



## Value Analysis: The Costs of Disconnection

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### Overview:

This document will discuss and verify the costs associated with a disconnection event.

### Introduction:

In the care of the critically ill patients the utilization of a ventilator connected to tracheostomy tube helps to ensure that the patient receives adequate oxygenation and ventilation (expelling carbon dioxide). The present connection between the ventilator circuit and the tracheostomy tube consists of a slip-style fitting that can easily separate due to a variety of factors such as:

1. Taper of the inner cannula.
2. Connection is wet due to moisture in the ventilation process or “bio-slime”.
3. Connection is pressurized continuously, but with rapidly fluctuating pressure changes.
4. The patient moves relative to the ventilator circuit

External securing devices may be utilized to enhance the security of the connection, but these products are not the perfect solution to solve the issue of disconnection.

### Discussion:

When a ventilator disconnection occurs, a ventilator alarm will typically sound-off, which alerts everyone to the situation.

- *The sound creates tension for the family members who become anxious and concerned.*
- *The patient may become agitated or disoriented from the disconnection.*
- *The sound creates tension for the Nursing staff as they need to:*
  - a. Stop what they are doing to determine the source of the alarm.*
  - b. Assess the situation.*
  - c. Reconnect the patient.*
  - d. Silence the ventilator alarm.*
  - e. Assess the patient’s physiological condition.*

*Cycle resumes as patients who disconnect typically continue to disconnect*

- *PEEP dependent patients are of particular concern:*

*Note: PEEP dependent patients require establishment and maintenance of PEEP to establish and maintain oxygenation.*

*Loss of PEEP occurs within 8 to 10 breaths, but can take from 1 to 3 hours to reestablish completely.*

*PEEP dependent patients can have catastrophic oxygen deprivation when PEEP is lost. During the reestablishment period, nursing, RT, and physicians are continually:*

- a. Reevaluating the patient to insure PEEP is being reestablished.*
- b. FiO<sub>2</sub> (Fraction of Oxygen) is being weaned to minimize oxygen toxicity.*
- c. Other parameters such as tidal volume, I:E Ration (Inspiratory : Expiratory Ratio), peak pressures may also need to be continuously modified.*
- d. Evaluating other organ damage (e.g. myocardial infarction) during PEEP loss period.*
- e. Obviously acute nursing and RT attention means other patients are not being seen requiring clinical resources to be stretched to cover the other patient load.*

- *The nursing staff will request the assistance of a Respiratory Therapist in adjusting the ventilator to re-establish the proper patient settings. This requires the Respiratory Therapist to:*
  - a. *Stop current task.*
  - b. *Assess the disconnection situation.*
  - c. *Determine the need for an external securing device.*
  - d. *Locate a LEGAL external securing device.*
  - e. *Install the LEGAL external securing device.*
  - f. *Maintain LEGAL external securing device.*

The patent pending taper design of the Phoneris Aero-Flex makes inline suctioning easier. This encourages more frequent suctioning, which:

- a. Decreases the Nursing/RT time required to complete suctioning.
- b. Potentially decreases the possibility of VAP by removing retained secretions.
- c. Potentially improves oxygenation by decreasing mucous plugging/atelectasis (collapse of small airways).
- d. Decreases the need to completely disconnect the patient and use a manual suction catheter to successfully suction the patient, which adds cost.
- e. Improves patient comfort from less tracheostomy tube/suction manipulation to successfully pass the suction catheter.

#### Issues and Analysis:

If the clinical staff treats the alarm as background noise and does not respond quickly enough a serious life-threatening situation including death can occur. Even if no adverse event occurs the distressed patient with a family member present may present the “picture” of negligence inviting a lawsuit with or without merit. The resulting lawsuit, which could have been avoided, will be costly to the hospital due to defense costs and if lost by the hospital an award to the patient in excess of multiple millions of dollars.

When the clinical staff responds to the alarm, it may take up to 10 minutes for a Nurse to re-establish a connection and resolve the situation. If the average cost per hour for a nurse is \$45 per hour, the cost of clinician time to resolve the event can be as high as \$7.50 per event.

If the patient requires the reestablishment of PEEP, it may take up to 3 hours of clinician time to reestablish PEEP. If the average cost per hour for a nurse is \$45 per hour and the average cost per hour for a respiratory therapist is \$20 per hour, the cost of clinician time to resolve the event can be as high as \$195.

Patients who disconnect once will typically disconnect numerous times during their hospital stay. During an average 7-day patient stay, the total number of disconnection events will exceed 10 occurrences, so for this patient the cost can exceed \$1950.

Patients who disconnect are more susceptible to VAP. In the new era of Pay for Performance (P4P), the costs associated with treatment of VAP cases are to be covered by the hospital and non-reimbursable by Medicare or Private Insurance Companies.

There are two possible solutions for the elimination of disconnection:

- One would be the utilization of external securing devices. These devices range in cost from \$4.00 to more than \$7.00. These devices are typically manufactured from Velcro or cloth and become contaminated on a daily basis by “bio-slime” which creates the need for daily replacement. Thus, daily supply costs are increased.
  - Furthermore, Velcro can attach to items such as gauze and 4 x 4's resulting in entanglement or dislodgement, i.e. split 4x4 frequently found underneath the neck plate of the tracheostomy tube to absorb secretions and aid in patient comfort. If dislodgement this increases Nursing and RT

time to replace the 4 x 4's. This can be extremely difficult on a freshly placed tracheostomy as the freshly placed tracheostomy is typically sutured in place meaning the split 4 x 4 have to be placed between the sutures and the tracheostomy tube.

- ✓ The other solution is the utilization of the Phoneris system. The Phoneris system contains two components. The Phoneris Inner Cannulae is a sterile replacement inner cannula intended to be utilized in the appropriate tracheostomy tube and to mate with the appropriate Phoneris Aero-Flex Ventilator Circuit Connector of the same style. The combination decreases the risk of disconnection. Furthermore, the combination of the Phoneris Inner Cannulae and the Phoneris Aero-Flex Ventilator greatly improves the ease and efficiency of suctioning a patient. The costs associated with the utilization of the Phoneris system are far lower than the costs associated with disconnection.

Conclusion:

The Phoneris Inner Cannulae and Phoneris Aero-Flex provides a specially designed integrated system that replaces the manufacturer's components to:

- ✓ Provide a more secure connection between the inner cannula and ventilator circuit.
- ✓ Eliminate the need for improvised securing devices, rubber bands, tapes, etc. which can increase the incidence of skin breakdown.
- ✓ Decrease the incidence of accidental disconnection that can lead to respiratory distress.
- ✓ Improve staff efficiency by decreasing the incidence and urgency of unplanned disconnections.
- ✓ Reduce stress on staff from accidental disconnections.
- ✓ Greatly improves ease of passing inline suction catheter.

The utilization of the Phoneris system can easily be justified based on the high costs associated with the treatment of events associated with ventilator disconnection.