

ECONOMIC AND ENVIRONMENTAL IMPACT: A CRITICAL ISSUE FOR PEDIATRIC AIRWAY MANAGEMENT



Use of uncuffed endotracheal tubes (ETT) in pediatric patients in critical care may have negative economic and environmental implications.¹



ECONOMIC IMPACT

Costs incurred due to gas consumption vary between cuffed and uncuffed ETT, and depends on:

- Length of procedure:
 - Use of cuffed tubes has shown savings in volatile inhalational agents and medical gases during longer procedures.²
- Fresh gas flow (consumption of anesthetic gas, oxygen, air and nitrous oxide):
 - Uncuffed tubes showed a **higher consumption of anesthetic gas (sevoflurane) as well as oxygen, air and nitrous oxide.**²
 - A study reported **five-fold higher fresh gas flow** with uncuffed pediatric ETT than cuffed ones²



DID YOU KNOW

In a study in 2010 carried out on 70 children, aged from birth upto 5 years, undergoing elective surgery with general inhalational anaesthesia with sevoflurane, regional anaesthesia and tracheal intubation, the gas consumption and total costs for gases for cuffed and uncuffed ETTs was as follows:²

	Cuffed ETT	Uncuffed ETT
Sevoflurane consumption per patient	6.2 ml	16.1 ml
Medical gas consumption	46 L	129 L
Total costs for sevoflurane and medical gases	€5.2 /patient	€13.4 /patient

Median costs for sevoflurane and medical gas consumption reduced by 0.16 €/min/patient by use of cuffed tubes. Minimum duration of inhalational anaesthesia required to compensate for the higher costs for cuffed ETT compared with uncuffed ETT was 49 minutes.²

Here is an example of calculation on the effective cost of surgical intubation in pediatric patients for a 30-minute long procedure.

Disclaimer: This data is based on information acquired in 2013 from one specific hospital setup in Australia. However, the actual results may vary with the situation, procedure and jurisdiction.

Parameters	Standard uncuffed ETT	MICROCUFF* ETT
Average procedure length (minutes) (N)	30 minutes	
Cost of one tube (A)	\$2.60	\$11.00
No. of tubes used per patient (B)	1.25	1.00
Total expenditure on tubes per patient (A*B=X)	\$3.25	\$11.00
Cost of anesthetic sevoflurane (C)	\$1.22 /ml	
Consumption of sevoflurane per patient (D)	0.32 ml/min	0.11 ml/min
Total expenditure on sevoflurane during the entire procedure (C*D*N=Y)	\$11.712	\$4.026
Cost of oxygen (E)	\$0.005 /L	
Consumption of oxygen per patient (F)	2.45 L/min	0.95 L/min
Total expenditure on oxygen during the entire procedure (E*F*N=Z)	\$0.3675	\$0.1425
Effective cost of surgical intubation (X+Y+Z)	\$15.33	\$15.17

The above calculation shows that the effective cost of surgical intubation was lower for cuffed ETTs than uncuffed ones. (\$15.17 vs. \$15.33)



ENVIRONMENTAL IMPACT

Use of high fresh gas flows due to uncuffed tubes leads to atmospheric pollution by anesthetic gases, increasing potential health risk to operation theatre personnel.¹



High levels of waste anesthetic gases may lead to potential adverse neurological effects or reproductive risk to exposed workers, or even developmental anomalies in their offspring³



OUR SOLUTION

Avanos Pediatric MICROCUFF* is designed for pediatric anatomy and provides the benefits of a cuffed ETT with complete airway control and a new level of safety.

MICROCUFF* tube seals with cuff membrane (10µ microthin polyurethane) in the trachea

Less gas leakage around the tube

- Staff and anesthesiologist will not breathe the gases and anesthetics leaking from the tube
- Gases are not wasted, resulting in cost savings

Use of minimal and low flow anesthesia

References: 1. Bhardwaj N. Pediatric cuffed endotracheal tubes. J Anaesthesiol Clin Pharmacol. 2013; 29(1):13-18. 2. Eschertzhuber S, Salgo B, Schmitz A, Roth W, Frotzler A, Keller CH, Gerber AC, Weiss M. Cuffed endotracheal tubes in children reduce sevoflurane and medical gas consumption and related costs. Acta Anaesthesiol Scand. 2010; 54(7):855-8. 3. Occupational Safety and Health Administration. Anesthetic gases: guidelines for workplace exposures [Internet]. [2010; accessed 2019 Oct 01]. Available from: <https://www.osha.gov/dts/osta/anestheticgases/index.html>.