From Vent to Victory: Empowering RTs with Evidence-Based Extubation Protocols

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Respiratory Therapist III

Respiratory Therapy – University of Vermont Medical Center

About mEEE

Education

- Bachelors of Science, Biological Sciences - University of Vermont 2016
- Associates of Science, Respiratory Therapy – Vermont Technical College 2019

Experience

- Respiratory Therapist – University of Vermont Medical Center 2019 – Current

Extracurriculars

- Amateur Disc Golf Competitor – PDGA #256887
- Proud Cat dad of three boys

Disclosures and Conflicts of Interest

- N/A

Presentation Road Map

- Review the history of ventilator liberation
  - Review history of ventilator day and length of stay (LOS)
  - Review historic timeline of vent weaning and modalities

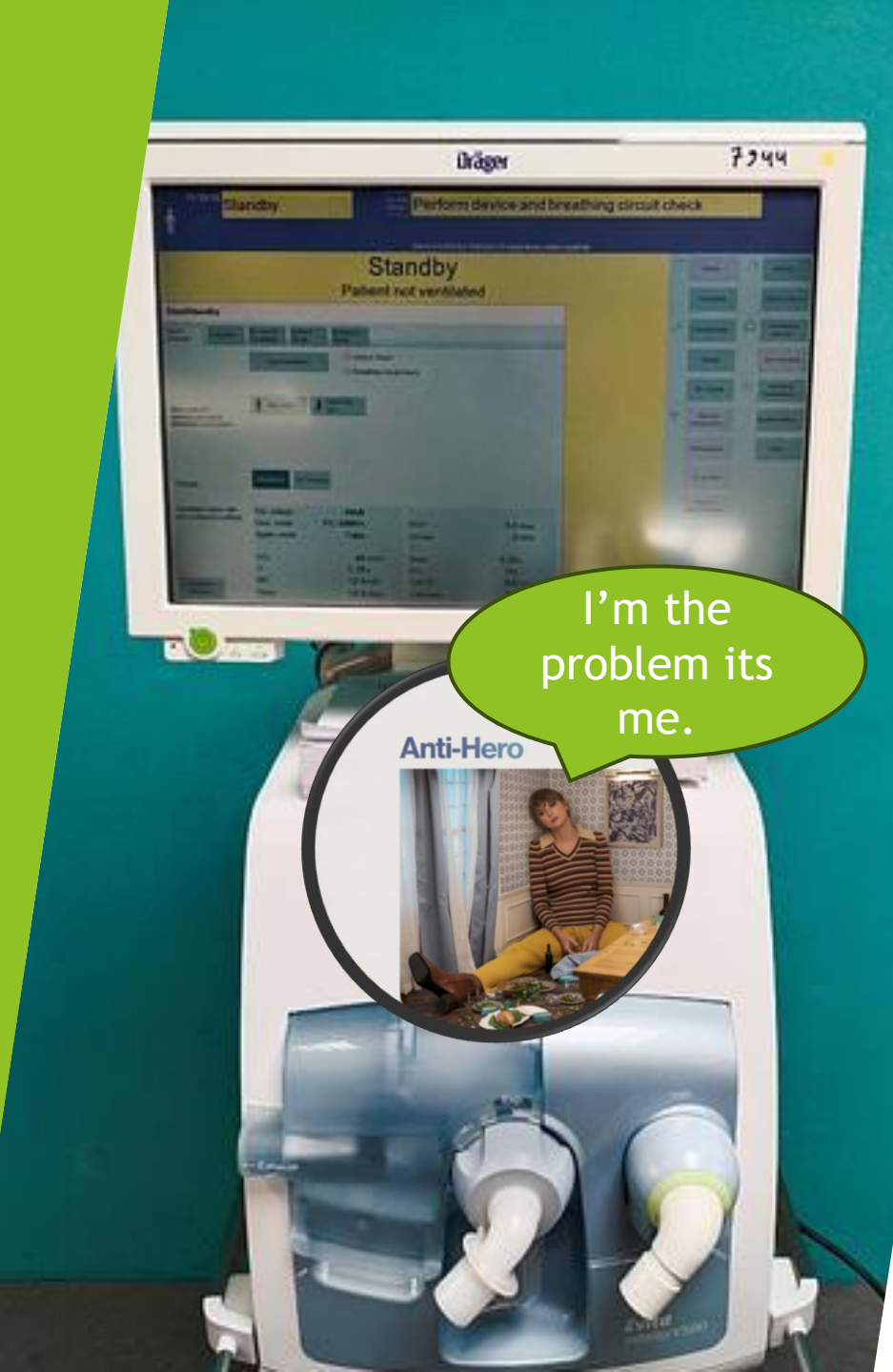
Presentation Road Map

- Discuss current strategies for ventilator liberation
  - Review literature supporting frequency of weaning
  - Review literature supporting the mode of weaning
  - Review literature supporting best parameters to monitor and review when assessing trial tolerance

Presentation Road Map

- Implementation of a Respiratory Therapist Driven Extubation Protocol
  - Review our Policy and what our therapists follow everyday
  - Review outcomes of our first round of data collection from a few years ago
  - Review any adjustments we are curious about implementing down the line
  - Review additional data that could be collected in the future

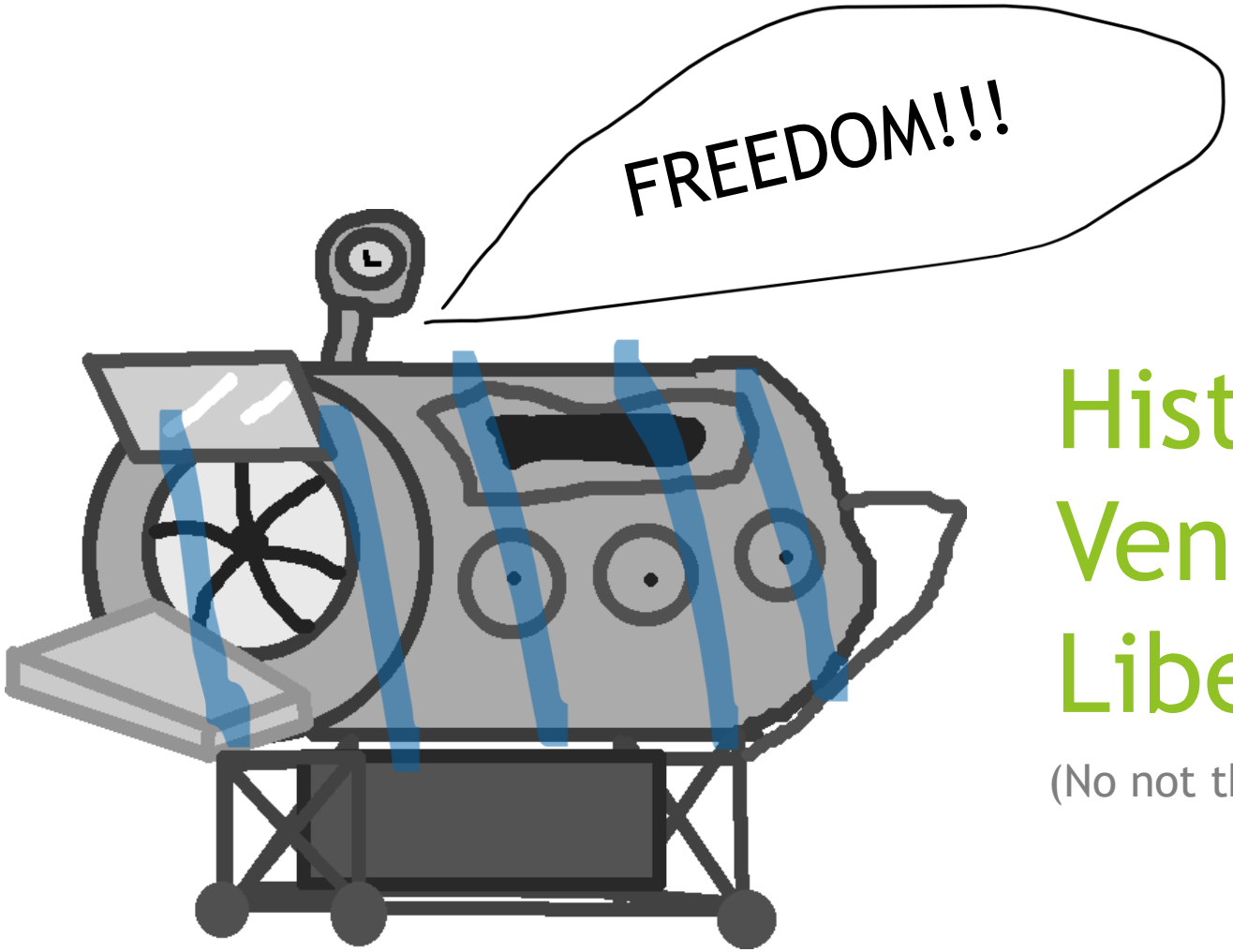
- RT **Driven** Extubation Protocol
  - Advocating for daily weans
  - Initiating daily weans
  - Monitoring weans
  - Assessing for extubation
  - Extubating appropriate patients
    - Without an MD at bedside or MD order in place



General Overview regarding Extended Vent Days

- Cost
- Ventilator-Associated Pneumonia (VAP)
- Money
- Ventilator-Induced Lung Injury
- Expensive
- Ventilator-Induced Muscle Weakness

Its best practice to limit the number of vent days for patients!



