

# Instillation of normal saline before suctioning reduces the incidence of pneumonia in intubated and ventilated adults

## Synopsis

Summary of: Caruso P, Denari S, Ruiz SAL, Demarzo SE, Deheinzelin D (2009) Saline instillation before tracheal suctioning decreases the incidence of ventilator-associated pneumonia. *Critical Care Medicine* 37: 32–38. [Prepared by Mark Elkins, CAP Co-ordinator.]

**Question:** Does the instillation of normal saline before suctioning reduce the incidence of ventilator-associated pneumonia in intubated and ventilated adults? **Design:** Randomised, controlled trial with blinded outcome assessment. **Setting:** The medical/surgical intensive care unit of a tertiary oncology hospital in Brazil. **Participants:** Adults expected to require at least 72 hours of mechanical ventilation via an endotracheal or tracheostomy tube. Previous ventilation within the past month and contraindications to bronchoscopy were exclusion criteria. Randomisation of 262 participants allotted 130 to the intervention group and 132 to a control group. **Interventions:** Closed tracheal suction systems with heat and moisture exchangers were used with both groups and were changed regularly. All patients were nursed with backrest elevation to 45 degrees. Medical or nursing staff, who were blinded to group allocations, requested suctioning when any of the following occurred: visible or audible secretions, ventilator-patient asynchrony, and increased peak inspiratory pressures or decreased tidal volumes attributed to secretions. Respiratory therapists performed the suctioning according to

a standardised procedure that included preoxygenation. The therapists instilled 8 mL of normal saline prior to suctioning in the intervention group only. **Outcome measures:** The primary outcome was the incidence of ventilator-associated pneumonia (VAP). If VAP was suspected because of radiographic evidence plus either fever, leukocytosis, or purulent secretions, a bronchoscopy with standardised lavage was performed. VAP was considered confirmed if the bacterial density of the lavage fluid exceeded 1000 colony-forming units/mL. Secondary outcome measures included time to VAP, duration of mechanical ventilation, length of stay and mortality in the intensive care unit, unscheduled ventilation circuitry changes due to secretions, and number of suctionings per day. **Results:** All participants completed the study. Significantly fewer participants in the saline group developed VAP (14/130) than in the control group (31/132), relative risk reduction 0.54 (95% CI 0.18 to 0.74). This indicates that one patient will avoid developing VAP for every 8 patients in which saline instillation is used. Significant benefits of saline instillation were also seen in the incidence of VAP (9 vs 21 per 1000 days of mechanical ventilation,  $p = 0.01$ ) and in the time to first VAP ( $p = 0.02$ ). The groups did not differ significantly on the remaining secondary outcomes. **Conclusion:** Instillation of normal saline before tracheal suctioning decreases the incidence of VAP in mechanically ventilated adults.

## Commentary

Normal saline instillation (NSI) prior to endotracheal suctioning has been practised widely for over two decades in intensive care units. High quality, clinical evidence about the effects of NSI is limited. *In vitro* evidence that NSI dislodges bacteria from endotracheal tubes suggests that it would increase contamination of the lower respiratory tract (Hagler and Traver 1994). On this basis, some have recommended that its routine use be discontinued (Thompson 2000). The study by Caruso and colleagues (2009), however, demonstrates that NSI reduces the incidence of VAP in intubated patients. The authors suggest possible mechanisms for this reduction: enhancement of sputum clearance by cough stimulation, dilution and loosening of sputum thus aiding secretion clearance, and a reduction in the endotracheal tube biofilm 'VAP reservoir' by frequent rinsing with NSI. As none of these was measured specifically during this study, the mechanism(s) for the reduction in VAP remains undetermined. Additional studies could clarify the relative impact of these proposed mechanisms.

Wide variation in the administration of NSI is known to occur between intensive care units. Published studies of NSI frequently do not specify the patient's position during NSI, the length of time from NSI to suction, or individual and cumulative NSI dosages. These details would help

guide those clinicians continuing to implement NSI. Whilst in this study the difference between groups in atelectasis and endotracheal tube occlusion did not reach statistical significance, these were lower in the NSI group. The lack of statistical significance may be due to the small number of events. However, the results may also have been affected by the physiotherapy interventions subjects received beyond endotracheal suctioning and whether this differed between groups. These important details were not specified.

To date, the debate on the use of NSI has been hampered by the limited evidence available. This may explain why NSI continues to be practised widely by health care professionals despite recommendations to the contrary. This study provides the first high quality, clinical evidence of benefit which must certainly reopen the debate.

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## References

- Thompson L (2000) Suctioning adults with an artificial airway. *Joanna Briggs Institute for Evidence Based Nursing and Midwifery, Systematic Review No. 9.*
- Hagler D et al (1994) *Am J Crit Care* 3: 444–447.

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