Weaning Strategies and Extubation Readiness Testing

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Geneva 2007

Introduction

- Mechanical ventilation is a world-wide used lifesaving intervention in the PICU and NICU, but it also involves the risk of serious complications

- Reducing the duration of ventilatory support is a way to prevent these complications

Indications

- Respiratory Distress
- Neurotrauma
- Prematurity
- Cardiac Surgery and Abdominal Surgery
- Polytrauma
- Intoxications
- Others

Ventilatory Modes

- Volume Controlled Ventilation
- Pressure Controlled Ventilation
- Volume Support Ventilation
- Pressure Support Ventilation
- Continuous Positive Airway Pressure
- Synchronized Intermittent Mandatory Ventilation
- Pressure Regulated Volume Control
- Automode

Analgesia and Sedation

- Mgt of pain and distress remains one of the more challenging areas of practice within the PICU/NICU
- Sedatives & analgesics are known to provide comfort and to relieve anxiety
- Modern advances in ventilator technology reduces the need for heavy sedation during MV and makes ventilatory weaning easier

Comfort Scale

(C.Marx et al, Crit Care Med 1994; 22: 163-170)

- Items: Alertness
  Calmness/Agitation
  Respiratory Response
  Physical Movement
  Blood Pressure Baseline
  Heart Rate Baseline
  Muscle Tone
  Facial Tension

Reliability and Validity of BP and HR in the Comfort Scale

The Comfort Scale would be more reliable and valid if HR and BP were removed from the scale. Research suggests that these items diminish the Scale's reliability and validity because HR and BP do not only reflect comfort- but reflects other phenomena.

F.Carnevale and S.Razack (PICU Children's hospital Montreal Canada)

Ventilation Weaning

Withdrawal from mechanical ventilation may seem simple, but it is sometimes more difficult than maintaining the mechanical ventilation itself

(S.Benito, Chest 1996; 51; 4, 267-269)

Before mechanical ventilation is withdrawn, the patient should be recovered or being in a satisfying process of recovering from the illness causing the respiratory failure

Unsuccessful extubations increase mortality, it is of paramount importance for clinicians to be able to identify those patients who are likely to have a successful weaning period and extubation

(JA Farias et al, Intensive Care Med 1998; 24: 1070-1075)