History of Ventilator Liberation

(No not that kind)

Bendixin et al. developed Respiratory Research in first respiratory intensive care in USA in 1961.

"[improving patient care] through the clinical application of the principles of respiratory physiology."

"It is our practice to limit endotracheal intubation to approximately forty-eight hours…to know the proper timing and rate of weaning from the respirator requires considerable judgement and experience. As a rule, weaning should start as soon as possible."

- Bendixin (1961)

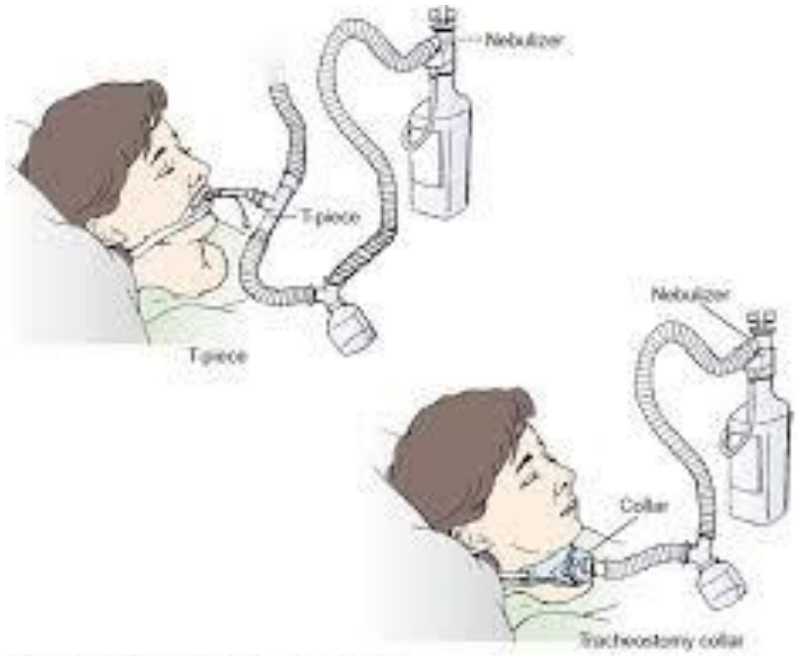
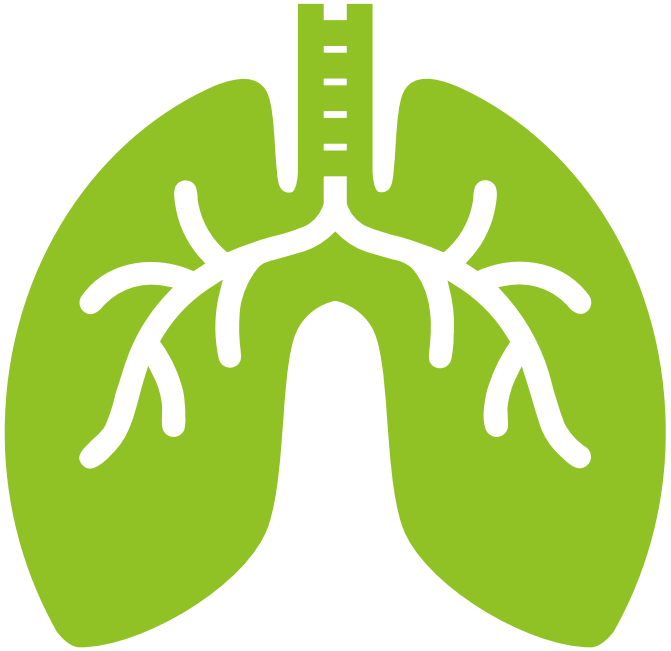


FIGURE 25-2 T-piece and tracheostomy collars are devices used when weaning patients from mechanical ventilation.

Weaning in the 1960s

Gradually increased time off the ventilator with supplemental oxygen via t-piece

In 1961, 400 patients a year ventilated, few were vented for longer than 2 days without tracheostomy.



- Patient Disconnected from ventilator for three to four minutes every half hour.
- If successful, this duration is gradually increased.
- Once the patient can breathe independently during the day, move air without difficulty, walk short distances, and maintain stable ventilation shown by blood gas readings, removal of the endotracheal tube may be considered.

Spill the Tea on T-Pieces

Difficulty with monitoring specific values in weaning patients

Monitoring Parameters

Sahn and Lakshminarayan's 1973 report first identified these.

- In 100 patients minute ventilation <10L/and maximal inspiratory pressure >30cmH2O "correlated well with the ability to discontinue mechanical ventilation."

More to Monitor

1977 Henning et al used esophageal-balloon catheters to make detailed measurements of work of breathing. Vent-dependent patients had higher work readings.

1982 Cohen et al. reported via electromyographic recordings in difficult-to-wean patients noted diaphragmatic fatigue associated with abdominal paradox (inward motion during inspiration) and respiratory alternans (alternating predominance of rib-cage and abdominal breathing).

1986 Milic-Emili proposed CROP index – Compliance , Rate , Oxygenation, and (maximal inspiratory) Pressure.

1997 Jaeschke et al. Supported review of f / Vt.

What the CROP is this?

CROP index

This index incorporates measures of compliance, respiratory rate, oxygenation and negative inspiratory pressure, thus CROP in the equation:

$$\text{CROP} = \text{dynamic compliance} \times \text{negative inspiratory pressure} \times \frac{(\text{PaO}_2/\text{PAO}_2)}{\text{rate}}.$$

One pediatric study by Thiagaran et al. [12] found a CROP index >0.15 was the most sensitive index for predicting extubation success.

A Comparison of Four Methods of Weaning (Esteban et al. 1995)

- Prospective randomized multicenter study involving 456 patients that received mechanical ventilation for an average of 7.5 +/- 6.1 days.
- Conducted from Oct 1992 through October 1993 in Med/surg ICUs of 14 teaching hospitals in Spain.
  - No single hospital contributed more than 10% of the patient population.
    - Patients received mechanical ventilation for a men of 7.5+/-6.1 days before weaning was started. Other inclusion criteria included:
      - Improvement and/or resolution of underlying cause of acute respiratory failure
      - Adequate gas exchange with P:F Ratio above 200 with PEEP of less than or equal to 5cmH20.
      - Core body temp below 38C
      - Hemoglobin level above 10 g/dl
      - No further vasoactive and sedative agents.
      - Physician must also agree that the patient was in stable condition and ready to be weaned.

These patients randomly sorted into 1 of 4 weaning techniques

Classic SIMV Wean

IMV with initial respiratory rate of 10+/-2.2 breaths /min and weaned (if possible) twice a day usually be 2-4 breaths (29 patients).

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Trials of T-Piece

Intermittent trials of spontaneous breathing on t-piece conducted 2 or more times a day if possible (33 patients). Patients able to breath for longer than 2 hours were extubated.

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Daily SBT

Once-daily trial of spontaneous breathing (31 patients) via t-piece for up to two hours per day. Patients able to breath for longer than 2 hours were extubated.

For all of the groups, failed extubation is considered if reintubation was necessary within 48 hours of extubation or if extubation was not possible after 14 days of weaning.

A once daily SBT led to extubation 3x as quickly as compared to IMV.

Table 2. The Length of Time from the Initiation of Weaning to Successful Extubation in the Four Groups.

Weaning Technique	Median	First Quartile	Third Quartile
		days	
Intermittent mandatory ventilation	5	3	11
Pressure-support ventilation	4	2	12
Intermittent trials of spontaneous breathing	3	2	6
Once-daily trial of spontaneous breathing	3	1	6

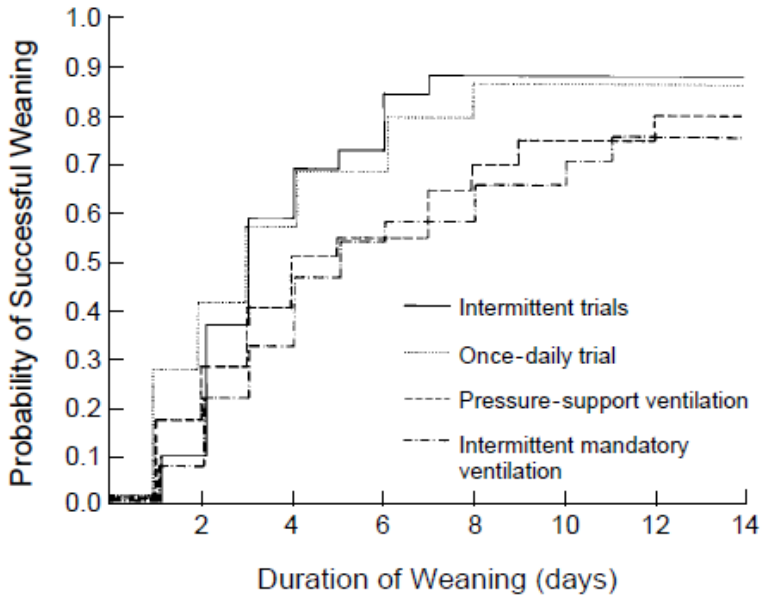


Table 3. Rate of Successful Weaning with the Various Techniques and According to Base-Line Characteristics.*

Variable	Relative Rate of Successful Weaning (95% Confidence Interval)	P Value
Weaning technique		
Once-daily trial of spontaneous breathing vs. intermittent mandatory ventilation	2.83 (1.36–5.89)	<0.006
Once-daily trial of spontaneous breathing vs. pressure-support ventilation	2.05 (1.04–4.04)	<0.04
Once-daily trial of spontaneous breathing vs. intermittent trials of spontaneous breathing	1.24 (0.64–2.41)	0.54
Duration of ventilat… before … (1-day		<0.005
Time to fail… spontan… (10-min …		<0.001
Age (10-yr incr…	…96)	<0.02

*Proportional-haz… analysis was used to estimate the 95 percent confidence in… of the relative rate of successful weaning.

