



# Spontaneous Breathing Trials

# Ely trial

- Ely, NEJM. 1996;335:1864-9
  - Randomized Controlled Trial
  - Single center medical and coronary intensive care unit
  - 300 patients enrolled

## Ely, NEJM. 1996;335:1864-9

- Ely NEJM 1996;335(25):1864-9
  - daily screening of patients by RRT looking at 5 criteria
    - $\text{PaO}_2/\text{FiO}_2 > 200$ ,  $\text{PEEP} \leq 5$ , adequate cough during suctioning,  $f/V_T \leq 105$ , and no infusion of sedatives or vasopressors.
  - If met these criteria 1/2 patients randomized to undergo 2 hour trial of T-piece

- Patients were monitored for tolerance of trial
  - trial discontinued if
    - RR > 35 / min for 5 minutes or longer
    - SaO<sub>2</sub> < 90 %
    - HR > 140 / min
    - sustained changes in HR > 20%
    - sys BP > 180 or <90
    - increased anxiety and diaphoresis

## Ely, NEJM. 1996;335:1864-9

- If patient tolerated 2 hour trial of spontaneous breathing oral communication informing the attending physician of the results of the trial and a note was placed on the chart for attending physician.

“Your patient has successfully completed a two hour trial of spontaneous breathing and has an 85 % chance of successfully staying off mechanical ventilation for 48 hours.”

## ■ Outcomes

### ■ Primary

- Duration of mechanical ventilation
- Duration of time from passing successful screening test to the discontinuation of mechanical ventilation
- Length of stay in ICU

### ■ Secondary

- Frequency of complications
- Cost of respiratory care, intensive care and hospitalization
- Length of hospitalization
- mortality