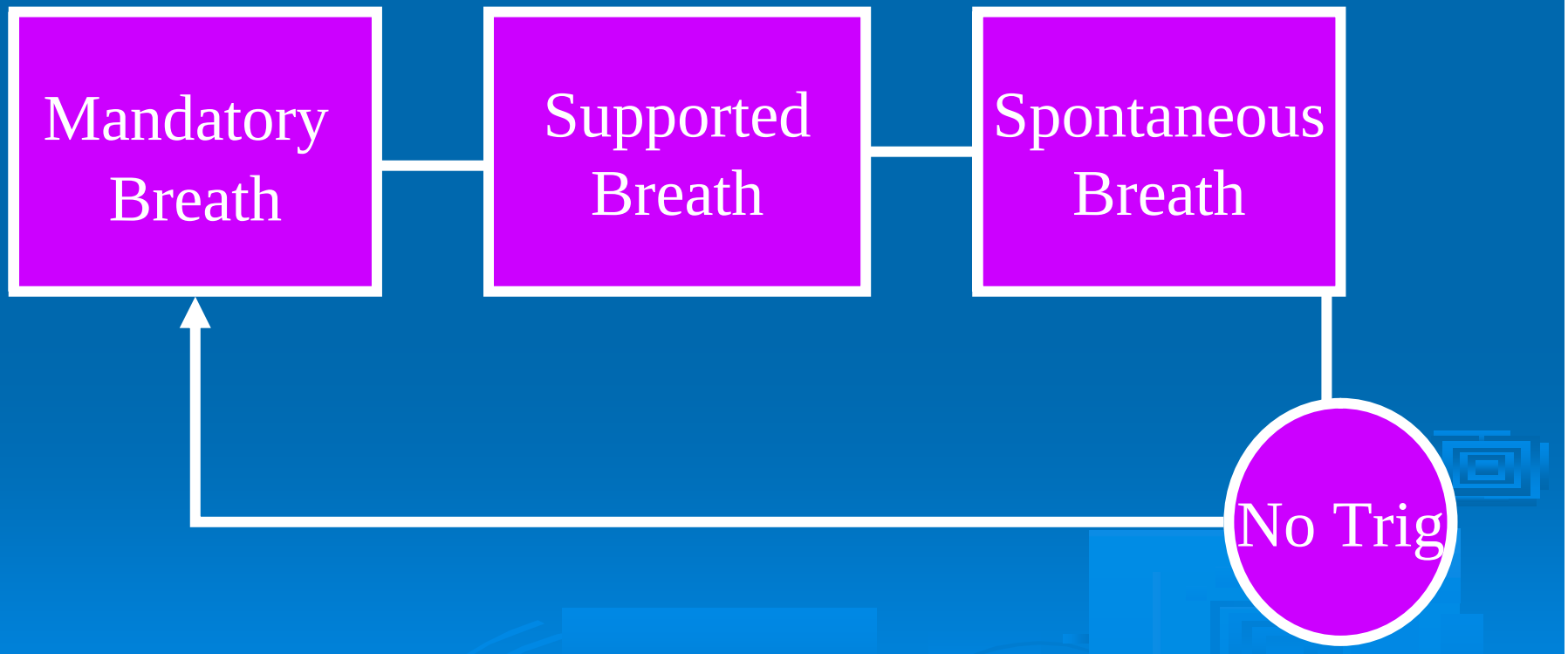
Weaning from mechanical ventilation represents the period of transition from total ventilatory support to spontaneous breathing

(S.Benito,Chest 1996; 51;4, 267-269)

Patient Interactive Ventilation

- The use of the automated switch of ventilatory mode is designed to allow the ventilator to interact with the patients needs
- The ventilator is adapted to the patient and not vice versa

Automode


Mandatory Breath
Supported Breath
Spontaneous Breath
No Trig

The ventilator monitors the patient’s ability to breathe spontaneously, shifts from a controlled ventilation to a spontaneous ventilation mode after two consecutive triggering efforts by the patient.

If no trigger there is a automatically switch to the controlled ventilation mode

The automode is suitable for patients with respiratory drive, who can trigger breaths but require back up, with changing ventilatory needs

Automode

- Weaning starts earlier
- Interactive respiratory therapy
- Less sedation
- Shorter stay on ventilator
- Flexible weaning
- Less fighting of the ventilator
- Fewer alarms
- Apnea back-up

Extubation Readiness Testing

Criteria

- Spontaneous respiratory effort
- Gag or cough with suctioning
- pH between 7.32 and 7.45
- PEEP of 7 cm H20 or less
- Level of consciousness acceptable for extubation

JAMA 2002, VOL 288, No 20

University of Michigan Sedation Scale

UMSS

- 0 Awake and alert
- 1 Minimally sedated
- 2 Moderately sedated
- 3 Deeply sedated
- 4 Unarousable

Time of weaning before extubation

- 35 hours
- 26 hours
- 8 hours
- 4 hours
- 12 hours
- 24 hours
- 24 hours
- Average rate of 19 hours

Conditions

PH	Sat	PEEP	Fi02	ETC02
7.34	97	3	26%	46
7.38	95	3	41%	25
7.45	98	3	30%	48
7.41	92	2	35%	47
7.48	97	3	34%	39
7.39	96	4	40%	46
7.34	97	3	33%	40

Comfort Score before detubation

- Alertness; Drowsy
- Calmness; Slightly anxious
- Respiratory response; Occasional cough
- Physical movement; Frequent slight movements
- Muscle tone; Normal
- Facial tension; Normal
- HR and BP at baseline

Conclusion

- In the ventilation process of a child the weaning period is crucial
- Shorter weaning periods are associated with better outcome and decreased mortality