

# Early Extubation Following Open Heart Surgery: the Role of the Intensivist

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## Discontinuation of Mechanical Ventilation

**wean** *vt* [ME *wenen*] 1. to accustom (as a child) to take food otherwise than by nursing 2. To detach from a cause of dependency or preoccupation : free from a usually unwholesome interest *syn* see **ESTRANGE**

# Principles of Discontinuation of Mechanical Ventilation (MV)

- Immediate or rapid post-operative extubation
- Delayed post-operative extubation
- Extubation during recovery from medical illness
- Protracted “weaning” from mechanical ventilation following prolonged medical illness
- Terminal extubation

# Strategies for Discontinuation of MV

- Is the patient ready?
  - Fluid status, hemodynamic stability
  - Pre-existing medical illness
  - Gas exchange
  - Renal function
  - Balloon pump
  - Delirium
- Respiratory function assessment
  - RSBI, spontaneous breathing trial

# Predictors of Successful Discontinuation of MV: RSBI

- Rapid shallow breathing index =  $f/V_T$
- $< 100$  portends success
- Four large studies were conflicting, all had methodologic weaknesses
  - (+) predictive value = 78%
  - (-) predictive value = 95%

## Using RSBI Following OHS

- 167 consecutive CVS patients
- RSBI utilized as sole extubation criteria
- Extubation time: 2hrs 40min
- No increased rates of re-intubation
- Reduced LOS in CCU

(Oribabor CE. Chest 2005;28;273)

# Predictors of Successful Discontinuation of MV ?

- PaO<sub>2</sub>:

- PaO<sub>2</sub> > 60 when FI<sub>O2</sub> < .35
- PaO<sub>2</sub>/FI<sub>O2</sub> ratio > 200

- Minute ventilation < 10 L/min

- NIF

- Compliance:  $VT / (\text{plateau pressure} - PEEP)$

- Occlusion pressure, WOB

- Integrative indices (CROP index)

# Spontaneous Breathing Trial

- Bedside evaluation during spontaneous breathing
  - VS, respiratory rate
  - Increased effort, nasal flaring
  - accessory muscles, recession of intercostal spaces
  - paradoxical breathing

## Process of Successful Discontinuation of MV

- Identify those patients where global assessment forecasts success
- Use screening extubation parameters (RSBI)
- Perform spontaneous breathing trial
- Goal: do not miss anyone who can successfully extubate
- Best test: low false positive rate

# Immediate Post-operative Extubation (2-6 hrs)

- Consider summary extubation: *just do it*
- Medical/surgical stability more important than extubation parameters
- Extubation parameters may not reliably predict success
- “lift head”, “shake my hand” = extubate
  - Tests strength and residual paralytic effect
  - Tests cooperation and LOC

# Very Early Extubation: Why?

- Risks of continued MV and bedrest
  - Pneumonia, DVT
  - sedation requirement
  - Decreased QoL?
- Optimum RN staffing
- Better “through-put” and bed utilization

# Fast-Track Recovery from CVS

- Meta-regression analysis of 27 fast-track studies (out of 643 articles)
  - Low risk patients
- Variables measured:
  - High dose vs low dose anesthesia
  - Normothermia vs hypothermia
  - Extubation protocol

(Ghislaine: Crit Care Med 34:1624;1624)

# Fast-Track Recovery from CVS

## ● Results:

- *Early extubation protocol* decreased ICU and hospital stay
- LOS in ICU and hospital not affected by other variables

## ● Parameters not measured:

- shorter acting narcotics, muscle relaxants, inhalational agents, regional anesthesia, methylprednisolone, dexmedetomidine

(Ghislane: Crit Care Med 34:1624;2006)

# Early Extubation in OHS: Cochrane Date Base

- Review of 30 studies reporting on early extubation
- Studies compared routine care vs. early extubation:
  - No increase in immediate or 30 day mortality
  - No difference in myocardial ischemia
  - No difference in re-intubation
  - Shorter ICU LOS and hospital LOS in patients fast-tracked to early extubation

(Cochrane Database (4);CD003587,2003)

# Early Extubation in Low Risk Patients After CVS

- Safe
- Decreases LOS

# Who Sees Low Risk CVS Patients Anymore?

- Historical studies can't compare with current clinical challenges
  - Decline in number of low risk patients undergoing CVS
  - PTCA
  - Change in patient demographics
  - Obesity
  - Elderly
  - Higher risk patients undergo CVS (this is the group *excluded* in studies of fast-track!)

# Early Extubation: Practice at 12 COAP Hospitals

- Patients are rarely extubated in the OR
- Most hospitals do not require physician presence for extubation
- Most hospitals allow RN/RT manage extubation, but several hospitals require contact with the staff physician
- All hospitals have a written protocol for extubation following cardiac surgery

# Early Extubation After CVS

- Formulaic respiratory parameters help, but are not the last word
- Clinical status prevails over parameters
- When in doubt, ask the nurse
- RN + RT teamwork is worth more than parameters
- Maintain “extubation mentality”
- OR extubation is not a realistic goal

# Barriers to Immediate Extubation

- Excess sedation
- Hesitant or inexperienced staff
- Inadequate RN/RT staffing
- Excessive physician caution
- Evening surgery
- Potential medical instability
- Increased number of consultants

## Extubation after CVS: OHMC

When the patient is awake, and

- hemodynamically stable
- $SpO_2 > 92\%$  on  $FI_{O_2} 40\%$
- chest tube drainage  $< 50\text{cc/hr}$

Measure spontaneous parameters, then

       extubate per RC Protocol, or

       call anesthesiologist for extubation orders

# Strategies For Improving Efficiency in the Care of CVS Patients

- Rapid growth of number of CABG procedures in the 1990's
- Innovative strategies:
  - Bypass the ICU by using dedicated cardiac recovery units
  - Single Stay Unit
  - Development of fast-track protocols

# CV Surgery Post-Op Care: Not utilizing Critical Care

- 245 consecutive patients
- 3 beds to dedicated CVS recovery
- Rapid extubation by protocol (1.5 hrs)
- 15 patients subsequently admitted to general ICU
- 90% of OHS patients can be treated safely and efficiently in a single stay unit

(Chong JL BHJ 1992;68:430)

# CV Surgery: Single Unit Stay

- Rapid extubation (2-6 hrs)
- Early chair (2 hrs after extubation)
- Early ambulation
- CV surgery patients admitted to a designated unit
- When stable, status changes to intermediate
- patients are not transferred to a step down

(Clark EI. AmJCritCare 2004;13:406)

# Ultra-Fast Tract (UFT) Extubation in the OR?

- 738 CVS patients

- Length of surgery 125 min
- Cross clamp 58 min
- Thoracic epidural, paravertebral blocks

- All patients extubated in OR

- Conclusion:

- UFT extubation is safe
- UFT saves \$1465 per patient