The Journey to Reducing Unplanned Extubations

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Advocate Children’s Hospital
Risks

• Infection
• Airway damage
• Prolonged ventilation
• Arrest
• Death
# The Cost of Unplanned Extubations

## Table 2. Comparison of hospital costs, length of stay and pre-unplanned extubation ventilator days between cases with unplanned extubations and matched controls.

<table>
<thead>
<tr>
<th>Costs ($)</th>
<th>Cases</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Costs</td>
<td>101,310 (IQR 48,131-175,163)</td>
<td>64,618 (IQR 18,595-110,630)</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>5876 (IQR 2910-14,550)</td>
<td>3128 (IQR 887-6860)</td>
</tr>
<tr>
<td>RT</td>
<td>9070 (IQR 3332-25,503)</td>
<td>4752 (IQR 1865-12,266)</td>
</tr>
<tr>
<td>Blood bank</td>
<td>783 (IQR 0-3405)</td>
<td>190 (IQR 0-2226)</td>
</tr>
<tr>
<td>Radiology</td>
<td>3042 (IQR 1488-6430)</td>
<td>1956 (IQR 778-3223)</td>
</tr>
<tr>
<td>Laboratory</td>
<td>6980 (IQR 2810-11,787)</td>
<td>3838 (IQR 1024-9067)</td>
</tr>
</tbody>
</table>

**Total Costs** | $36,692/case  
**LOS (days)** | ≈ 6 days (PICU/ CICU)

IQR, interquartile range; RT, respiratory therapy; LOS, length of stay; ICU, intensive care unit; UE, unplanned extubation
† Pre-unplanned extubation ventilator days were compared to ICU length of stay for controls.

Table from: Unplanned Extubations in Children: Impact on Hospital Cost and Length of Stay
Dantin J. Roddy, MD1; Michael C. Spaeeder, MD, MS2; William Pastor, MA, MPH3;

What do we know?

• Review of literature
• Identified two types of unintended ETT removal
• UE Rate reported: 0.3 – 4.2 UE/100 vent days
• Risk factor buckets:
  • Patient-associated
  • Personnel-associated
  • Care-associated


- 60 ICU patients.
- Calculated symptom, clinical, and total self-extubation scores
- Most common symptom observed was hoarseness (62%),
- Most common clinical finding was posterior laryngeal edema (58%)

What do we know?

Tracheal diameter:
• approximately 4 mm in the term infant
• approximately 20-25 mm in adult

Length of the trachea:
• approximately 4 cm in the term infant
• Up to approximately 12 cm in adults
Objectives

The participant will be able to:

- Define
- Assemble Team, Create Process
- Examine Factors & Intervene
- Collect Data
- Establish Baseline & Goal
An unplanned extubation is any dislodgement of an endotracheal tube from the trachea that is not intentional.

Inclusion criteria:
Any patient with an endotracheal tube, including inpatient units, emergency department, operative/procedural suites, and radiology.

Exclusion criteria:
Patients with events occurring outside the hospital during transport.
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Image taken from: http://emedicine.medscape.com/article/978865-workup#aw2aab6b5b2
Assemble Team

Champions from each key stakeholder group

- Respiratory Care
- RNs
- Physicians/NP
First Team Task: Establish Baseline

- Assign responsibility for collecting information
- Introduce post event huddle to help collect information
Post event huddle

What is it?

• It is a “time out” to discuss the event and circumstances and influences surrounding it.
Post event huddle

What is the purpose?

• To gather information to establish your Baseline and trends
• Use that information to come to a conclusion
• Conclusion:
  What could have been done differently to avoid the event.

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Post event huddle

Who is involved?

Bedside caregivers:
• Attending physician
• RN
• RCP*

Decide who will lead the huddle using the tool

*leads the huddle @ ACH-OL using tool

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Post event huddle

What is the process?

• After event, stabilize patient
• Huddle tool to bedside; participants come to bedside
• Go through the huddle, asking the questions to generate conversation and feedback

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Any activity at time of extubation?
(check all that apply)
☐ Patient moving around
☐ Parent holding / Kangaroo
☐ During CPR
☐ Repositioning
☐ Suctioning
☐ Tube re-taping
☐ During a procedure. What was the procedure?
________________________________________________________________________
☐ Staff moving patient. Where was patient being moved to or from?
________________________________________________________________________
☐ Did two people assist with moving or procedure? ☐ Y ☐ N
☐ Other (Explain)

Did an improper handoff contribute to event? (Explain):