Once/Day Reigns Supreme

Table 4. Outcomes in Patients Who Were Difficult to Wean from Mechanical Ventilation.*

Weaning Technique	Successful Weaning and Extubation	Reintubation	Continued Mechanical Ventilation after 14 Days
		no. of patients (%)	
Intermittent mandatory ventilation	20 (69.0)	4 (13.8)	5 (17.2)
Pressure-support ventilation	23 (62.2)	7 (18.9)	4 (10.8)
Intermittent trials of spontaneous breathing	27 (81.8)	5 (15.2)	1 (3.0)
Once-daily trial of spontaneous breathing	22 (71.0)	7 (22.6)	1 (3.2)

*The percentages do not total 100 percent in the group… …ved pressure-support ventilation and a once-daily trial of spontaneous brea… …atient died in each group and weaning was interrupted because of … …patients in the pressure-support group.

And they STAY Extubated

Table 4. Systematic Reviews Evaluating Use of Pressure Support Ventilation With Spontaneous Breathing Trials

Study	Year	Included Studies	Subjects, *N*	Major Findings
Pellegrini et al[28]	2016	12	2,161	SBT technique did not affec…5% CI 0.94–1.61]), ICU mortality (RR 1.11 [95% CI (…5% CI 0.90–1.63]). Pre-specified subgroup…ce for liberation in simple-to-w…ged weaning subgroup, however, T-pie…ation (weighte…difference −3.08 [−5.24 to −…
Burns et al[25]	2017	31	3,541	PSV comp…as likely for successful initia…5% CI 0.89–1…xtubation (RR 1.06 [95% CI …–1.10]).
Li et al[26]	2020	10	3,165	There w…tween the T-piece and PSV (OR …difference in the rate of re-i…–1.80]), hospital mortality (…nce = −0.10 [95% CI −0.59 to 0.39]…0.82 [95% CI −2.20 to 0.55] d).
Cardinal-Fernandez et al[27]	2022	7	705	In this network meta-analysis, a fixed level of PSV was as…st probability of a suc…SBT (P-score 0.90), but tube compensation was …d with the highest prob…uccess (P-score 0.90).
Ye et al[29]	2023	9	3,115	In this networ…nt difference was between PSV 30 min and T-piec…5% CI 0.84–0.98]). The cumulative ran…best to worst was PSV 30 min, …30 min and PSV 120 min wer…A 82.5% for 30 min PSV, 70.7% …for T-piece 120 min). T-piece 120 min (SUCR…, 60.9%) may result in lower re-intubation rates, followed by …A, 41.8%) and PSV 30 min (SUCRA, 34.4%).

PSV superior to t-piece simple-to-wean

PSV improved re-intubation rates

Shorter trial intervals on PSV was superior

The Push for PSV Trials

Research continues through the 90s

Study	Study Objective	Oxygenation Criteria for SBT Initiation	F_{IO_2} During SBT	Oxygenation Criteria for SBT Termination	of pub.
Brochard et al[2]	Comparison of 3 methods of weaning	$S_{pO_2} > 90\%$ with an F_{IO_2} 0.40	F_{IO_2} was kept at level used during mechanical ventilation	$P_{aO_2} < 50$ mm Hg	1995
Esteban et al[3]	Comparison of 4 methods of weaning	$P_{aO_2}/F_{IO_2} > 200$ mm Hg	F_{IO_2} at same level as used during mechanical ventilation	$S_{pO_2} < 90\%$	1994
Ely et al[4]	RT protocol to notify physicians when patients successfully complete SBT	$P_{aO_2}/F_{IO_2} > 200$ mm Hg	No change made in F_{IO_2}	$S_{pO_2} < 90\%$	1996
Esteban et al[23]	SBT with T-piece or pressure support	$P_{aO_2} > 60$ mm Hg with $F_{IO_2} \leq 0.40$	F_{IO_2} at the same level as used during mechanical ventilation	$S_{pO_2} < 90\%$	1997
Esteban et al[5]	Evaluation of SBT duration	$P_{aO_2} > 60$ mm Hg with $F_{IO_2} \leq 0.40$	F_{IO_2} at the same level as used during mechanical ventilation	$S_{pO_2} < 90\%$	2008
Tanios et al[17]	Evaluate effect of including rapid shallow breathing index in a weaning protocol	$P_{aO_2}/F_{IO_2} > 150$ mm Hg or $S_{pO_2} > 90\%$ at $F_{IO_2} \leq 0.40$	Changes of ventilator setting only allowed at the discretion of the managing physician	$P_{aO_2} < 60$ mm Hg or $S_{pO_2} < 90\%$ on $F_{IO_2} \geq 0.40$	2006
Girard et al[5]	Efficacy and safety of a paired sedation and weaning protocol	$S_{pO_2} > 88\%$ on $F_{IO_2} \leq 0.50$	F_{IO_2} at the same level as used during mechanical ventilation	$S_{pO_2} < 88\%$ for ≥ 5 min	2008
Fernandez et al[46]	1 h reconnection of mechanical ventilation after	$S_{pO_2} > 90\%$ on $F_{IO_2} \leq 0.50$	No change made in F_{IO_2}	$S_{pO_2} < 90\%$	2017

Helped to shape guidelines on oxygenation monitoring

AARC Clinical Practice Guidelines

Table 2. American College of Chest Physicians/American Thoracic Society 2017 Guidelines for Liberation From Mechanical Ventilation

1. For acutely hospitalized patients ventilated > 24 h, the initial SBT should be conducted with inspiratory pressure augmentation (5–8 cm H_2O) rather than without (T-piece or CPAP).
2. For acutely hospitalized patients ventilated for > 24 h, use protocols attempting to minimize sedation.
3. For patients at high risk for extubation failure who have been receiving mechanical ventilation for > 24 h, and who have passed an SBT, extubate to preventive NIV.
4. For acutely hospitalized patients who have been mechanically ventilated for > 24 h, use protocolized rehabilitation directed toward early mobilization.
5. Manage acutely hospitalized patients who have been mechanically ventilated for > 24 h with a ventilator liberation protocol.
6. Perform a cuff leak test in mechanically ventilated adults who meet extubation criteria and are deemed at high risk for postextubation stridor.
7. For adults who have failed a cuff leak test but are otherwise ready for extubation, administer systemic steroids at least 4 h before extubation; a repeated cuff leak test is not required.

From Reference 10.
SBT = spontaneous breathing trial
NIV = noninvasive ventilation

PSV preferred over t-piece

Sedation "Vacation"

Cuff Leak Check

Implementation of a **Respiratory Therapist** Driven Extubation Protocol

Why Push for an RT Driven Protocol?

- Patients' extubations were found to be delayed despite meeting criteria
  - Resident Physician Hesitancy
  - Lack of Attending Physician Presence
  - Proximity to end of shift

