable
    - Volume, Pressure or Hybrid
- **Main Settings**
  - V_T, PC level
  - RR, FiO2, PEEP, I:E (or I-time)
  - Trigger Type/Sensitivity
  - Inspiratory Flow Pattern (?)

Less Important, Need to Set(?)

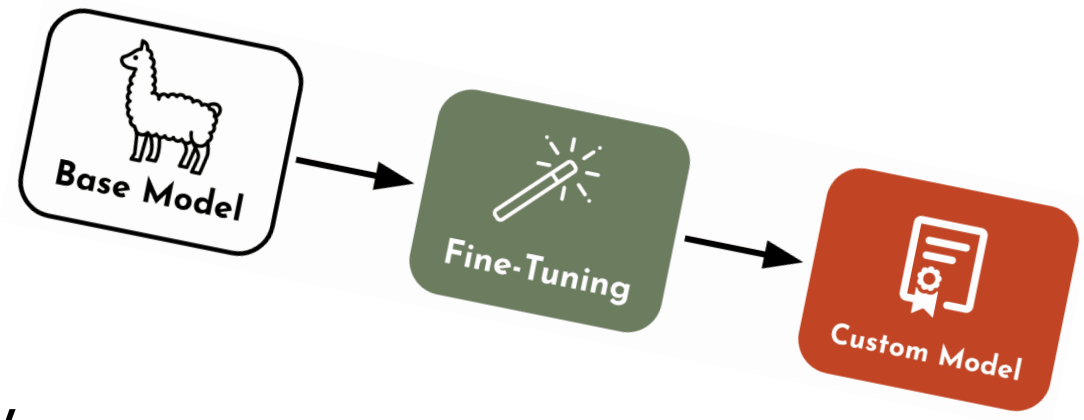
- **Inspiratory Phase**
  - *Example*: Rise Time
- **Pressure Support-Related**
  - *Example*: Cycle Off (%)

Non-traditional Settings

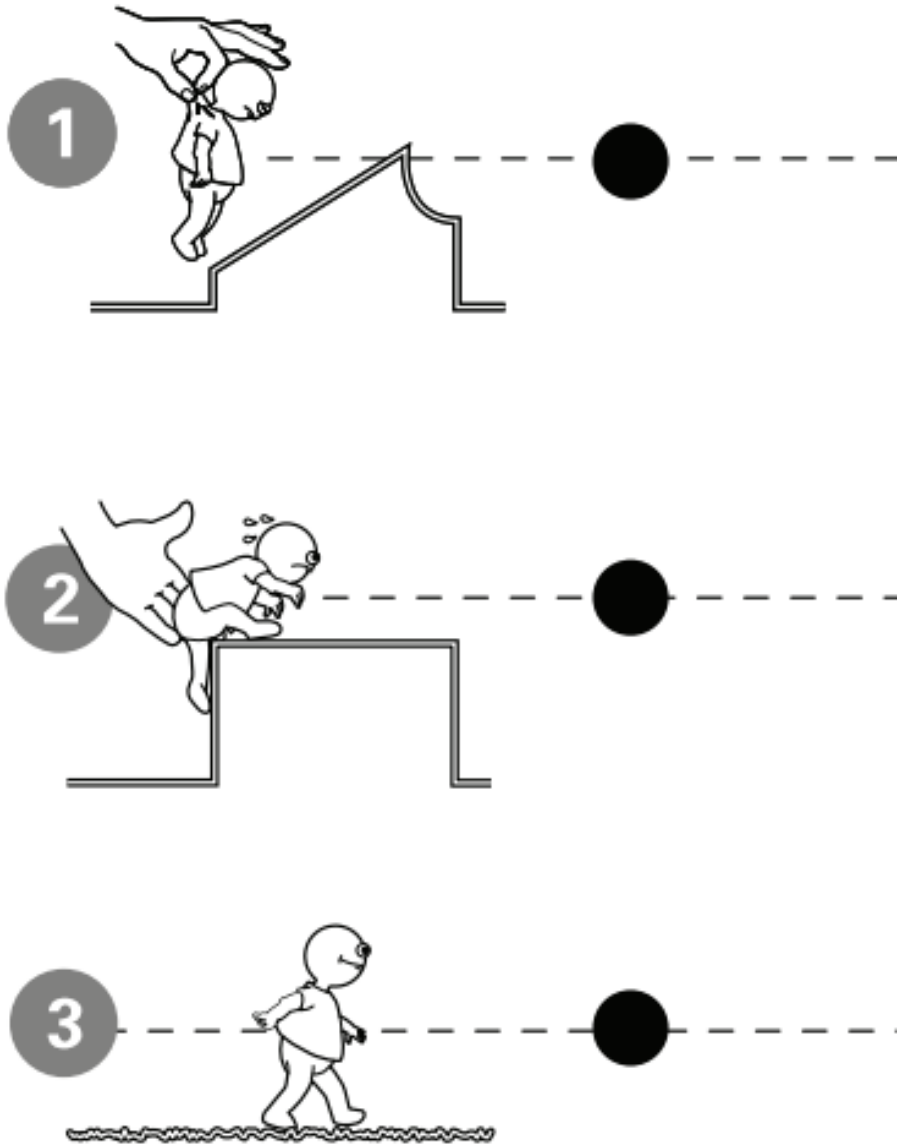
- aka. “Boutique” or “Fine Tune” settings
  - “Tailored” settings

<u>Function/Purpose</u>:

1. Manipulate breath delivery
2. Enhance patient comfort
3. Prevent and/or “treat” asynchrony



6.1.3 Scope - ventilatory needs



The ventilator can be used for:

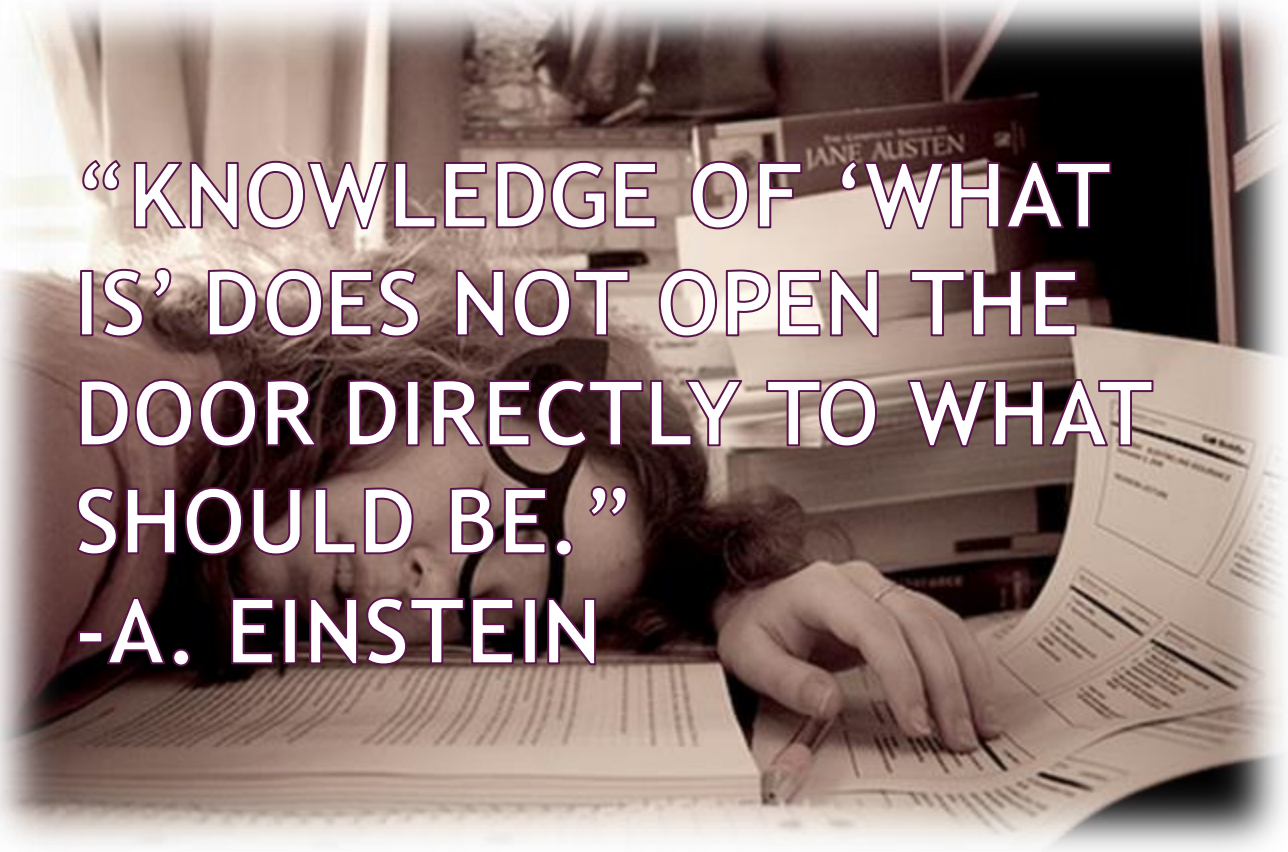
1. controlled ventilation
2. supported ventilation, or
3. spontaneous breathing/CPAP

