Indications for ENDOTRACHEAL INTUBATION in the operating room include:

- the need to deliver positive pressure ventilation
- protection of the respiratory tract from aspiration of gastric contents
- surgical procedures involving the head and neck or in non-supine positions that preclude manual airway support
- almost all situations involving neuromuscular paralysis
- surgical procedures involving the cranium, thorax, or abdomen
- procedures that may involve intracranial hypertension
Endotracheal Intubation

INDICATIONS FOR ENDOTRACHEAL INTUBATION

Some non-operative indications are:

▸ profound disturbance in consciousness with the inability to protect the airway
▸ tracheobronchial toilet
▸ severe pulmonary or multisystem injury associated with respiratory failure, such as sepsis, airway obstruction, hypoxemia, and hypercarbia
Objective measures may also be used to help determine the need for intubation:

- respiratory rate > 35 breaths per minute
- vital capacity < 15 ml/kg in adults and 10 ml/kg in children
- inability to generate a negative inspiratory force of 20 mm Hg
- \( \text{PaO}_2 \) (arterial partial pressure of oxygen) < 70 mm Hg
- \( \text{A-a gradient} \) (Alveolar-arterial) > 350 mm Hg on 100% oxygen
- \( \text{PaCO}_2 \) (arterial partial pressure of carbon dioxide) > 55 m Hg (except in chronic retainers)
- dead space > 0.6 L
Endotracheal Intubation
Tracheal mucosal blood flow in 40 patients undergoing surgery was assessed using an endoscopic photographic technique while varying the cuff inflation pressure it was found that:

▸ cuffs when over pressurized impaired mucosal blood flow
▸ an important factor in tracheal morbidity associated with intubation
▸ Hence it is recommended that a cuff inflation pressure of 30 cm H20 (22 mm Hg) should not be exceeded.
Estimation of endotracheal (ET) cuff pressure by finger palpation is one of the methods currently used in the clinical setting.

- Accuracy for the estimated method by finger palpation was 69% for high pressures, 58% for normal pressures, and 73% for low pressures.
- Conclude that precise intracuff pressure measurement is mandatory to prevent complications of over- or under inflation.

Critical Care Medicine [1990, 18(12):1423-6]
Tracheal intubation constitutes a routine part of anaesthetic practice both in the operating theatre as well as in the care of critically ill patients. The procedure is estimated to be performed 13-20 million times annually in the United States alone. There has been a recent renewal of interest in the morbidity associated with endotracheal tube cuff over inflation, particularly regarding the rationale and requirement for endotracheal tube cuff monitoring intra-operatively.

Sultan P, Carvalho B, Rose BO, Cregg R. Department of Anaesthesia, University College Hospital, 230 Euston Road, London
2011 Nov;21(11):379–86
ETT Cuff Pressure Management

- cuffs may be overinflated generating excessive lateral wall pressures
- effect may also occur with nitrous oxide administration during anaesthesia
- nitrous oxide diffusing into the cuff creating excessive pressure despite a satisfactory initial sealing pressure

R D SEEGOBIN, MRCP, FFARCS, senior registrar
G L VAN HASSELT, FFARCS, senior registrar

Correspondence to: Dr R D Seegobin  BRITISH MEDICAL JOURNAL VOLUME 288
Excessive pressure exerted on the tracheal mucosa is an avoidable factor

Cause of damage after intubation of the trachea with cuffed tubes

Many patients are intubated in the out-of-hospital setting by emergency medical teams

The time spent in the out-of-hospital setting could very well be long enough for tracheal mucosal damage to occur if cuff pressure is not controlled

Conclusion: This study revealed that the majority of cuff pressures exceeded safe pressure and required correction. Frequent measurement and adjustment of cuff pressure has been recommended, but this method requires a specific manometer.