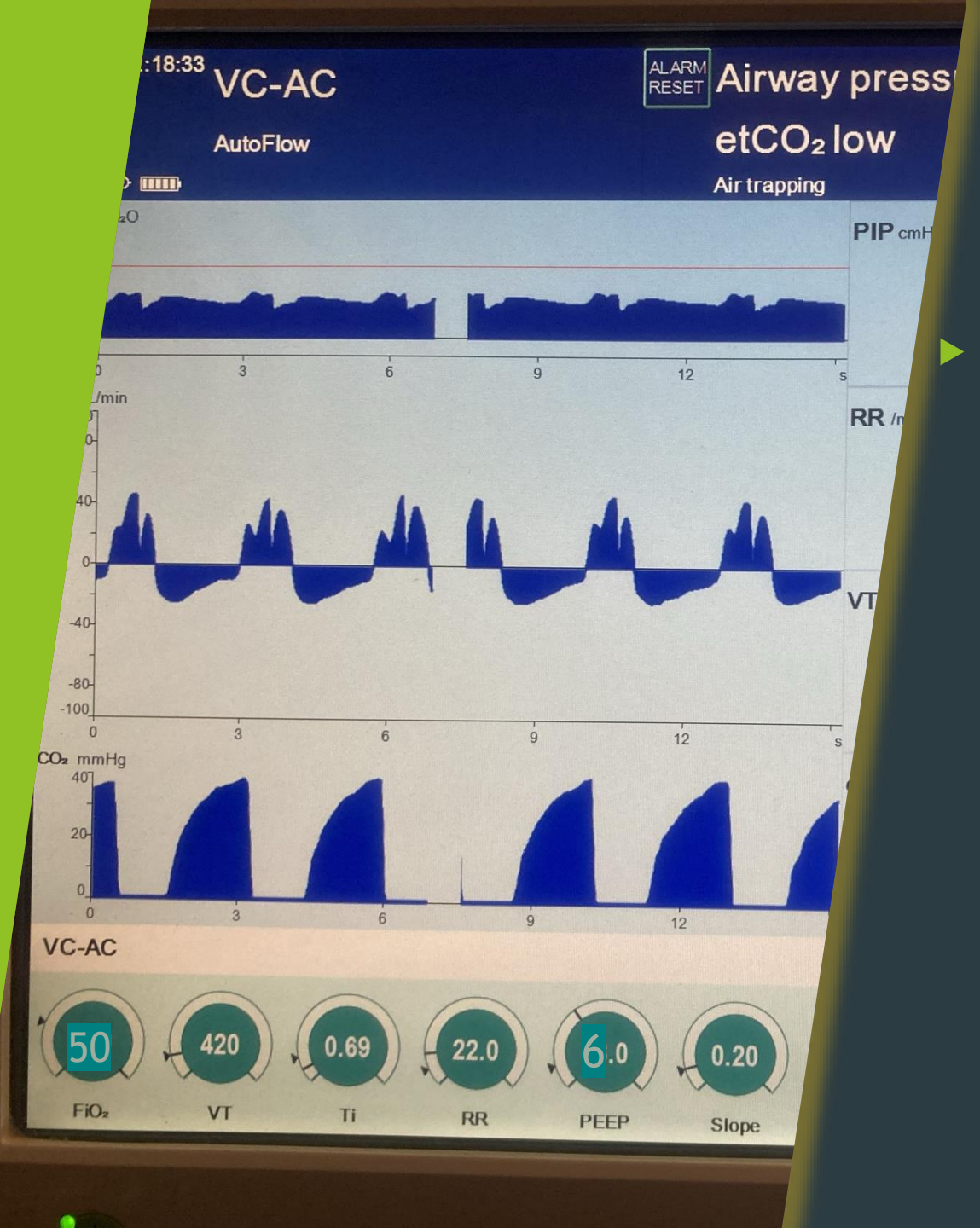
POV Therapist asking MD to extubate at 0700

Step 1 – Talk it Out

Evening RT discusses with ICU team regarding patient eligibility for RT Drive Extubation.

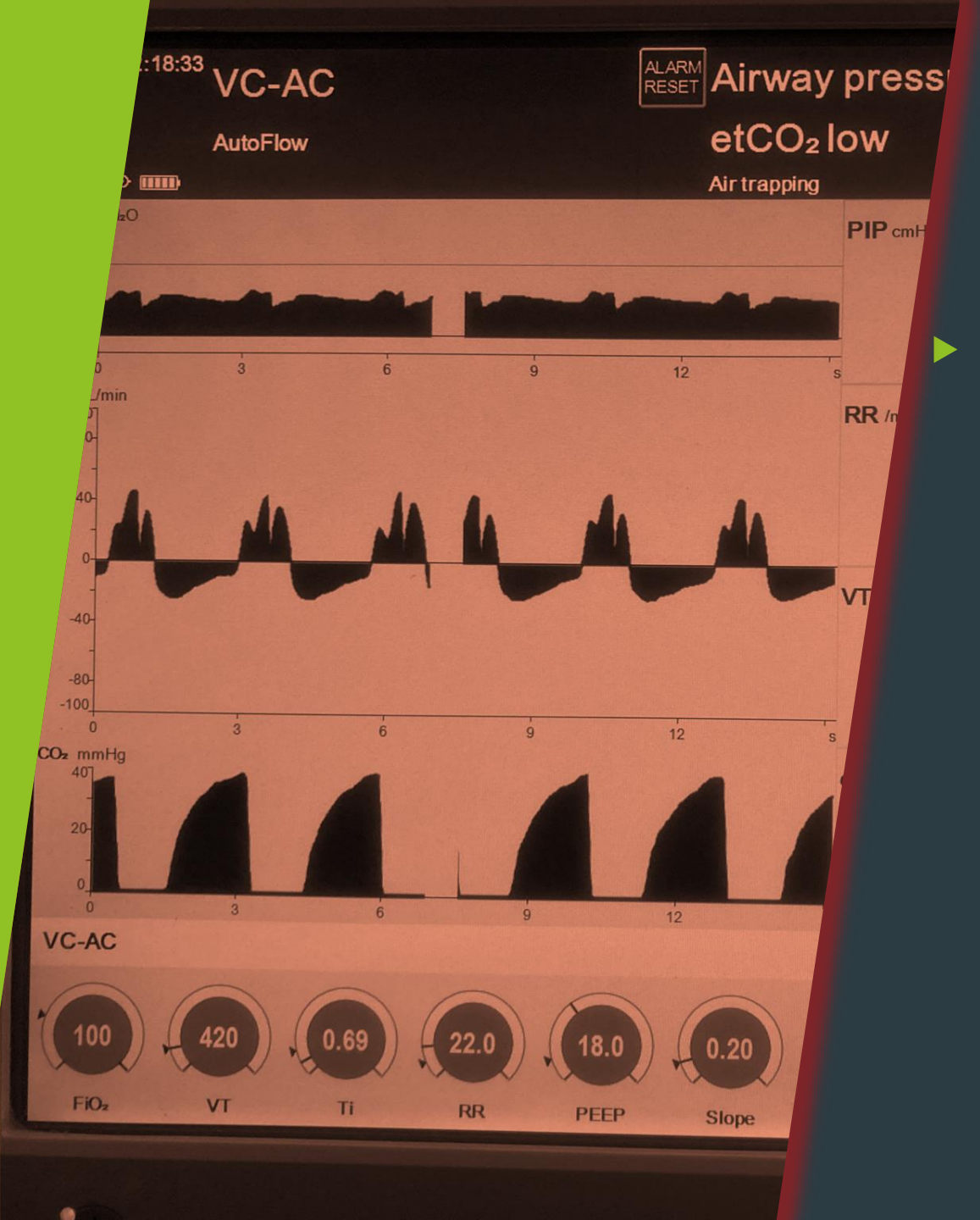
Evening Evaluation

- Whose In?
  - Initial Reason for Intubation Solved
  - SpO2 >90%
    - FiO2 setting ≤ 50%
    - PEEP setting ≤ 8cmH2O
  - Pulse < 130 bpm
  - Respiratory Rate < 38 bpm
  - Again, Clarify weaning plan with Primary Team for neurosurgical patients, or if an ICP monitor is present.



Evening Evaluation

- To Consider
  - Upcoming planned surgery, major procedure, or off unit imaging
  - pH < 7.25 or > 7.50
  - Complex or Difficult Airway
  - DNI or active goals of care discussions
  - For Spinal Cord Injury Patients; follow the Spinal Cord Injury Protocol



Evening Evaluation

- Whose Out?
  - High Ventilator Settings (PEEP of ≥8 cmH2O, FiO2 ≥ 50%)
  - ICP Monitoring/Neuro Status
  - Hemodynamic Instability
    - On Multiple Pressors, escalating pressors, active bleeding
  - Nitric or Flolan use
  - APRV (Airway Pressure Release Ventilation)
  - HFOV (High Frequency Oscillatory Ventilation)
  - Initial Reason for Intubation not corrected

Step 2 – Daily Morning SBT Screening Evaluation

- Coordinate with RN for timing of sedation vacation
- Make sure head of bed is >30^{o}
- Calculate Richmond Agitation-Sedation Scale (RASS)
  - Unarousable Sedation → -5
  - Deep Sedation → -4

Step 2 – Daily Morning SBT Screening Evaluation

- Coordinate with RN for timing of sedation vacation
- Make sure head of bed is >30^{o}
- Calculate Richmond Agitation-Sedation Scale (RASS)
  - Moderate Sedation → -3
  - Light Sedation → -2

Step 2 – Daily Morning SBT Screening Evaluation

- Coordinate with RN for timing of sedation vacation
- Make sure head of bed is >30º
- Calculate Richmond Agitation-Sedation Scale (RASS)
  - **Drowsy → -1**
  - **Alert and Calm → 0**

Step 2 - Daily Morning SBT Screening Evaluation

- Coordinate with RN for timing of sedation vacation
- Make sure head of bed is >30º
- Calculate Richmond Agitation-Sedation Scale (RASS)
  - Restless → +1
  - Agitated → +2