Source: SERVO-i VENTILATOR SYSTEM V8.0, User's Manual

Friendly Reminder:

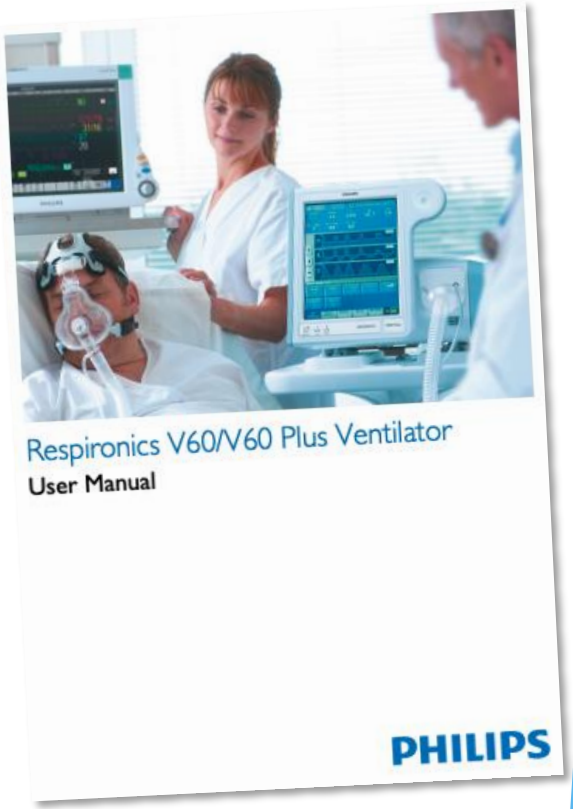
Everyone is different in many ways, size, shapes… preferences…

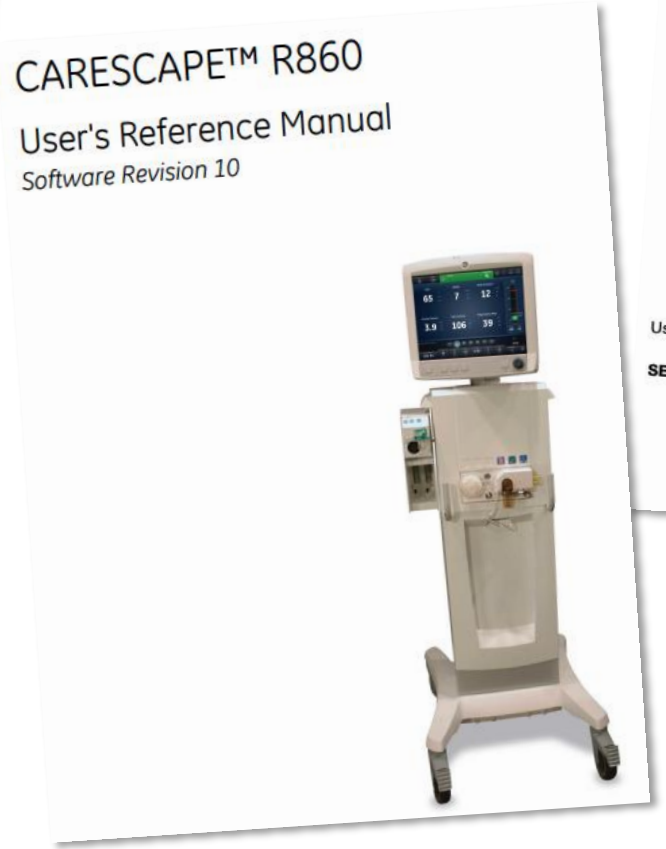
So, why would anyone think we all breathe exactly the same?