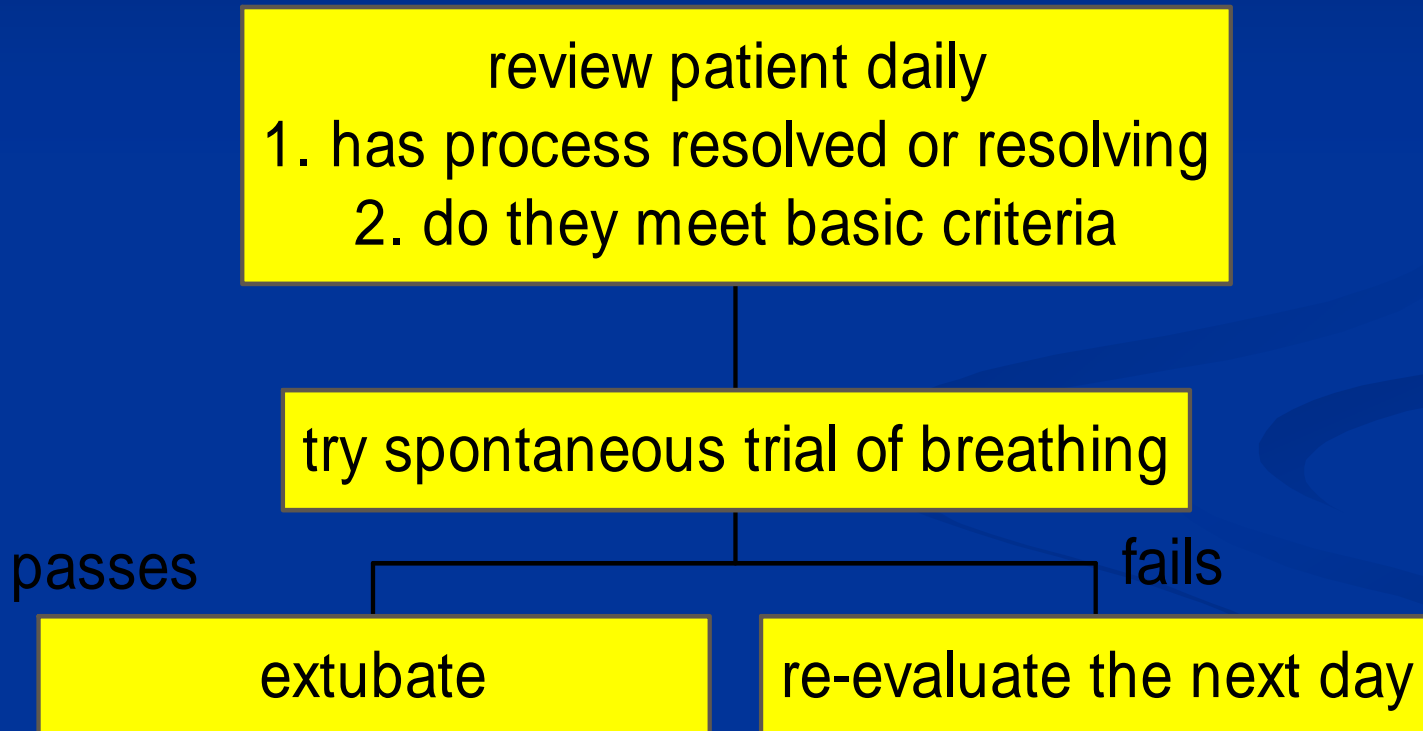
## ■ Results

Outcome	Intervention (N = 149)	Control (N = 151)	P value
Mechanical Vent	3	4.5	0.003
Intensive Care	8	9	0.17
Reintubation	6 (4%)	15 (10%)	0.04
Ventilation > 21 d.	9 (6%)	20 (13%)	0.04
Intensive Care \$	15,740	20,890	0.03
Hospital \$	26,229	29,048	0.3

# Take Home Messages

- *Daily screening* is beneficial for clinicians and patients (duration of MV, time to discontinuation)
- What technique is used to conduct an SBT seems to be less important than *whether* an SBT is conducted
- 30 min is adequate in most patients (but maybe not all!). *Not an equivalency trial.*

# Approach to discontinuing ventilation



# Clinical Practice Guidelines

- Patients receiving mechanical ventilation for respiratory failure should undergo a formal assessment of discontinuation potentials if the following criteria are satisfied:
  - Evidence for some reversal of the underlying cause for respiratory failure:
  - Adequate oxygenation (e.g. PaO<sub>2</sub>/FiO<sub>2</sub> ratio > 150 to 200; requiring positive end-expiratory pressure [PEEP]  $\approx$  5 to 8 cm H<sub>2</sub>O; FiO<sub>2</sub>  $\approx$  0.5 to 0.5); and pH (e.g. 7.25);
  - Hemodynamic stability, as defined by the absence of active myocardial ischemia and the absence of clinically significant hypotension;
  - The capability to initiate an inspiratory effort.

Grade of evidence: B

# Clinical Practice Guidelines

- An initial brief period of spontaneous breathing can be used to assess the capability of continuing onto a formal SBT.
- The criteria with which to assess patient tolerance during SBTs are the respiratory pattern, the adequacy of gas exchange, hemodynamic stability, and subjective comfort.
- The tolerance of SBTs lasting 30 to 120 min should prompt consideration for permanent ventilator discontinuation.

