

Detection and Prevention of Overinflation of the Tracheal Tube Cuff During Surgery at a Tertiary Care Hospital

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Background

- Excessive inflation of tracheal cuff (pressure >30 cm H₂O) during intubation can lead to many complications, such as:
 - Sore throat, +/- blood-streaked expectoration
 - Obstruction of tracheal mucosa microvasculature of the tracheal mucosa → tracheal ischemia and ulceration.¹
 - Tracheal stenosis and/or rupture²
- Clinical studies indicate that tracheal cuff pressures are frequently higher than the recommended range.³
- Current practitioner adherence to recommended monitoring practices, such as using a manometer to ensure proper inflation, is inconsistent and influenced by factors such as limited access to supplies, time constraints, and gaps in provider education.^{4,5}

Aim Statement

Reduce tracheal cuff overinflation from a measured rate of 90% to 45% or below after educational intervention.

Methods

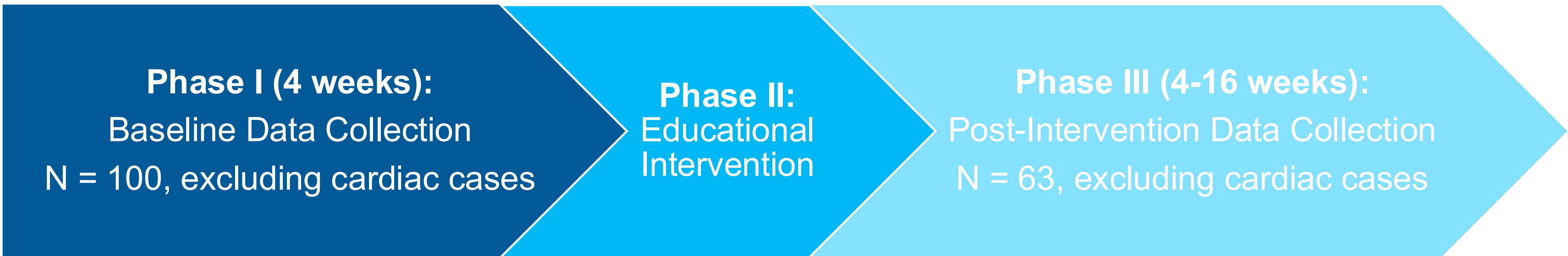


Figure 1. Phases of data collection.

- Study population: adult patients undergoing general anesthesia with tracheal intubation at Parkland Hospital
- Phase 1: Baseline tracheal cuff pressure data (n=100)
- Phase 2: Educational sessions given to anesthesia providers at Parkland that presented our baseline pressure readings and then demonstrated optimal cuff pressure measurement techniques (manometers).
- Phase 3: Re-evaluation of tracheal cuff pressures (n=63)

Results

- Overall rate of over-inflation decreased by approximately 50%, from 90% pre-intervention to 44% post-intervention (P<0.0001).
 - Post-intervention, cuff overinflation was lower in the first 8 weeks (23.5%) but increased to 52% during weeks 9-16.
- Mean cuff pressure decreased from 76.8 Cm H₂O to 37.6 Cm H₂O (p<.0001).
- A manometer was used in 59% of the cases after the intervention, compared to 1% of the cases before the presentation.
 - When a manometer was employed, the rate of appropriate cuff inflation reached 70%, compared to only 19% when a manometer was not used.