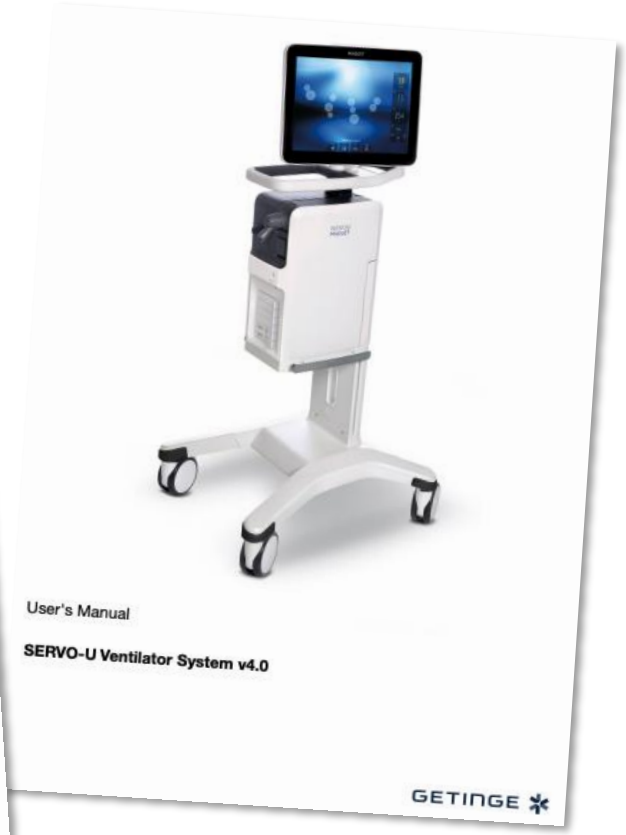


"KNOWLEDGE OF 'WHAT IS' DOES NOT OPEN THE DOOR DIRECTLY TO WHAT SHOULD BE."
-A. EINSTEIN

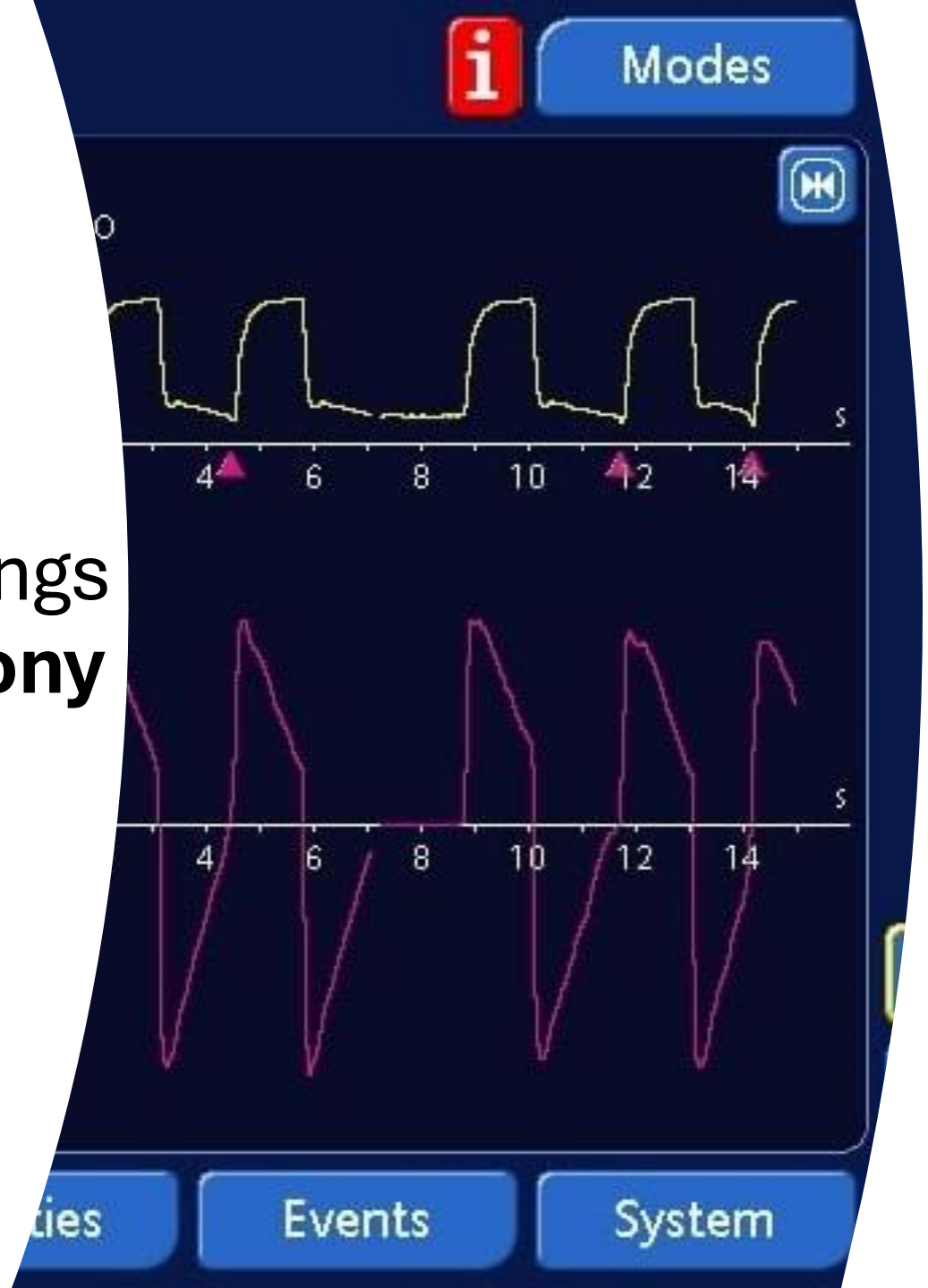
Don’t Forget the User Manual







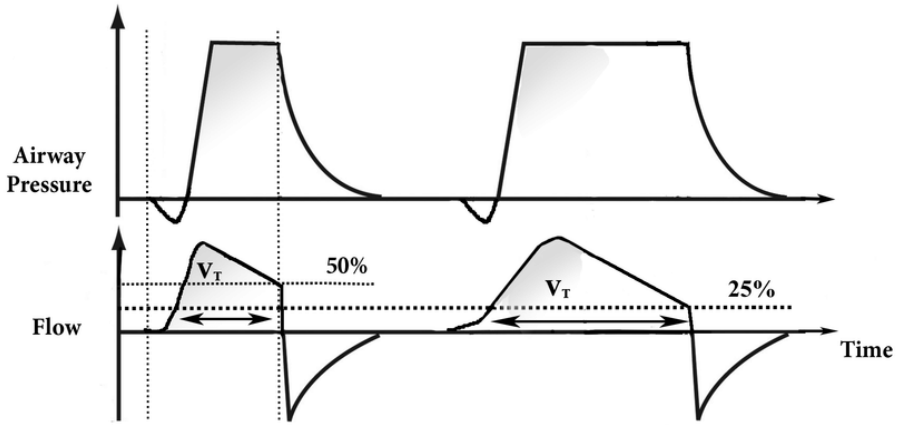
Examples of “Boutique” Settings (Patient **Synchrony** Settings)



- End Inspiration
- Inspiratory Rise Time
- PS Rise Time
- Pressure Rise Time
- Expiratory Trigger
- Pressure Support Time
- Trigger Window
- Pressure Max
- Pressure Limit
- Inspiratory Pause

“End Inspiration”

- aka. Inspiratory Cycle Off (%)
- aka. Expiratory trigger
  - Flow is applied, until…