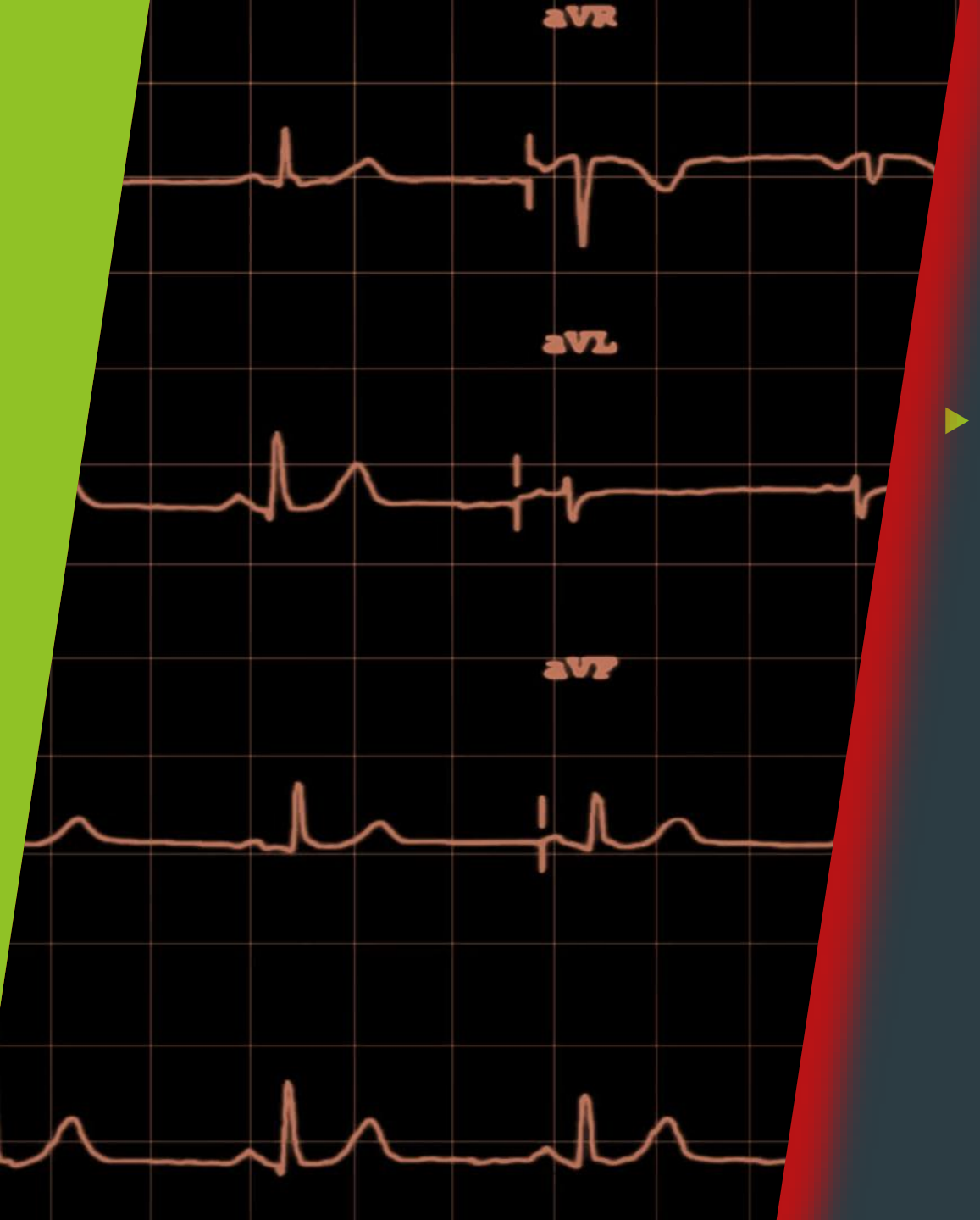
Step 2 – Daily Morning SBT Screening Evaluation

- Coordinate with RN for timing of sedation vacation
- Make sure head of bed is >30º
- Calculate Richmond Agitation-Sedation Scale (RASS)
  - Very Agitated → +3
  - Combative → +4

“The Early RT gets the Tube”

-Me thinking of slide titles circa 5 minutes before this presentation

- Aim for start time between 0400 – 0500
  - Patient rested overnight
  - Outside of shift change / rounding hours
- Place patient’s head at at least 30^{o}
- Transition to Pressure Support Ventilation
  - Pressure Support Ventilation (PSV) 5cmH2O
  - PEEP 5cmH2O
- Length of Trial: 1 hour Goal



During the Trial

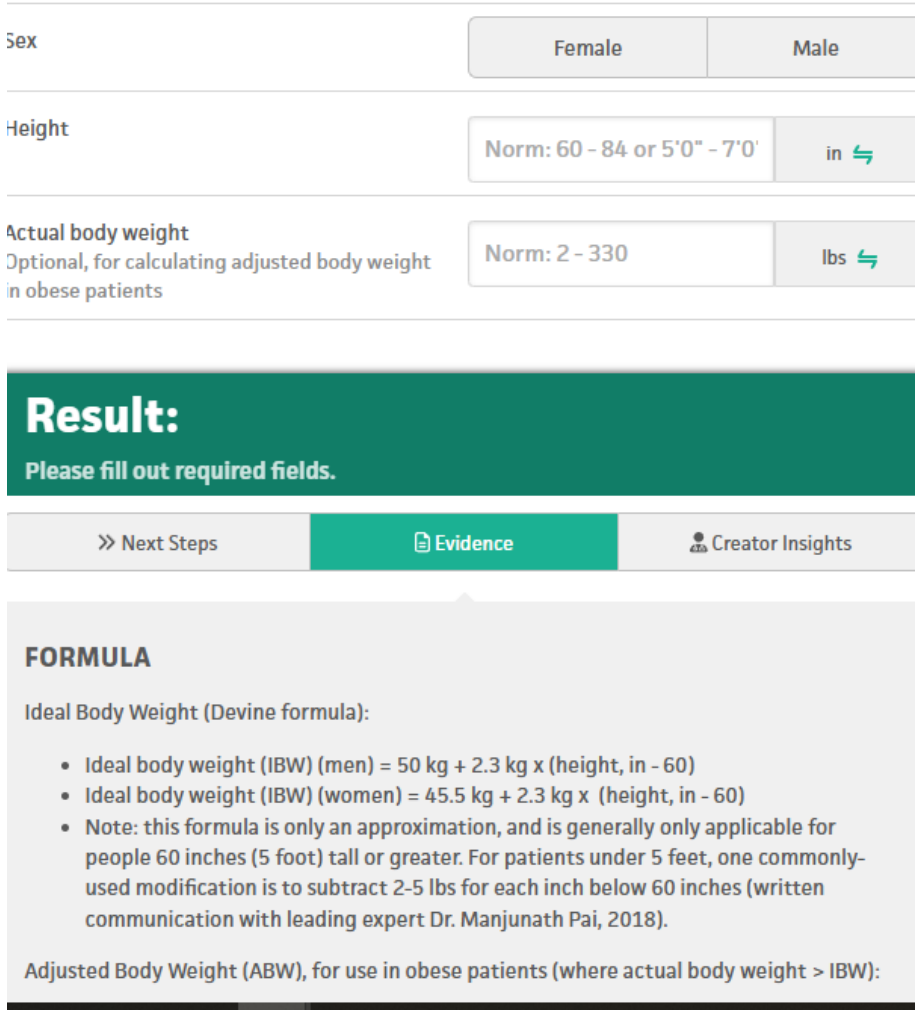
- Warning Signs to watch
  - Pulse < 60 or > 130 bpm
  - Sustained Respiratory Rate > 38 bpm
  - Systolic Blood Pressure > 180mmHg or < 90 mmHg
  - SpO2 < 88% despite increasing FiO2 to 50% or higher
  - ETCO2 increase/decrease > 10mmHg
  - Significant change in respiratory pattern, diaphoresis, or paradoxical breathing pattern

Post SBT Trial

- Obtain the Following Values after successful 1 hour SBT
  - FVC (Forced Vital Capacity in mL/Kg of Ideal Body Weight)
  - NIF (Negative Inspiratory Force cmH2O)
  - RSBI (Rapid Shallow Breathing Index)

Forced Vital Capacity

- Aim for a target of over 10 mL/Kg of Ideal Body Weight.
- The first comprehensive study was by Sahn and Lakshminarayan in 1973.
- 100 patient study
- Minute ventilation of less than 10L/min closely related to the ability to stop mechanical ventilation.



Negative Inspiratory Force

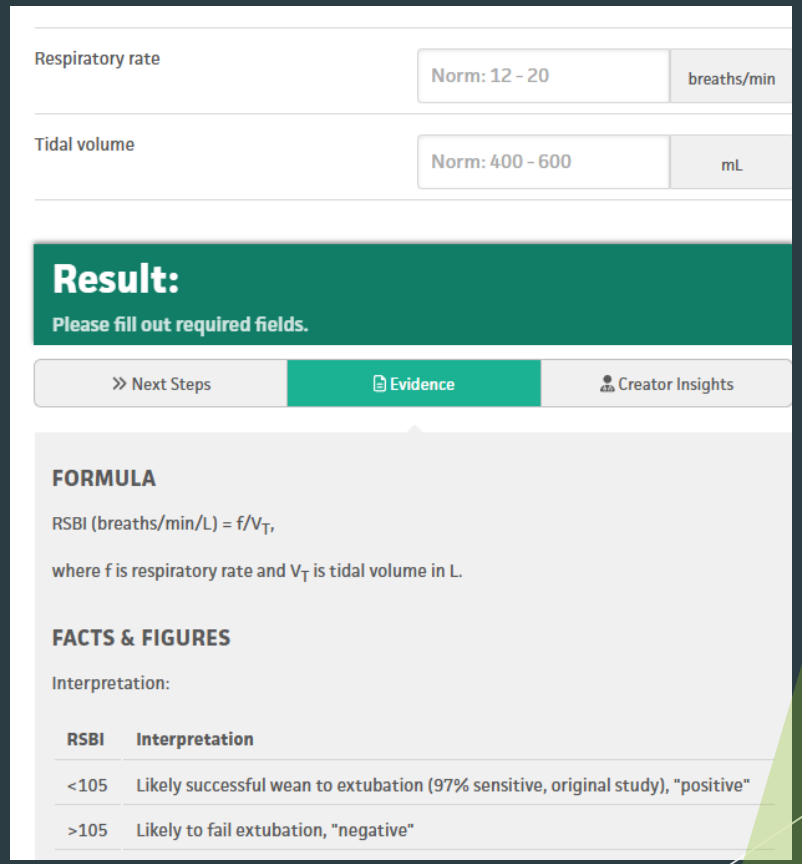
In the same comprehensive study by Sahn and Lakshminarayan in 1973, also noted a maximal inspiratory pressure exceeding 30cmH2O were closely related to the ability to stop mechanical ventilation.