Possible reason identified for the extubation
(check all that apply)
☐ Loose tape
☐ Loose protective skin barrier
☐ Tube secured improperly
☐ Excessive secretions
Patient agitated? ☐ Y ☐ N
If yes, was there an order for sedation? ☐ Y ☐ N
If yes, was it: ☐ cont. ☐ scheduled ☐ PRN
If yes, was it given? ☐ Y ☐ N
If Yes, was it adequate? ☐ Y ☐ N
PICU/PSHU: Was patient wearing restraints? ☐ Y ☐ N
If no, were restraints indicated? ☐ Y ☐ N
Was the tube plugged? ☐ Y ☐ N
Was the assignment or tasks of the RN or RT a contributing factor? If Y for either, please explain:
RN: ☐ Y ☐ N
RT: ☐ Y ☐ N
How many patients did the RN have? ☐1 ☐2 ☐>2
☐ Any other reasons not mentioned? (Explain):
Post event huddle

What happens next?

- Huddle tool turned to a designated person
- Tool is used to provide key learnings to UE team meeting
- Unit managers take back and share with their staff during daily huddles and/or staff meetings

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Post event huddle: What happens next?

Pool data to identify biggest impact areas, share with teams

Share the huddle summaries and lessons learned

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**Pool data to identify biggest impact areas, share with teams**

**Share the huddle summaries and lessons learned**

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**Unplanned Extubation (UE) Summary**

**Huddle Summary:** One side of the NeoBar was off or almost off, but appeared intact during RCPs earlier check. Pt woke up, but securement was loose and patient extubated. RCP noted that physicians identified that it was loose during their rounding, but that information was not given to the RCP.

**Lessons Learned:** Improperly secured ETT should have been re-secured immediately. If the need would have been communicated to the RCP, she would have insisted that it be fixed.

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[Graph showing contributing factors to unplanned extubation]

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Common Factors to prevent UE

- Standardize Securement
- High Risk Procedure Protocol
- Xray Position
- Sedation/Comfort
- Extubation Readiness
Standardized Securement

- Securement is a 2 person process (minimum)

- Reference points (gum vs. lip)
  - NICU uses lip to correlate with NRP

- Securement process
  - Consider using a Job Instruction Tool

- Utilize the bedside card
  - Assure landmarks are appropriate at each hand-off, before CXR and after moving patient

- Audit
  - Make sure securement is appropriate, and if not coach & correct
Neobar is used in NICU-OL because it also protects the palate and prevents groove in palate, when applied properly.

FACT: When we were using both NeoBar and Tape, UEs were 50% in each category. NeoBar DID NOT contribute to more UEs
Min. 2 people (one person’s job: monitor and anchor ETT throughout movement) during procedures such as:

- Bedside imaging
- Bedside invasive procedures
- Repositioning Patient and Kangaroo care (parent holding)
- ETT Repositioning / Retaping
- In house transport
- Weighing
- Linen changes
Standard X-Ray position

Assure standard position and validate ETT depth

• Head midline and neutral
• Arms down at sides
• Minimize torso rotation
• For neonates, consider: A staff member (RN, RT) to hold the baby's head noting/documenting location of tube at time of x ray
Assure standard position and validate ETT depth

• Why? Neck position effects endotracheal tube position. When the neck is flexed, the tube goes down. When the neck is extended the tube moves up.

• If the tube appears high, it may be that way because the x ray was taken with the neck in a suboptimal location and this is not readily apparent on an AP film. As a result, we may be moving a tube that would be in OK position in midline
What do we know?

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https://airwayjedi.com/2016/04/18/intubating-the-infant-or-toddler/
Standard X-Ray position?

X-rays on same day, same patient; Documentation of ETT same cm
Sedation & Comfort

From post-event findings: Agitation present?

- **YES**: 66.7%
- **NO**: 33.3%

From post-event findings: Sedation?

- **NONE**: 58.3%
- **PRN**: 20.8%
- **Cont.**: 16.7%
- **Scheduled**: 4%
Pharmacological vs Non-Pharmacological

- Sedation may increase mechanical ventilation time
- Consider sedation protocols
- Medications can have adverse events such as hypotension (all)
- Questions remain regarding the efficacy, safety, and neurodevelopmental impact (neonates)
- Consider non-pharmacological interventions (examples: swaddling, positioning, and facilitated containment for neonates; music therapy, ear plugs/eye masks, massage for all)
- Use of restraints is controversial (adults & peds)
Daily Discussion of Extubation Readiness

Discuss ventilation goals daily or twice daily, even when extubation is not eminent.

• A twice daily discussion reduces ventilation time.
• Documentation of this discussion aids communication.
Our Journey: ACH-OL NICU

End of summer 2013, use NeoBar prototype.

In fall of 2016 increased variability after a year of stability.

Zero events in September 2017.

One event in October & November 2017.
Questions?

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References

UE cost impact:


Incidence and consequences of UE:

Incidence and consequences of UE (cont.):