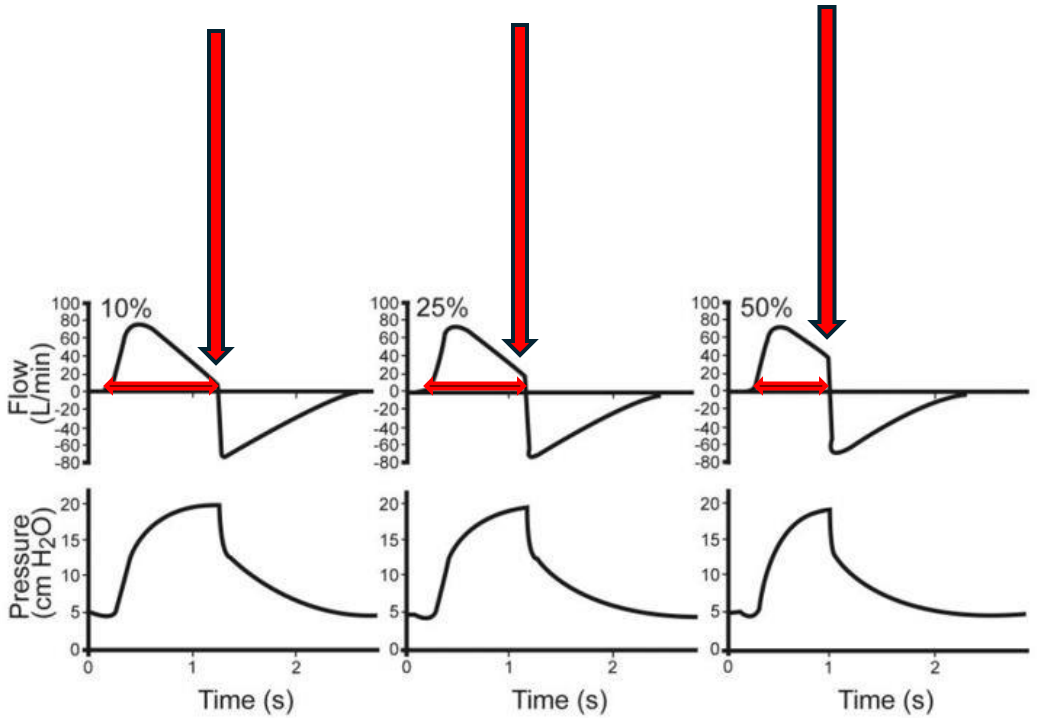
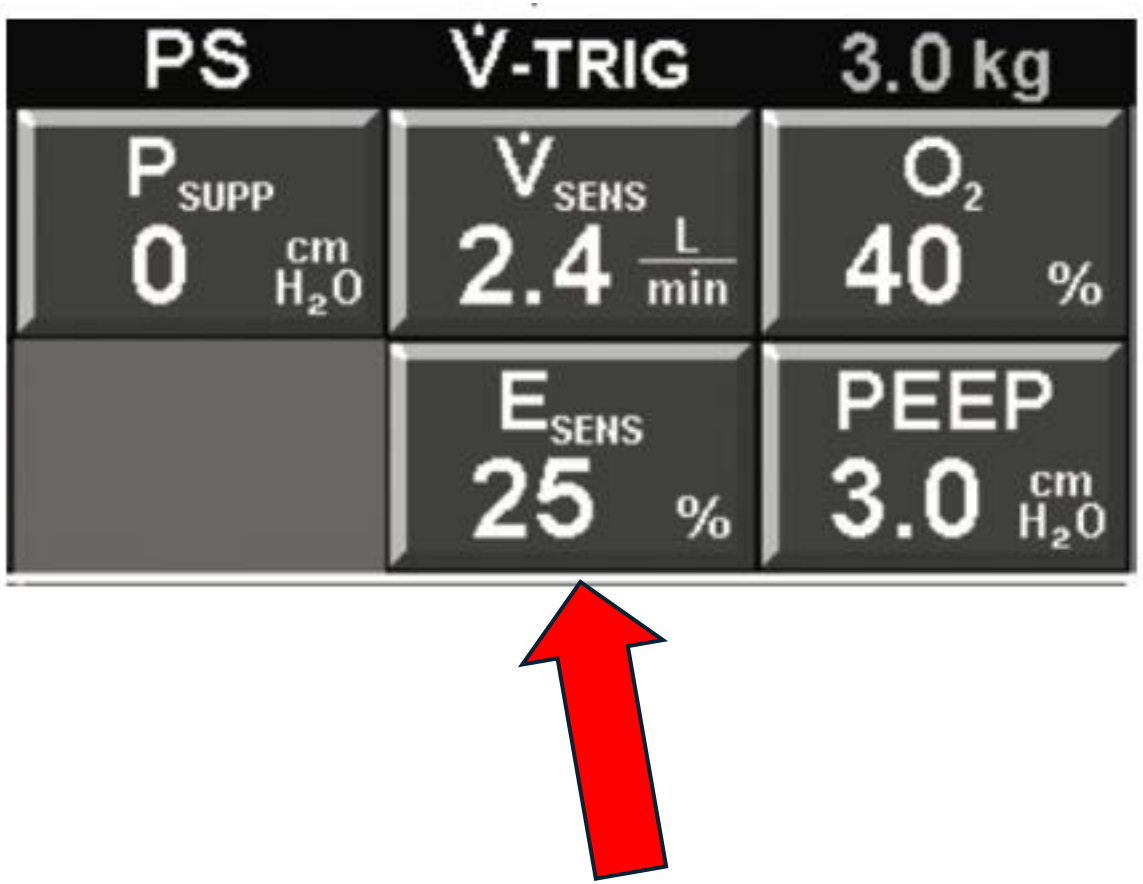
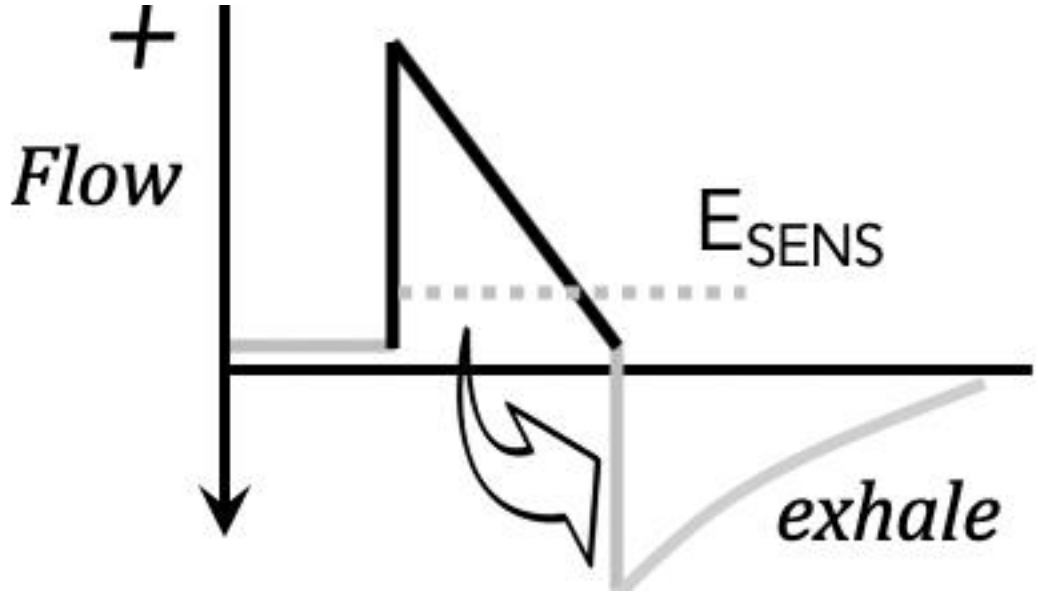


Fig. 3. Lung model waveforms with flow cycling at 10%, 25%, and 50%, with a Puritan Bennett 840 ventilator set on pressure support 15 cm H_2O and PEEP of 5 cm H_2O. The lung model settings were resistance 5 cm H_2O/L/s, compliance 0.05 L/cm H_2O. (Adapted from Reference 19.)

Gentile, Michael A. "Cycling of the mechanical ventilator breath." Respiratory care 56.1 (2011): 52-60.

