An Audit of Tracheal Cuff Pressure Measurement in an Intensive Care Unit within a District General Hospital in the UK

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Background and Aims

Background of Audit

• Measurement of Cuff Pressure within Intensive Care Units is often not routine\(^1\)
• Cuff Pressures, when recorded, are often not within the appropriate range\(^2\)
• Manufacturers’ recommended ranges lies between 20-35\(\text{cmH}_2\text{O}\).
• Problems of over inflation involve mucosal ischaemia, tracheal erosion or, stenosis (this may be worsened by concomitant use of inotropes or, hypotension).
• Problems of under inflation involve respiratory gas leakage (especially during positive pressure ventilation) along with a suboptimal barrier seal to oropharyngeal secretions.

Aims of Audit

• To establish the rate of recording of Cuff Pressures within the Intensive Care Unit.
• To record the Pressure value and (if relevant) appropriateness with respect to the value of PEEP.
• To record the patient’s Blood Pressure with respect to patient’s baseline.
• To ascertain if the patient had concomitant use of Inotropes.
• Target sample size was laid down at 50 intubated days (100 readings)
Method

- **Audit Design**

- Utilised an established audit recipe from the Royal College of Anaesthetists (RCOA), UK (Nightingale).
- Decision was taken for recording to be completed by Nursing Staff who were briefed prior to commencement of the audit period.
- A brief pilot using the recording form was performed to establish usability of the data sheet.
- Staff were instructed to complete recordings with the use of a manometer at the change of each Nursing Shift (x 2 per 24 hours).
- The target sample size was set at 100 readings (equivalent to 50 intubated days).
- At the end of the audit period feedback would be provided to enable the possibility of further audit loops.

- **Audit Form**

1. Cuff Pressure value?
2. PEEP value (if appropriate)?
3. Hypotension relative to patient baseline?
4. Inotrope use?
5. Is the cuff correctly inflated within target range?
Results

- Overall 45 measurements were gained during the audit from a target sample size of 100 (28 patients - with a possible maximum of 142 measurements).
- Completion rate for eligible patients was therefore 31.6%.

- 12 of the measurements taken were above 35cmH20 = High (26.6%).
- 4 of the measurements taken were below 20cmH20 = Low (8%).
- 29 of the measurements taken were within recommended range (65%).
Results

• **High cuff pressure group** – 75% (9/12) were recorded as correctly inflated (range = 40-110). 1 was dropped to recommended range (1/12). Remainder had no more measurements.

• **Low cuff pressure group** – 50% (2/4) were recorded as correctly inflated (range = 15-18). 1 was increased to recommended range (1/4). Remainder had no more measurements.

• **Peak Airway Pressure/PEEP**
  High cuff pressure group - Peak Airway range 16-34, mean = 26 (PEEP range 5-13, mean =7.1).
  Low cuff pressure group – Peak Airway range 21-30, mean = 23.5 (PEEP range 5-10, mean =5).
  (Sample mean Peak Airway Pressure = 14.5. Sample mean PEEP 7.8).

• **Hypotensive relative to baseline**
  High cuff pressure group – 42% were recorded as hypotensive ( n = 12).
  Low cuff pressure group – 50% were recorded as hypotensive (n = 4).
  (Sample hypotension rate 29%, n = 45).

• **Inotropes used**
  High cuff pressure group – 92% (n = 12).
  Low cuff pressure group – 25% (n = 4).
  (Sample use of inotropes 66%, n = 45).
Discussion

• **Audit Limitations**

  - Measurements taken by multiple Nursing Staff but who were aware of the audit process.
  - RCoA recommended the designation of a single Medic for data collection.
  - Overall sample size obtained during the audit period less than target (n=45).
  - Measurements outside the reference range numbers were limited (n=16).
  - Enhanced validity would have been achieved by increasing the duration of the audit period.

• **Audit Recommendations**

  - Results and discussion to be presented to Department to raise awareness and encourage ongoing practice improvement.
  - Patients would benefit from further audit cycles over an increased period to improve reliability of good practice.
  - Incorporation of cuff pressure monitoring and measurement within a checklist system.
  - This would be best done at the start of each Nursing shift as part of a formal check process.
Conclusion and Acknowledgements

• **Summary**

Formal recording of cuff pressures within ICU at the time of recording was 31% (n=45).

Of the measurements taken, 34% lay out with the Manufacturer’s recommended range.

For measurements outside the range there was a higher Peak Airway Pressure (26 in high cuff pressure group, 23.5 in low cuff pressure group, 14.5 sample mean) with a lower value of PEEP (7.1 in high cuff pressure group, 5 in low cuff pressure group, 7.8 sample mean).

For measurements outside the range there appeared to be a higher rate of hypotension relative to baseline (42% in high cuff pressure group, 50% in low cuff pressure group, 29% in sample).

For higher measurements there was an increased use of inotropes (92% in high cuff pressure group, 25% in low cuff pressure group, 66% in sample).

• **Conclusion**

Scope exists to improve upon formal cuff pressure recording within this Intensive Care unit.

Scope exists for increased awareness of the potential complications of over or, under inflation.

Scope exists for increased awareness of the compounding effects of hypotension, inotrope use and positive airway pressure upon inflation complications.

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• **References**