In the mid-1980s, several studies examined airway occlusion pressure (P0.1).

Research by Herrera (1985) and Sassoon (1987) indicated that low P0.1, signifying low respiratory drive, was a better predictor of weaning success than traditional tests.

- Targeted goal of > -20cmH2O

Rapid Shallow Breathing Index



1997 Jaeschke et al. Supported monitor of f / Vt for frequency to tidal volume ratio for monitoring weaning patients.

Originally for assessing weaning readiness, now extrapolated to assess extubation successfulness.

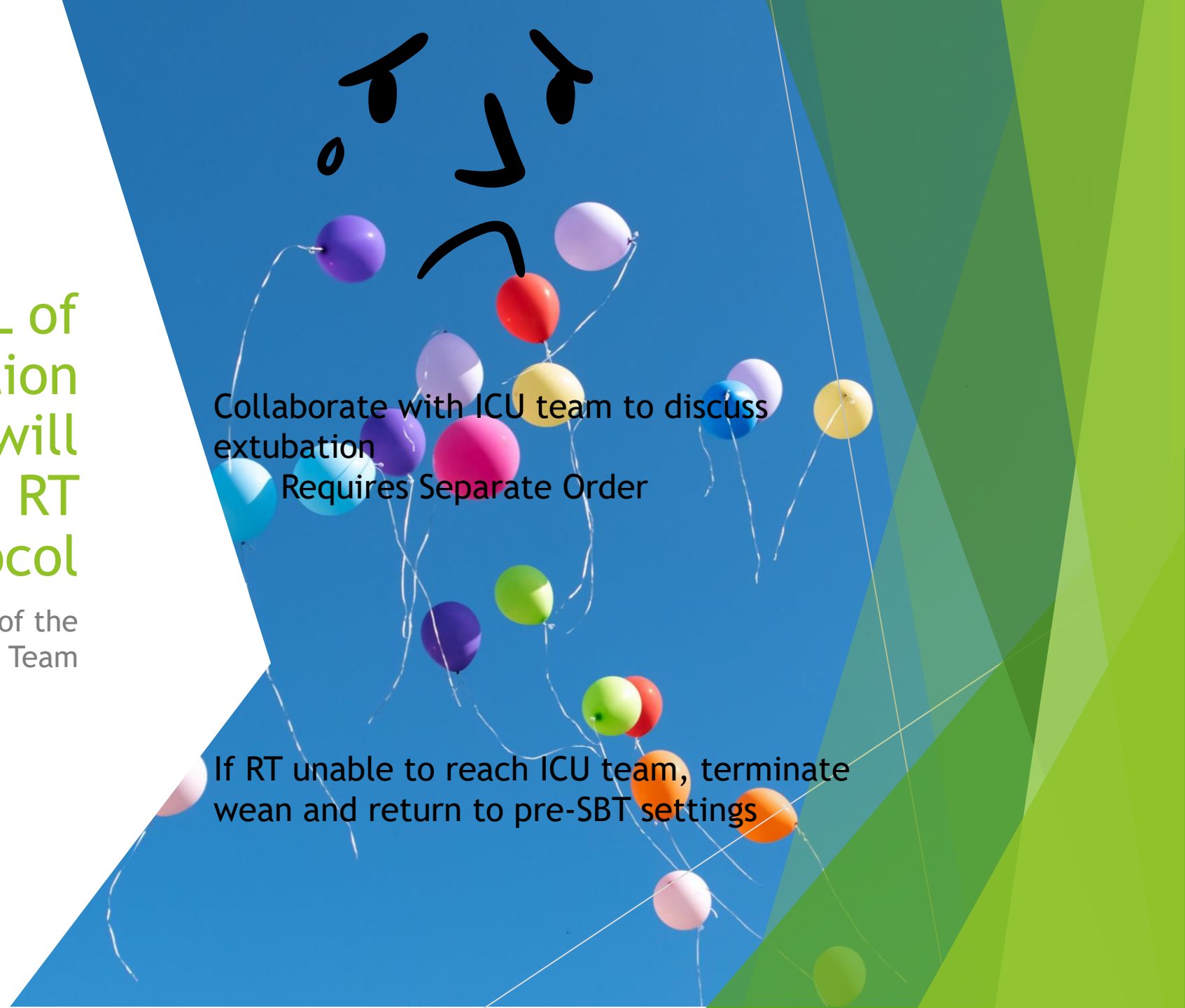
- Targeted goal of < 80
  - Pressure Support of 0cmH2O, and PEEP of 5cmH2O

Additional Attributes to Consider

- Cuff Leak Present
- Secretions manageable
  - Strong Effective Cough
  - Gag intact
  - Swallow intact
- Patient Following Commands
- Patient able to Lift head off bed

If Patient meets ALL of the Extubation Criteria, RT will extubate per RT Protocol

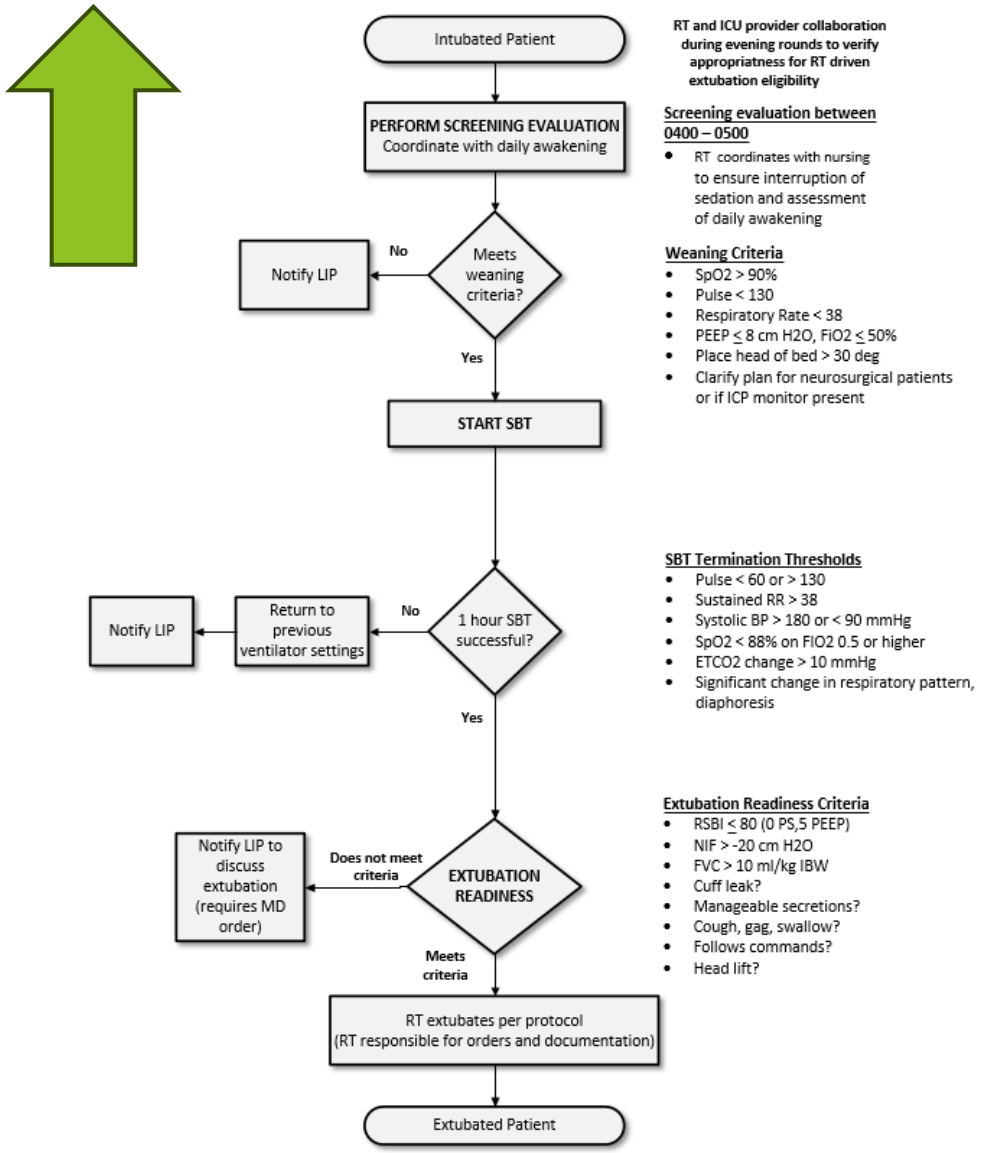
If Patient does NOT meet ALL of the Extubation Criteria, discuss with ICU Team



Collaborate with ICU team to discuss extubation
- Requires Separate Order

If RT unable to reach ICU team, terminate wean and return to pre-SBT settings

Ventilator Weaning Protocol Process (Medical and Surgical ICU)
2/24/2020



RT and ICU provider collaboration during evening rounds to verify appropriatness for RT driven extubation eligibility

Screening evaluation between 0400 – 0500

- RT coordinates with nursing to ensure interruption of sedation and assessment of daily awakening

Weaning Criteria

- SpO2 > 90%
- Pulse < 130
- Respiratory Rate < 38
- PEEP ≤ 8 cm H2O, FiO2 ≤ 50%
- Place head of bed > 30 deg
- Clarify plan for neurosurgical patients or if ICP monitor present

SBT Termination Thresholds

- Pulse < 60 or > 130
- Sustained RR > 38
- Systolic BP > 180 or < 90 mmHg
- SpO2 < 88% on FIO2 0.5 or higher
- ETCO2 change > 10 mmHg
- Significant change in respiratory pattern, diaphoresis

Extubation Readiness Criteria

- RSBI ≤ 80 (0 PS,5 PEEP)
- NIF > -20 cm H2O
- FVC > 10 ml/kg IBW
- Cuff leak?
- Manageable secretions?
- Cough, gag, swallow?
- Follows commands?
- Head lift?