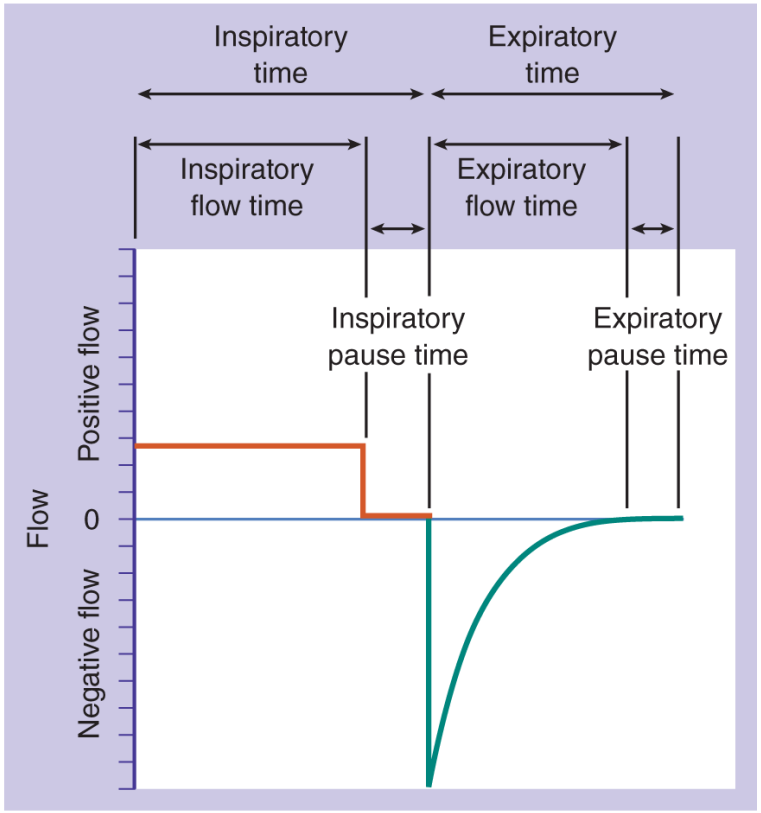
Expiratory Sensitivity

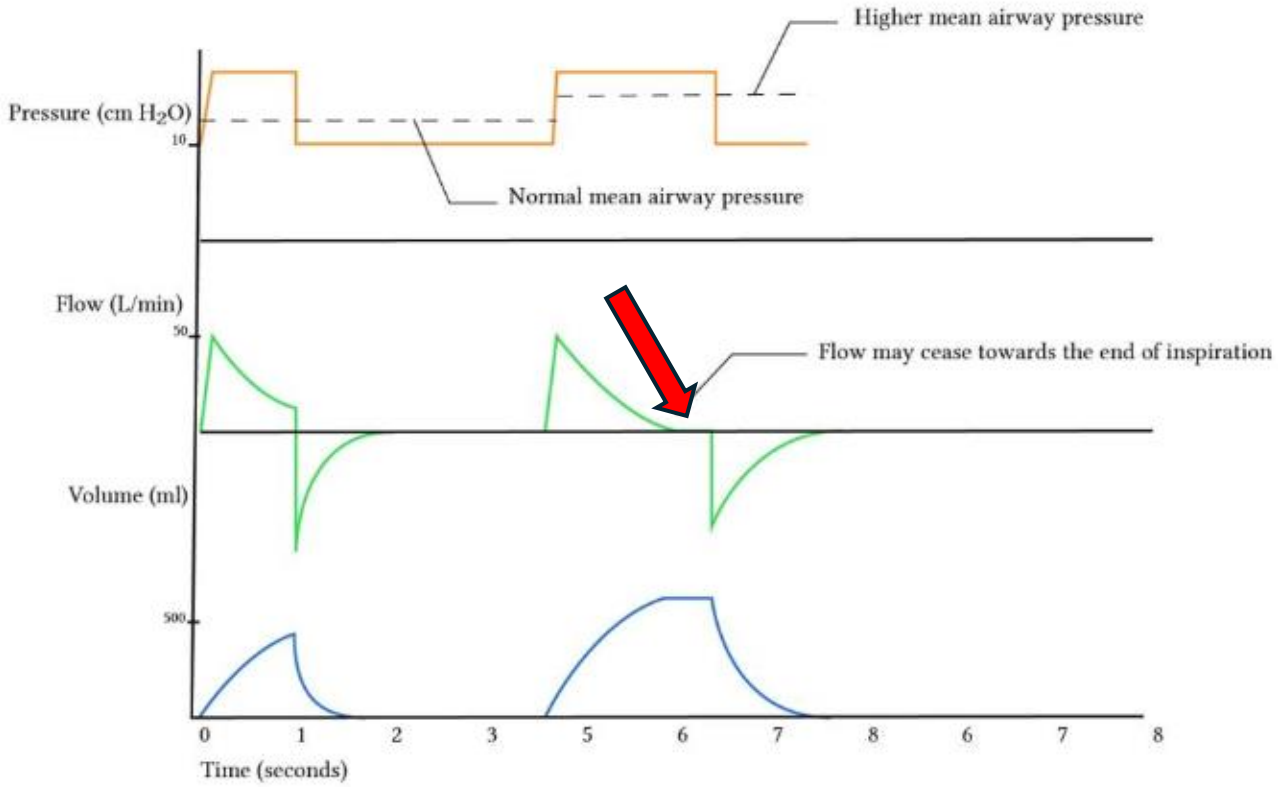




Inspiratory Pause

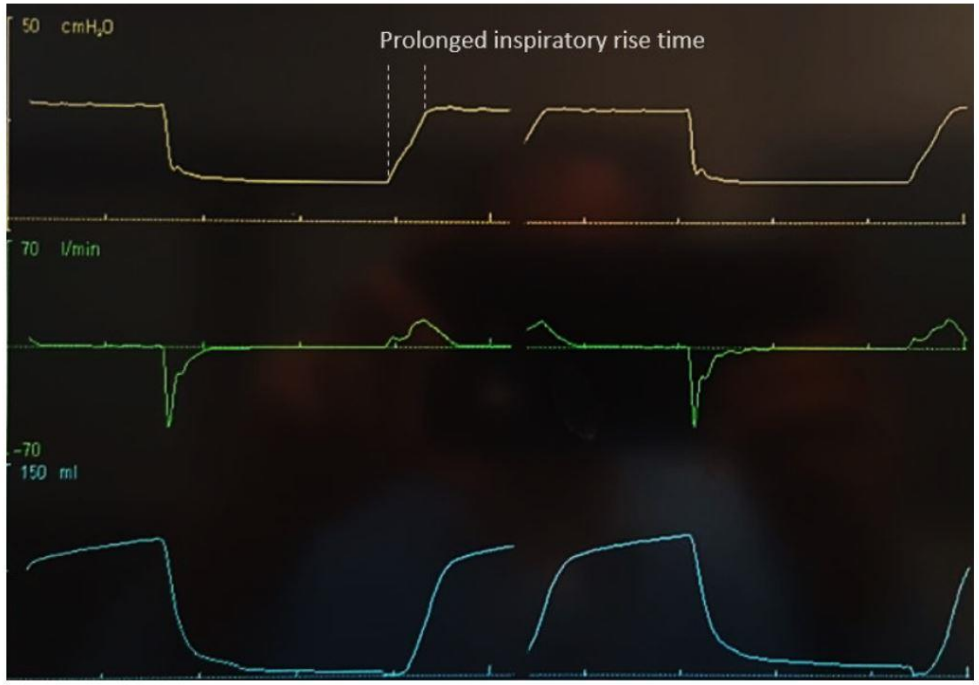