Grade of evidence: A

# Clinical Practice Guidelines

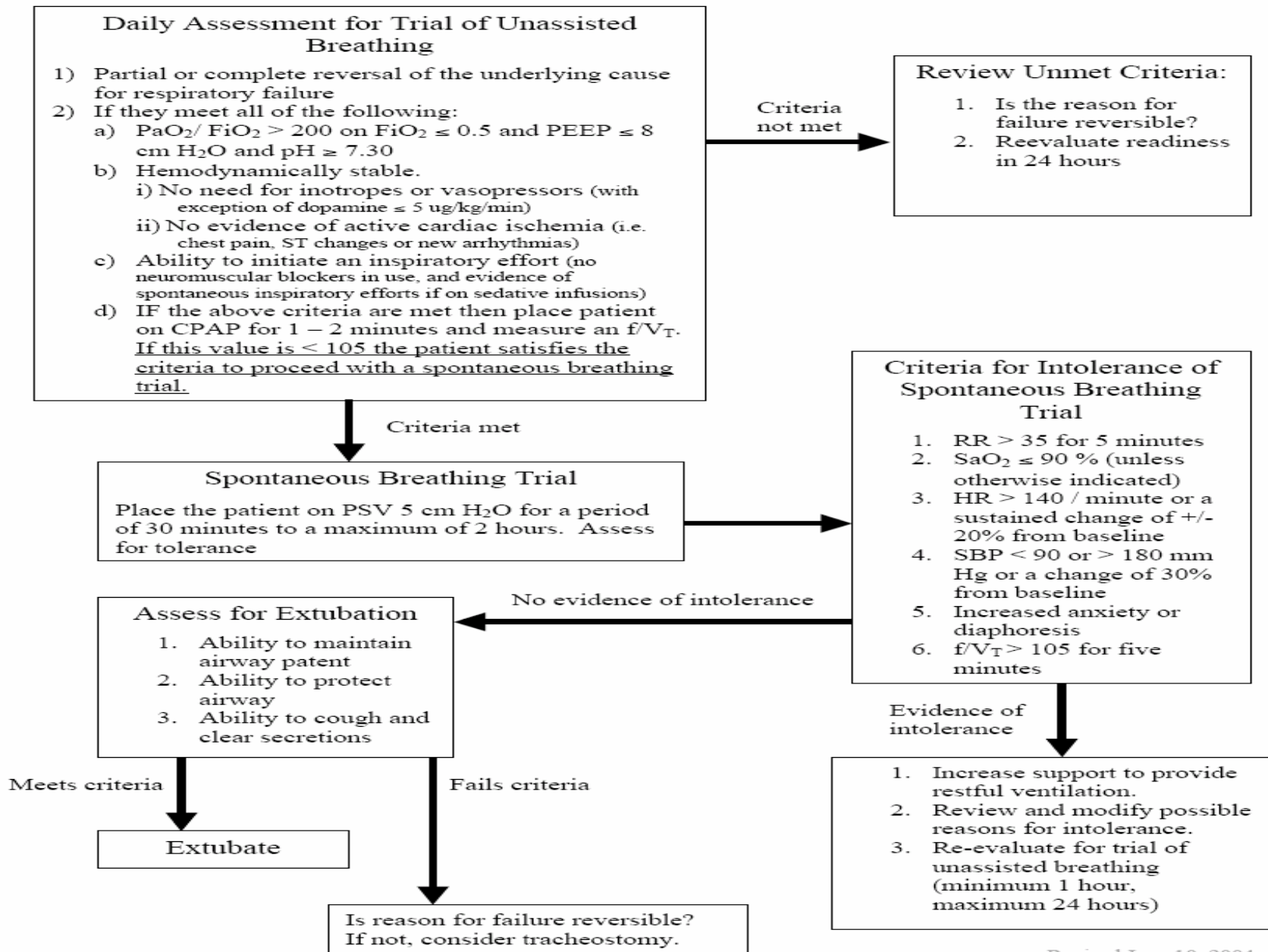
- Patients receiving mechanical ventilation for respiratory failure who fail a Spontaneous Breathing Trial should have the cause for the failed SBT determined. Once reversible causes for failure are corrected, and if the patient still meets the criteria in recommendation 1. then subsequent SBTs should be performed every 24 hours.

Grade of evidence: A

- Patients receiving mechanical ventilation for respiratory failure who fail an SBT should receive a stable, non-fatiguing, comfortable form of ventilatory support.

Grade of evidence: C

# Spontaneous Breathing Trials



## Daily Assessment for Trial of Unassisted Breathing

- 1) Partial or complete reversal of the underlying cause for respiratory failure
- 2) If they meet all of the following:
  - a)  $\text{PaO}_2 / \text{FiO}_2 > 200$  on  $\text{FiO}_2 \leq 0.5$  and  $\text{PEEP} \leq 8$  cm H<sub>2</sub>O and  $\text{pH} \geq 7.30$
  - b) Hemodynamically stable.
    - i) No need for inotropes or vasopressors (with exception of dopamine  $\leq 5$  ug/kg/min)
    - ii) No evidence of active cardiac ischemia (i.e. chest pain, ST changes or new arrhythmias)
  - c) Ability to initiate an inspiratory effort (no neuromuscular blockers in use, and evidence of spontaneous inspiratory efforts if on sedative infusions)
  - d) IF the above criteria are met then place patient on CPAP for 1 – 2 minutes and measure an  $f/V_T$ . If this value is  $< 105$  the patient satisfies the criteria to proceed with a spontaneous breathing trial.

### Review Unmet Criteria:

1. Is the reason for failure reversible?
2. Reevaluate readiness in 24 hours

### Spontaneous Breathing Trial

Place the patient on PSV 5 cm H<sub>2</sub>O for a period of 30 minutes to a maximum of 2 hours. Assess for tolerance

## Criteria for Intolerance of Spontaneous Breathing Trial

1. RR > 35 for 5 minutes
2. SaO<sub>2</sub> ≤ 90 % (unless otherwise indicated)
3. HR > 140 / minute or a sustained change of +/- 20% from baseline
4. SBP < 90 or > 180 mm Hg or a change of 30% from baseline
5. Increased anxiety or diaphoresis
6. f/V<sub>T</sub> > 105 for five minutes

## Assess for Extubation

1. Ability to maintain airway patent
2. Ability to protect airway
3. Ability to cough and clear secretions

Meets criteria

Extubate

Fails criteria

Is reason for failure reversible?  
If not, consider tracheostomy.

1. Increase support to provide restful ventilation.
2. Review and modify possible reasons for intolerance.
3. Re-evaluate for trial of unassisted breathing (minimum 1 hour, maximum 24 hours)

# Spontaneous Breathing Trials