We sought to determine the ability of paramedics to inflate endotracheal tube cuffs within safe pressure limits as well as to estimate the pressure of previously inflated endotracheal tube cuffs by palpation of the pilot balloon.
RESULTS:
Fifty-three paramedics were sampled. The average pressure generated by inflating the endotracheal tube cuff was > 108 cm H(2)O. Participants were only 13% sensitive detecting over inflated endotracheal tube cuffs (95% CI 7.3–17.8)
CONCLUSIONS:
Participants were unable to inflate endotracheal tube cuff to safe pressures and were unable to identify endotracheal tube cuffs with excessive intracuff pressure by palpation. **Clinicians should consider using devices such as manometers to facilitate safe inflation and accurate measurement of endotracheal tube cuff pressure**

Prospective observational measurement of tracheal tube cuff pressures in the emergency department

**Conclusion:**

Excessive tracheal tube cuff pressures were demonstrated in the majority of patients intubated both in the prehospital setting and Emergency Department

Dr Lloyd Gavin, Emergency Department, Royal Devon and Exeter Hospital, Barrack Road, Exeter EX2 5DW, UK; **Accepted** 19 April 2009
Endotracheal Tube Cuff Pressure Threshold for Prevention of Nosocomial Pneumonia

CONCLUSIONS: Multiple changes in practice resulted in decreased VAP rates, with vigilant cuff pressure monitoring just one factor in the improvement. Auditing compliance, posting results, and providing positive and negative feedback to individual RTs resulted in improved compliance in monitoring. Outlying RTs self-corrected when their coworkers results were better. Frequent discussion of VAP Vigilance, VLOS, and reporting audit results plus training new hires in VAP all contributed to our success.
Molecular Analysis of Microbial Communities in Endotracheal Tube Biofilms

Ventilator-associated pneumonia is the most prevalent acquired infection of patients on intensive care units and is associated with considerable morbidity and mortality.

- Molecular profiling using DGGE demonstrated considerable biofilm compositional complexity and inter-patient diversity.
- Antimicrobial (silver coated) endotracheal tubes to inhibit biofilm formation, reduce colonization of the airway and decrease the incidence of VAP. The reduction in the number and delay of onset of VAP in a large clinical trial is encouraging, however, bacteria can develop silver resistance.
- Improved oral hygiene has proved to be an effective strategy for reducing VAP.
- Conversely, antifungal treatment of patients demonstrating airway colonisation with Candida spp. have less P. aeruginosa VAP [47]. An anti-candidal approach has also been successful in reducing the biofilm on laryngeal prosthetic devices.
variation in aerobic bacterial counts between patients ranged between 0 and $2.1 \times 10^8$ cfu/cm$^2$

reasons for such variation could in part relate to the effectiveness of the seal between endotracheal tube cuff and mucosal wall of the trachea

A totally effective seal would prevent leakage of pooled secretions from above the cuff

leading to subsequent contamination of the endotracheal tube lumen and lungs

effectiveness of the seal will vary with pressure variation between the balloon of the cuff
Manometers

Found on Google

Posey
Manometers

- Tracoe
- Cuff Mate
Manometers

Disposable pressure indicator
RESULTS: There were differences in bias and precision among the tested cuff inflators.
- Cuff-Mate 2 had the smallest bias and best precision.
- None of the cuff inflator brands accurately measured cuff pressure.
- Cuff volume loss during cuff measurement process.
- Intracuff volume, the best-fit linear regression equation was: cuff volume = 0.05 CP – 0.39/0.96)
- The 4 cuff inflators tested differ in bias and precision and none of the devices accurately measure cuff pressure.
PYLANT Monitor

- Single patient use
- Disposable
- Accurate
  - Factory tested 3 different times
- Premium quality
- No risk of cross contamination between patients
- Easy to stow. Use in ambulance, air transport ED, OR, ICU
- Inexpensive
- Keep one in your pocket for any intubation situation
- Protect your patients from cuff trauma, prevent aspiration
- Monitor pressure every second or intermittently
- Can be used to measure LMA pressures to 60 cmH2O+