- aka. Inspiratory hold time

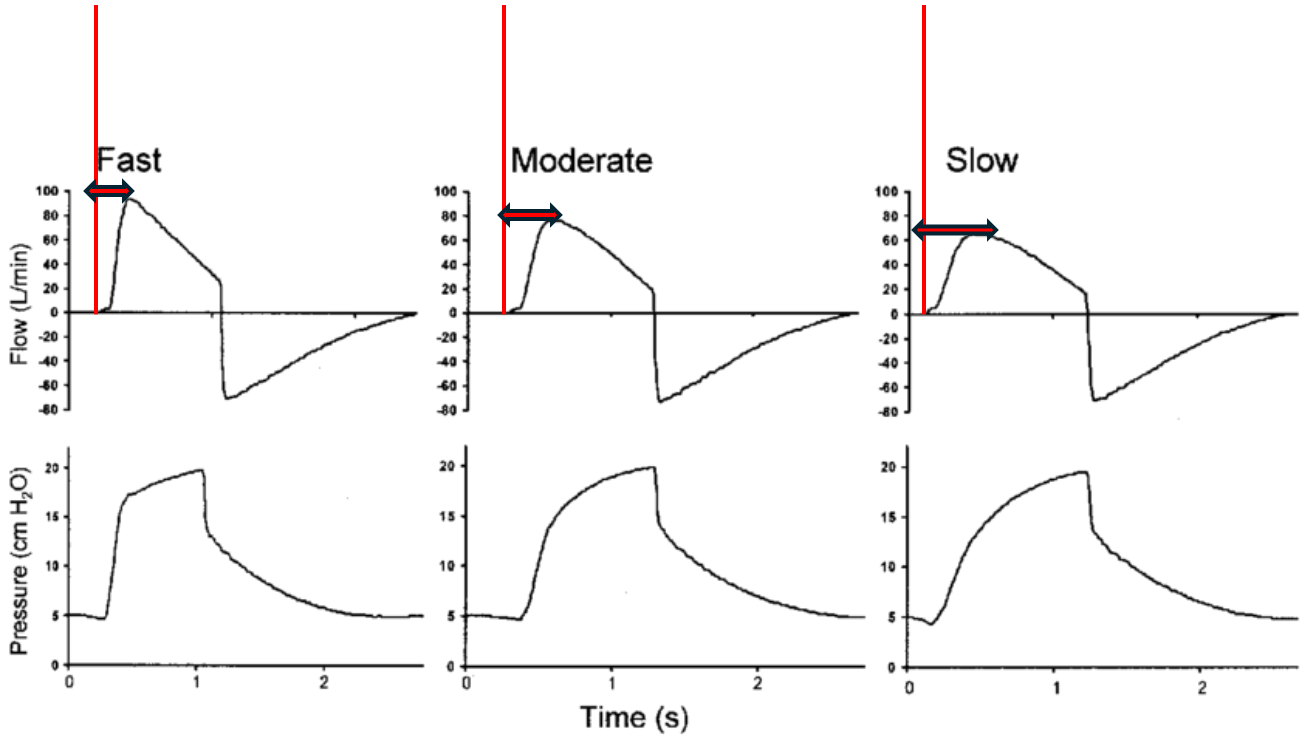




Inspiratory Rise Time

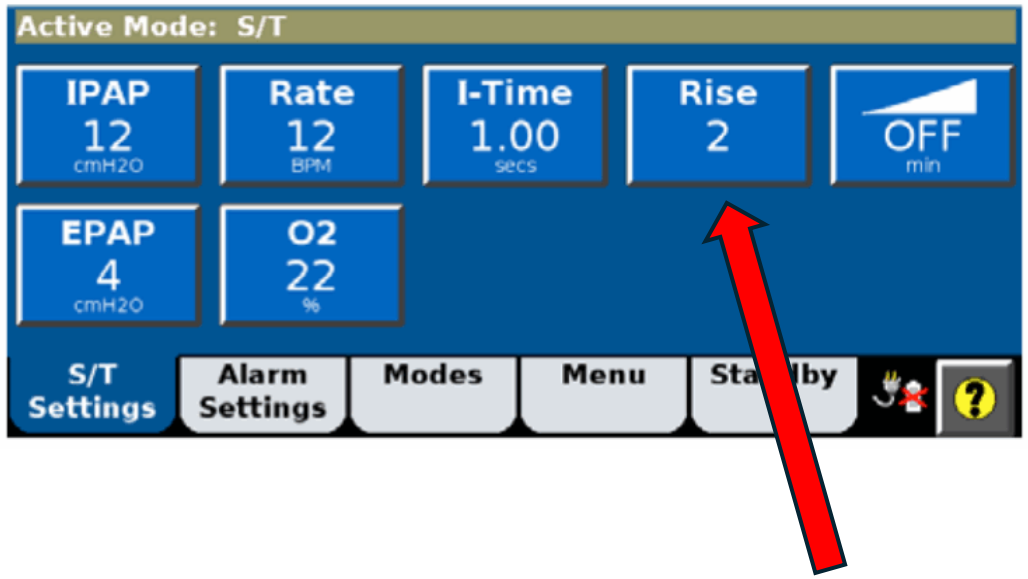
- Delay to peak flow
  - Peak flow delayed until…