PLACING THE EXTUBATION IN THE RESPIRATORY THERAPIST'S HANDS – CAN WE BE SUCCESSFUL?

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Background

Many patients who are mechanically ventilated are often extubated long after being clinically ready. Extended and unnecessary mechanical ventilation time can lead to several negative outcomes, such as increased risk of infection, Ventilator Induced Lung Injury (VILI), Ventilator Associated Events (VAE) and increased length of stay (LOS). At our academic medical center, patients' extubations were found to be delayed (after meeting criteria) for several reasons, including resident physician hesitancy, lack of attending MD presence, or proximity to end of shift.

Our goal was to define and implement a protocol with a set of objective criteria for weaning and extubation. Using this protocol, the Respiratory Therapist (RT) would extubate the patient without a physician evaluation – eliminating delay and shortening the course of mechanical ventilation without any unplanned reintubations.

Methods

Every evening during rounds, weaning and extubation evaluation for every ventilated patient would be discussed between the RT and resident physician provider. If weaning readiness criteria was met, a daily 1 hour spontaneous breathing trial (SBT) would be performed between the hours of 04:00 – 06:00 am.

Weaning readiness was defined as having:

- FIO2 ≤50% with a SPO2 >90%
- PEEP (Positive End Expiratory Pressure) ≤ 8 cmH2O
- HR < 130
- RR < 38

SBTs were conducted on Pressure Support Ventilation (PSV) 5 and PEEP 5.

SBTs were terminated if any of the following threshold values were observed:

- HR < 60 or > 130
- Sustained RR > 38
- Systolic Blood Pressure > 180 or < 90 mmHg
- SPO2 < 88% despite increasing FIO2 to 50%
- ETCO2 increase/decrease > 10 mmHg
- Significant change in respiratory pattern, diaphoresis, or paradoxical breathing pattern

If a successful SBT was completed, the RT would perform pulmonary mechanics, a Rapid Shallow Breathing Index (RSBI) and assess extubation readiness (per protocol).

...ents who met extubation criteria would be extubated by the RT.
...e criteria was defined as:
...breaths/min/L (0 PS, 5 PEEP)
...CO
...eal Body Weight (IBW)
...eable (cough, gag, swallow intact)
...commands, able to lift head off bed

Success was defined as remaining ventilator free for 72 hours post-extubation. All patients who met the initial weaning criteria would have a smart note template placed into their chart, regardless of whether they were extubated or not (See Figure 1). This both served as a tracking tool for data collection, and helped facilitate communication with the attending physician and the rest of the ICU team.

Vent Wean

Patient {qualifies/does not qualify} for RT driven extubation protocol, as discussed with physician ***. Will proceed with SBT in the morning.

This patient {RT Did/Did Not Meet Spontaneous Breathing Trial}.

Patient {RT did/did not tolerate weaning trial}

Placed back on previous vent setting due to ***.

Extubation criteria was {RT extubation met/not met}

RASS ***
FVC ***
NIF ***
Post-SBT RSBI ***
Air leak was {Present/ Not present}
Secretions are ***
Patient {is/is not} following commands

Patient met all criteria for extubation, and was extubated to ***.

Patient met all criteria for extubation, but was not extubated because *** and was placed back on previous vent settings.

Figure 1: This is a Smart Phrase note that was created to ensure all aspects of weaning were assessed and properly documented in each patient's chart.

Results

There were a total of 34 patients during the evaluation period who met criteria for weaning and completed a successful 1 hour weaning trial. 21 of these patients were in our Medical ICU (MICU) and 13 were in our Surgical/Neurosurgical ICU (SICU).

Out of the total 34 patients, 12 (35.3%) were successfully extubated by an RT following the protocol, 9 in MICU and 3 in SICU (Table 1). The average time from end of a successful SBT and extubation was 65 minutes.

Poor neurological status, provider declined, planned procedures, and other (12, 5, 2, 4) respectively, were given as reasons for not extubating the other 22 patients (Table 2).

None of patients that were extubated via the RT driven protocol required reintubation within the 72 hour window.

Conclusions

Implementing a respiratory therapy driven weaning and extubation protocol can facilitate successful and timely extubation by RTs. Safety measures as outlined in our protocol, along with attending physician support in our ICUs, supported this practice change at our academic medical center. With clearly defined criteria and a care plan in place, RTs can evaluate, assess and perform extubation without direct physician guidance.

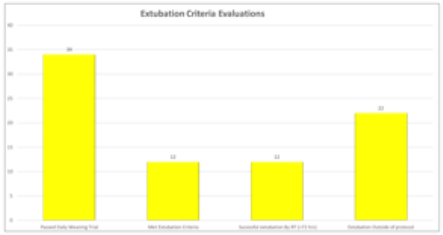

Table 1: This graph shows the total number of patients that passed a daily weaning trial, met extubation criteria and were extubated, successfully extubated, and patients that were extubated outside of the RT driven protocol

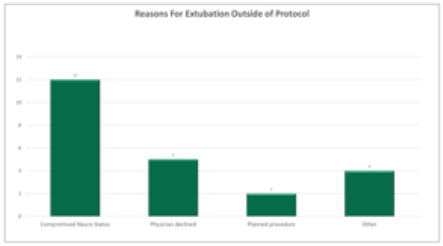

Table 2: This graph shows number of patients extubated outside the RT driven protocol and the number of patients per each reason.