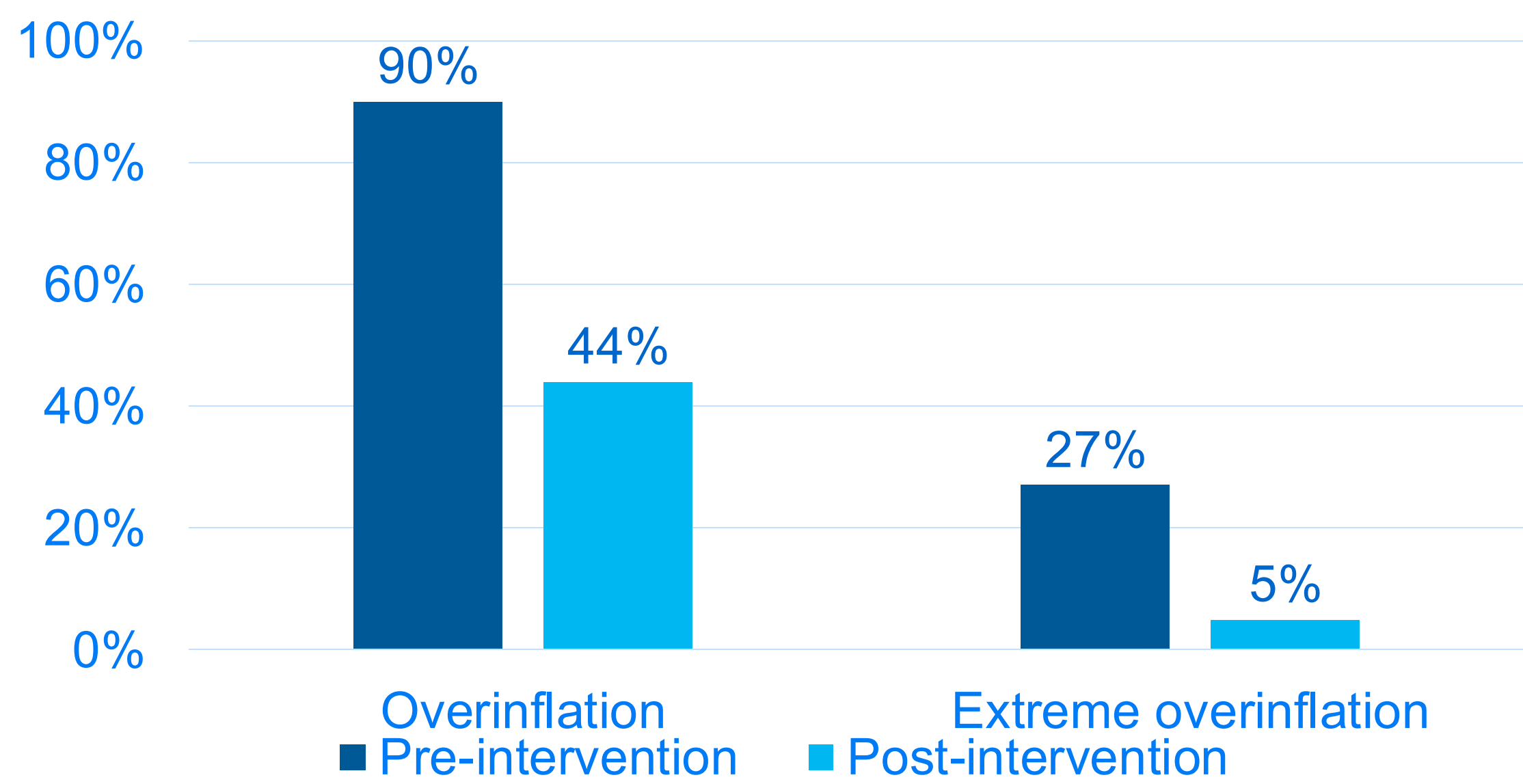


Figure 2. Change in rates of cuff overinflation (>30 cmH₂O) and extreme overinflation (>100 cmH₂O) before and after intervention.

Characteristic	Pre-intervention	Post-intervention
Female sex, n (%)	51 (51)	33 (52.4)
Body mass index, mean (SD)	30.7 (6.9)	30.9 (7.8)
Weight, mean (SD)	86.3 (22.6)	84.4 (18.9)
Height, mean (SD)	167 (10.2)	166 (11.6)
Manometer used, n (%)	1 (1.0)	37 (59)
Provider who inflated cuff, n(%)		
Anesthesiology Resident	8 (8.0)	11 (17.5)
Attending Anesthesiologist	30 (30.0)	10 (15.9)
Nurse Anesthetist	50 (50.0)	35 (55.6)
Other	12 (12.0)	
Tracheal tube size, n (%)		
6	3 (3.0)	3 (4.8)
6.5	15 (15.0)	5 (8.0)
7	52 (52.0)	38 (60.3)
7.5	17 (17.0)	7 (11.1)
8	13 (13.0)	10 (15.9)
Nitrous oxide used, n (%)	71 (71.0)	40 (63.5)
Duration intubation (min)		
Median (IQR)	146(107-240)	214 (144-294)
Cuff pressure (cm H ₂ O)		
Mean (SD)	76.8 (45.3)	25 (30)
Median (IQR)	65.3(44.9-108.8)	37.6 (23.5-40.0)
Range	9.5-236.6	7-134

IQR, interquartile range. SD, standard deviation.

Table 1. Characteristics of patients and tracheal cuff pressures pre- and post-intervention.

Discussion

- Significant reduction in tracheal cuff pressures following the intervention
- A targeted training initiative and accessible monitoring devices was effective in decreasing tracheal cuff overinflation, potentially enhancing safety in patients undergoing general anesthesia.
- Limitations: single-institution design (limited generalizability), and the relatively small sample size
- A notable concern is that the initial success observed immediately after the intervention waned over time.
 - For sustained improvements, ongoing monitoring paired with regular educational refreshers could be beneficial to maintain these enhanced practices