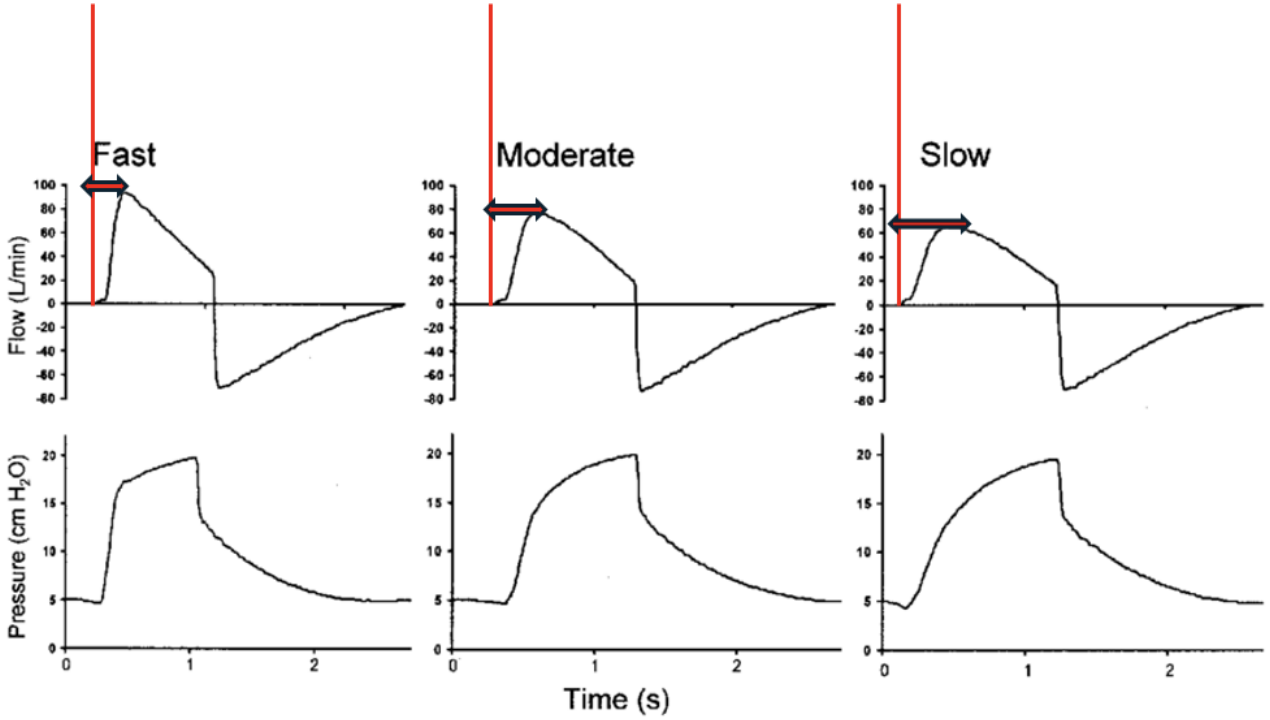




Pressure Support Rise Time

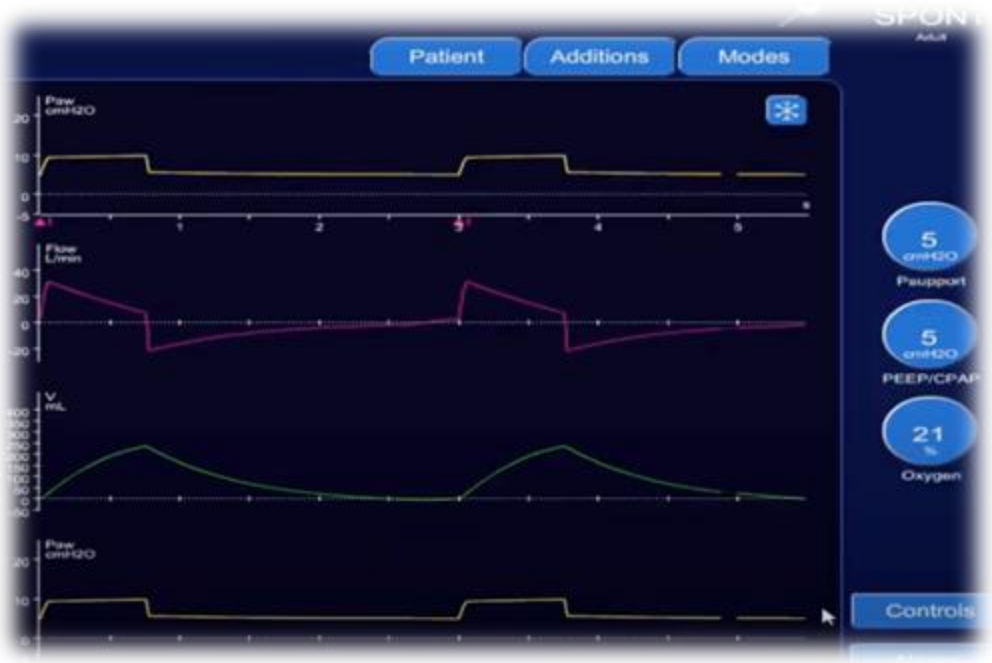
- Same as inspiratory rise time, but only activated during spontaneous, pressure-supported breaths
  - Peak flow delayed until…

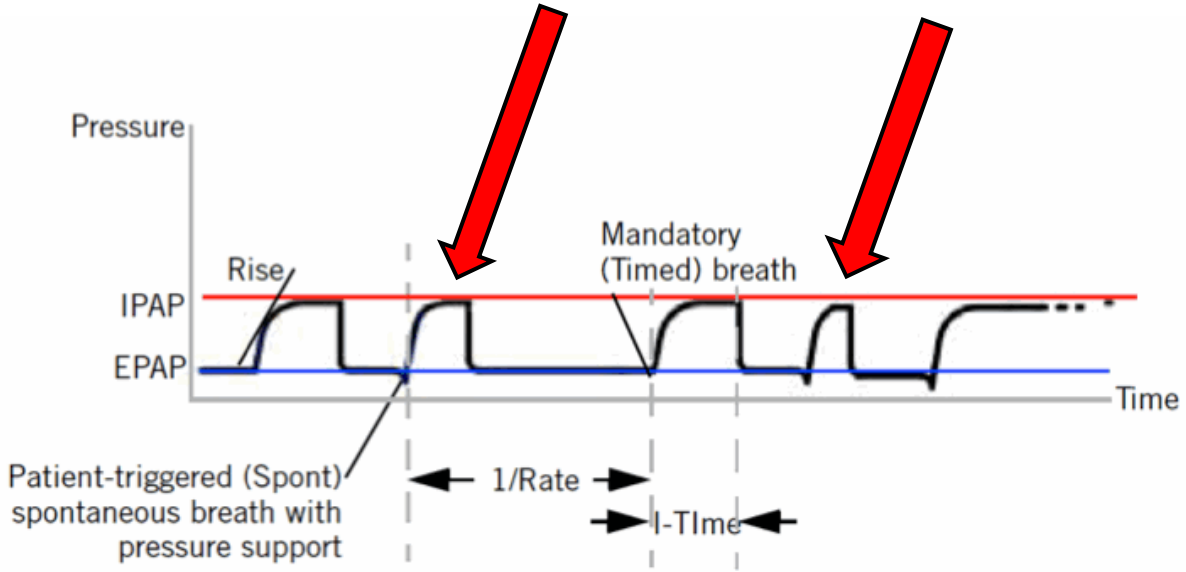




Pressure Support Time

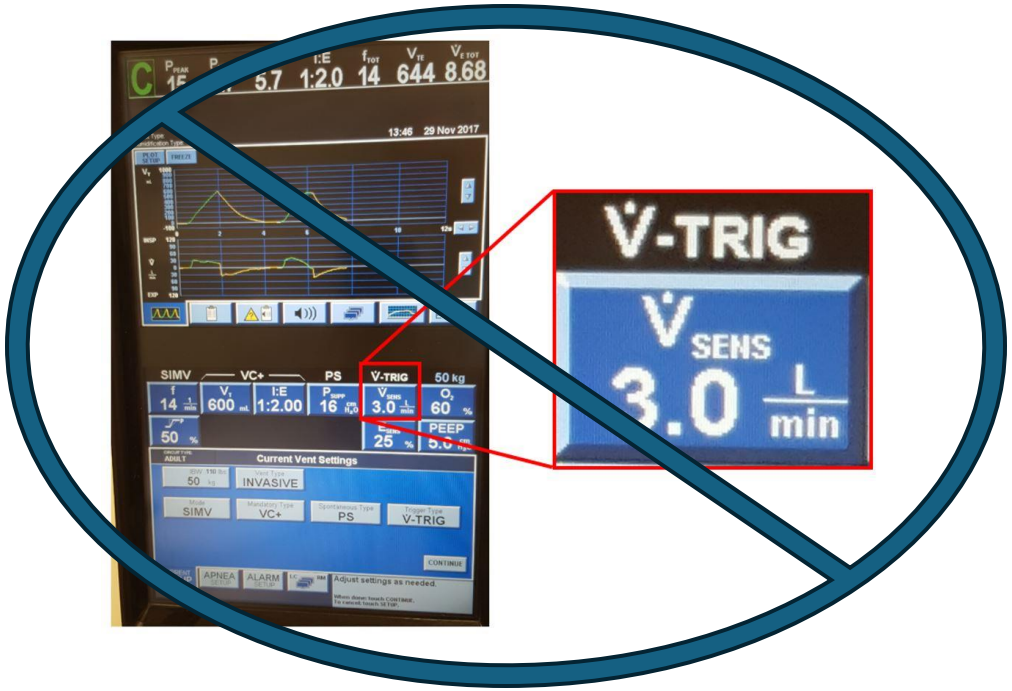
- Spontaneous ‘set’ I-time during use of pressure support