See Respiratory Care Volume 66, Issue 10 Published 10/1/2021

Disclosures

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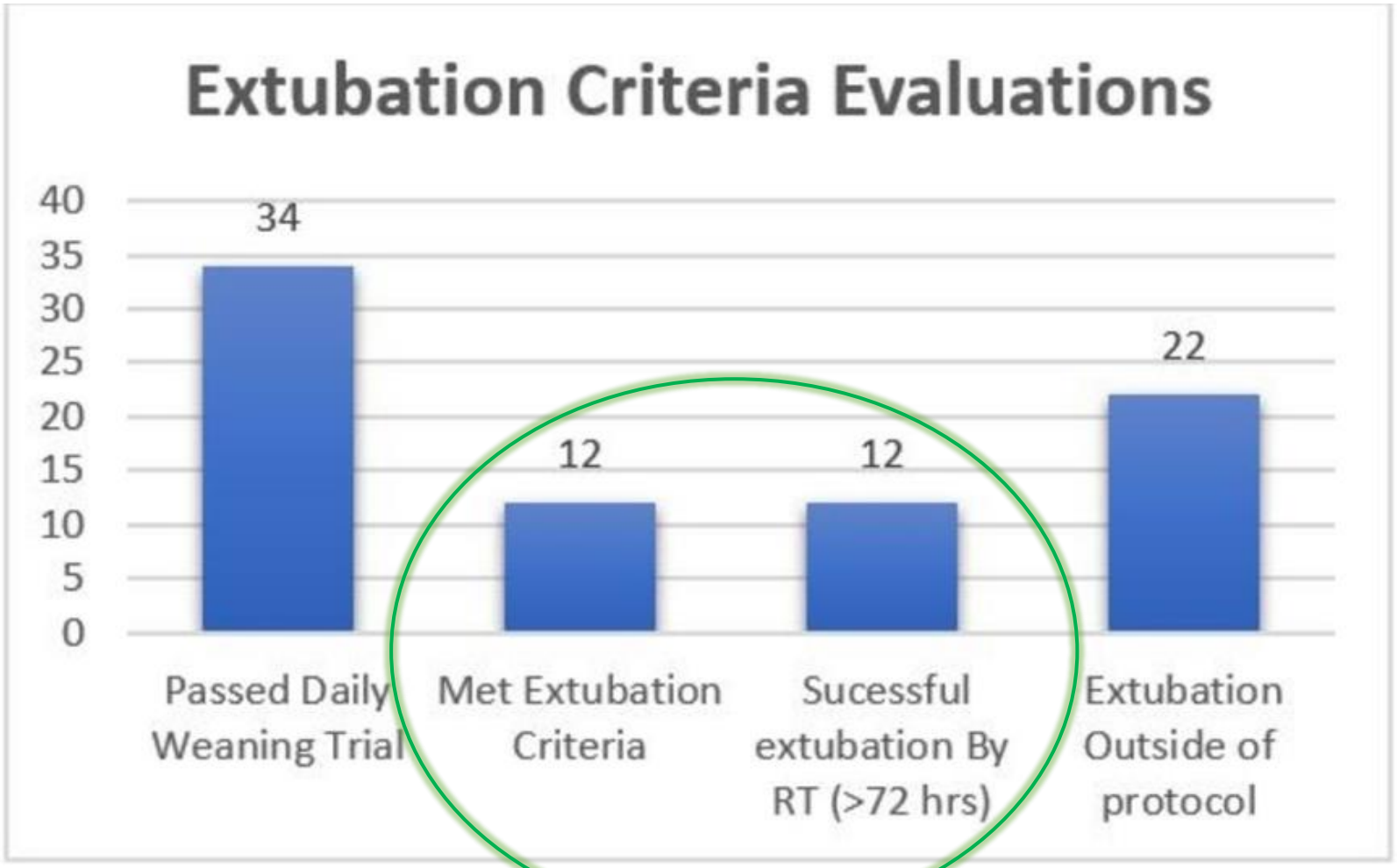
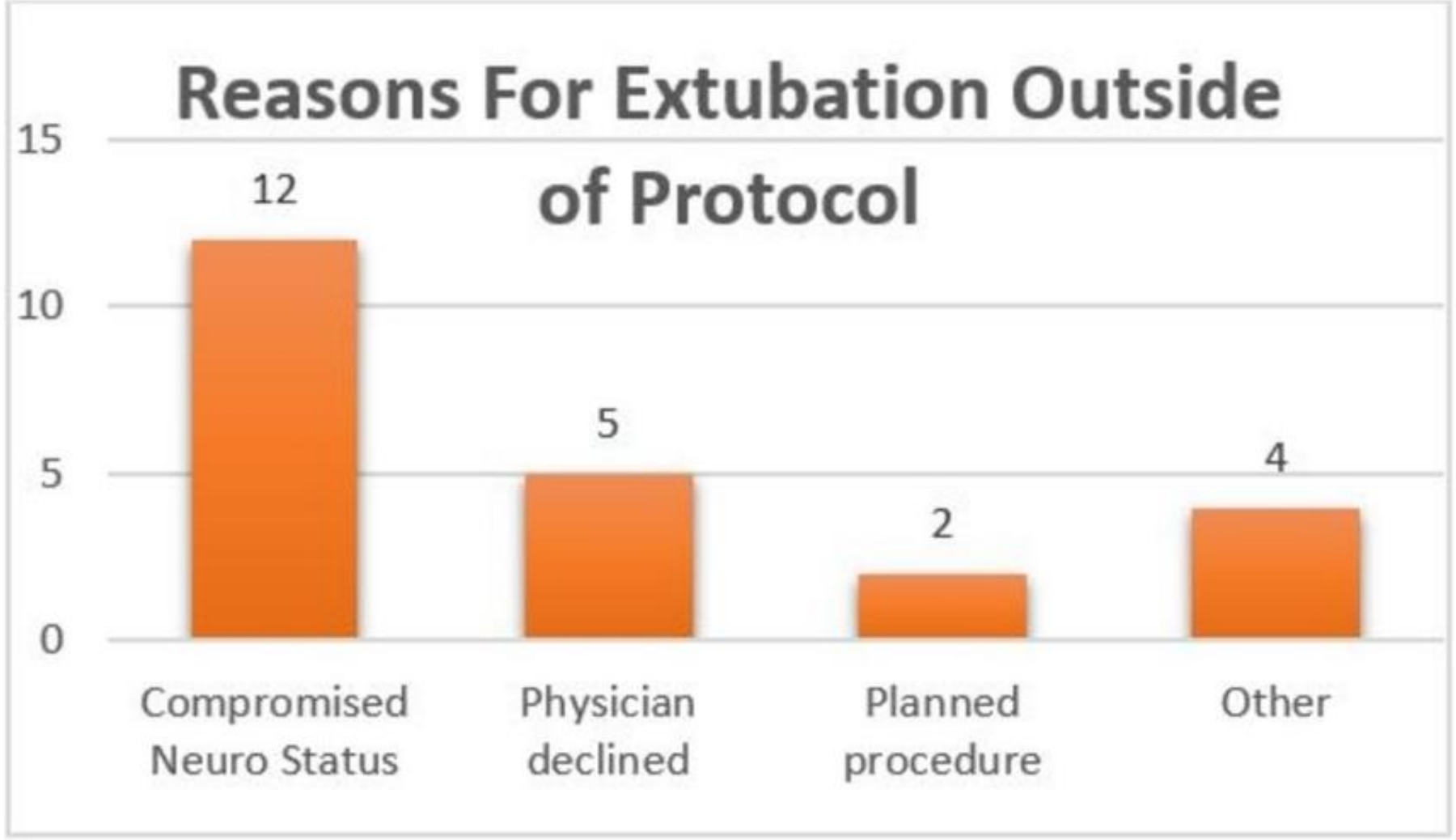

Extubation Criteria Evaluations
40
35
30
25
20
15
10
5
0
34
12
12
22
Passed Daily Weaning Trial
Met Extubation Criteria
Sucessful extubation By RT (>72 hrs)
Extubation Outside of protocol

Results


Reasons For Extubation Outside of Protocol
15
10
5
0
12
5
2
4
Compromised Neuro Status
Physician declined
Planned procedure
Other

Future Considerations

- Expanding Parameters
  - If 100% of weaning patients are successful, are we weaning enough patients?
    - Increasing RSBI threshold
    - Increasing Minute Ventilation threshold
    - Increasing Pressure support to 5cmH2O for RSBI assessment
- Adding additional monitor values to trend
  - End-Tidal CO2 changes
  - Submit your ideas ☺

Next Steps

- Continue to promote daily weaning and review readiness for extubation
- Continue data collection to evaluate changes in length of stay, reintubation rates, and compliance with RT Protocol

Documents Status: **Approved**

IDENT	UVMHN_RESP101
Type of Document	Policy
Applicability Type	Network
Date Effective	3/17/2024
Date of Next Review	3/17/2025

THE University of Vermont HEALTH NETWORK

TITLE: Ventilator Weaning Protocol

Step 1: RT must communicate with ICU licensed independent practitioner (LIP) during evening shift or overnight to determine patient eligibility for RT driven extubation the following morning, or when patient meets the criteria in Step 2. The purpose of this is to confirm stabilization of initial reason for intubation, and to ensure that there are no other non-respiratory barriers to extubation (see step 5).

Step 2: PERFORM SBT SCREENING EVALUATION DAILY (recommended start times:

UVMMC	(0400-0500).	**AHMC**	(0730-0830)
CVMC	(0400-0500)	**PMC**	(0700-0900)
CVPH	(0400-0600)		

Coordinate with RN re: timing of daily awakening.
Respiratory therapist (RT) will document in flowsheet and note (see documentation requirements in Step 6).

The following criteria must be met prior to RT protocol initiation of a spontaneous breathing trial (SBT):

- SpO2 > 90%
- Pulse < 130
- Respiratory Rate < 38
- FiO2 ≤ 0.5 and PEEP (Positive End Expiratory Pressure) ≤ 8 cm H2O
- Place head of bed > 30° (per HOB guidelines)
- Clarify weaning plan with primary team for neurosurgical patients, or if an ICP monitor is present

Patients on the following support DO NOT meet criteria for the weaning protocol

- Nitric Oxide or Flolan
- APRV (Airway Pressure Release Ventilation)/Bi-level Ventilation
- Inverse Ratio Ventilation
- HFOV (High Frequency Oscillatory Ventilation)

Additional comments: If spinal cord injury, use SCI protocol

Step 3: START SBT
A spontaneous mode of ventilation with PS (pressure support) 5 and PEEP (positive end expiratory pressure) 5 are considered to be the desired minimal support for spontaneous breathing trials. If the patient is currently on greater than 5 of PEEP, reduce their setting to PEEP 5 for the duration of the breathing trial, as long as they are stable. Breathing trial not to extend longer than 1 hour.

Terminate wean if any of the following threshold values are observed. Document all reasons for termination of the wean. (Patient is to return to previous ventilator settings and notify LIP)

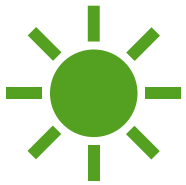
Pulse < 60 or > 130
Sustained RR > 38
Systolic Blood Pressure > 180 or < 90 mmHg
SpO2 < 88% despite increasing FIO2 to 50% or higher
ETCO2 increase/decrease > 10 mmhg
Significant change in respiratory pattern, diaphoresis, or paradoxical breathing pattern

Step 4: POST SBT TRIAL
Obtain the following values after successful 1 hour SBT trial:
RSBI
NIF

Its not just evidence based practice

Its Policy ☺

On your way out, consider the following:



RTs are present with weaning patients from sunset to sunrise

RTs are coordinating with nurse/resident colleagues for successful daily trials

RTs are collecting data to support next step in ventilator liberation

Promote Physician Champions who are allowing the RTs to get the job done

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- Thank you for listening!
- Please direct all inquires to Alex.Gambero@uvmhealth.org
- Thank you to Emily, Chris, Cara
- Thank you Andrea, love you
- The best boys in the business:

Questions?