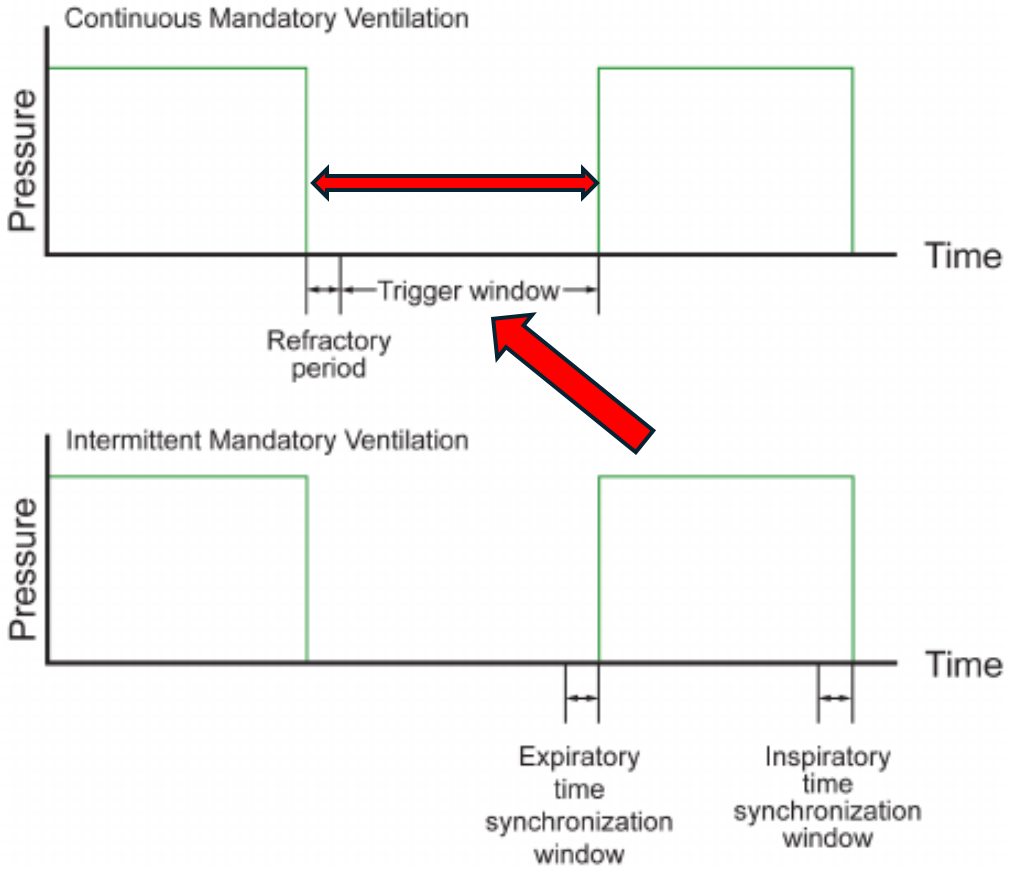




Trigger Window

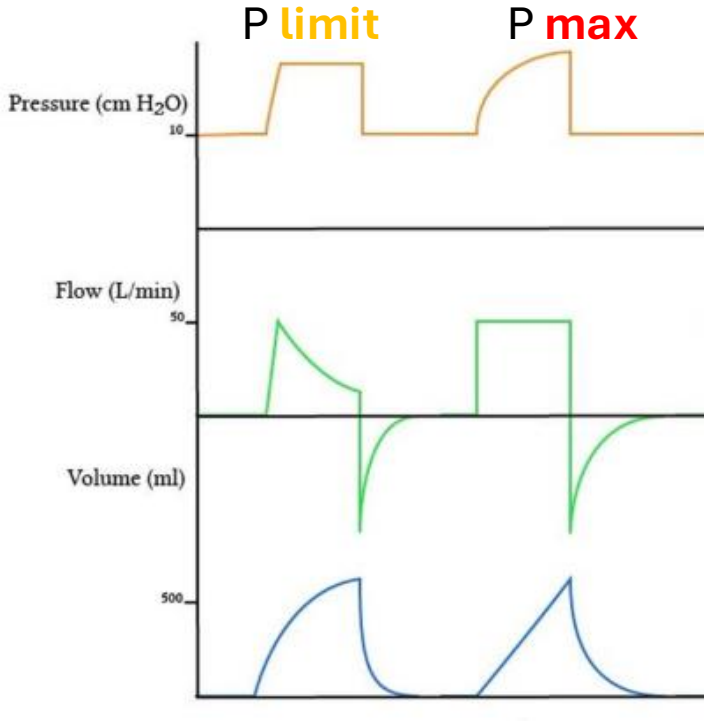
- aka. Patient “window of opportunity
  - Patient can trigger a spontaneous breath





Pressure Limit vs. Pressure Max

- P **limit** = pressure unable to exceed this level during inspiration
  - Forced plateau pressure
- P **max** = pressure at which force cycling occurs
  - Peak pressure cut off



Some practice…

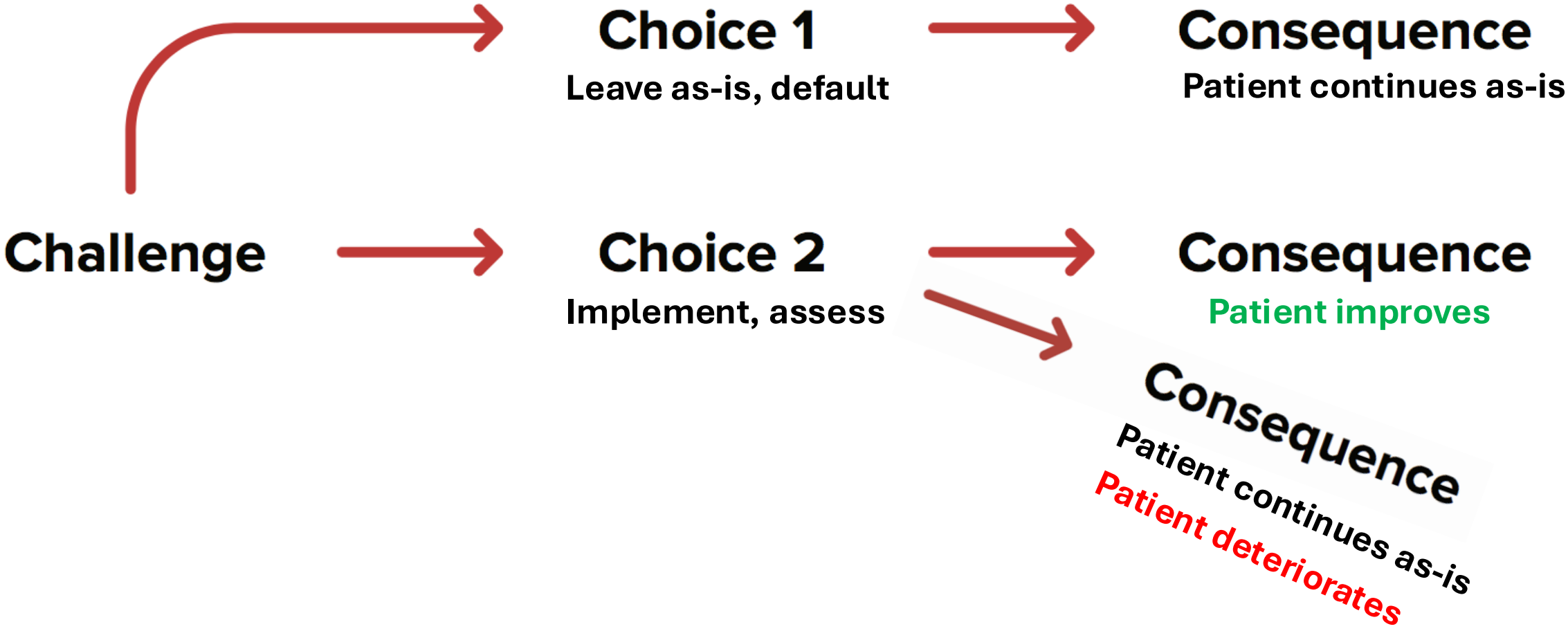
- Your patient is displaying asynchrony, appearing to attempt expiration while inspiration is still ongoing
- Your patient seems to spasmodically cough or grimace for a short period immediately after the breath is triggered, occasionally force cycling at inspiration onset, immediately into expiration

We’re not that far...

Summary Considerations

- Most ventilator software generically defaults to ‘safe’ parameters for both main and ‘boutique’ settings
- Technically, non-traditional settings are not completely arbitrary/random and can influence the breath in a negative or positive manner

Do I Set/Adjust Boutique Settings?



Questions?

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