Collaborate to Extubate

Clinical Safety & Effectiveness
Cohort 19: Team # 7
The Team

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• Sponsor Department:
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• Decrease unplanned extubation (UPE) by 50% (1.1 UPEs/100 ventilator days to 0.5 UPEs/100 ventilator days) by December 31, 2016 in the Medical ICU at University Hospital.
Definition

• UPE includes self-extubation and accidental extubation.

• Frequent during mechanical ventilation in critically ill patients

• Associated with increased morbidity and mortality

Background: Incidence

- Multiple Studies on UPE
  - Most recent articles in adult ICUs report: 1 – 22% of intubated patients have an UPE
  - 18-91% of UPE are self-extubations
  - Reintubation rates are also wide: 1.8 – 88%

Background: At What Cost?

- Increased morbidity:
  - Increase ventilator days and associated risks
    - Pneumonia
    - DVT
  - Increase LOS
  - Increased mortality

Medical Intensive Care Unit

- January thru July 2016
  - 148 intubated patients
  - 24 UPEs
    - 16% of all intubated patients
    - Data on 22 patients only
  - 1.1 UPEs/100 ventilator days
  - All were self-extubations
  - 17 (70%) occurred between Day 0-3
Extubation – Flow Diagram

On Baseline Sedation

Patient to start SAT (Spontaneous Awake Trial)

Patient has contraindication to SAT

Continue Daily Wean 7:30-8:00

Pupil light Activated

Scope changes from last project review

Decrease Medication; Increase light in room; D/C sedation

RN Assesses Pt. @ 8:00am

Pt. Passes SAT

Notify RT

RT starts CPAP trial x 30 minutes

NO

NO

Pt. Passes SBT/CPAP

Notify MD; Recommend extubation; Document SBT results

MD approves extubation

YES

YES

RT & RN Extubate Patient

Return to prior vent setting; Ask MD about sedation; Discuss patient @ team rounds; Implement team decision

NO

NO
Cause and Effect Diagram

WHY
Unplanned Extubations in MICU

- MD didn’t show up on time
- Hesitates to extubate
- Not aware of protocol
- MD not available
- MD started CPAP without informing RT
- Won’t extubate even when patient ready
- RN didn’t monitor patient
- RN not confident
- RN didn’t restart sedation
- RN
- Patient
- agitated
- inadequate sedation
- patient fails SBT
- CPAP trial not stopped after 30 mins
- Patient following commands, restrates off
- Doesn’t know protocol
- Rt didn’t follow up
- Loose ETT
- Loose restraints
- busy with other patient
- Others
- missing purple light

Others
Unplanned Extubation

Volume of Cases by Day of Extubation

n=22

Day-0: 2
Day-1: 3
Day-2: 8
Day-3: 4
Day-4: 1
Day-6: 1
Day-9: 1
Day-13: 1
Day-17: 1
Real Issue: Flow Position at UPE

Pareto Chart of Flow Position at Unplanned Extubation

- On Baseline Sedation: 16
- During SBT: 2
- Awaiting MD approval for extubation: 2
- During SAT: 1
- Return to 1/2 Sedation due to failure of SBT: 1

Volume of Flow Position - Unplanned Extubation

- 0%
- 10%
- 20%
- 30%
- 40%
- 50%
- 60%
- 70%
- 80%
- 90%
- 100%
Causes for UPE

Pareto Chart of Causes for Unplanned Extubation

$n = 87$

Categories of Causes

Volume by Causes for Unplanned Extubation

- Short Acting Medication: 17, 19.5%
- Self Exubation Day 0,1,2,3: 17
- Delirium (CAM ICU): 15
- RASS Not @ Goal: 14
- Day Shift: 13
- Night Shift: 9
- Not Restrained: 1
- Tube Not Well Secured: 1

Percentages:
- 100.0%
- 98.9%
- 97.7%
- 87.3%
- 72.4%
- 56.3%
- 39.0%
- 19.5%
- 19.5%
Sedation Utilized

Pareto Chart of Sedation Utilized

Categories by Sedation Medications

Volume by Sedation Medications

Fentanyl Propofol
Precedex
Fentanyl Precedex
No Sedation
Fentanyl Propofol Precedex
Propofol Precedex
Propofol Fentanyl Precedex Versed
Propofol Versed
Fentanyl
Propofol Fentanyl Versed Ketamine
Baseline Process Control Chart for Patients

p-Chart for Unplanned Extubation by Month
n=148 Patients

Unplanned Extubation / All Intubated Patients by Month

- Jan-16: 7.7% (CL)
- Feb-16: 37.5% (UCL)
- Mar-16: 31.3%
- Apr-16: 15.8%
- May-16: 4.8%
- Jun-16: 8.0%
- Jul-16: 20.0%

UCL 38.3%
CL 16.2%
Baseline Process Control Chart
UPE per 100 Ventilator Days

u Chart for Self Extubation Rate by Month
n=2173 Vent Days

Jan-16  Feb-16  Mar-16  Apr-16  May-16  Jun-16  Jul-16
0.56    1.97    1.61    0.87    0.34    0.79    1.61    2.89
**Action Plan**

**Aim Statement:** To reduce UPE in the Medical ICU by 12/31/2016

<table>
<thead>
<tr>
<th>Action Strength</th>
<th>Action Driver</th>
<th>Action</th>
<th>Who?</th>
<th>Why?</th>
<th>Start Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td>Inadequate sedation</td>
<td>Target RASS (-3) @ Day 0 - 3 of Mechanical Ventilation</td>
<td>Nursing Staff/MD</td>
<td>Standardize Simplify</td>
<td>11/1/16</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Inadequate sedation</td>
<td>Patient Room Sign: Sedation Target: (-3) @ Day 0 - 3 of Mechanical Ventilation</td>
<td>Charge Nurse</td>
<td>Standardize Simplify</td>
<td>11/1/16</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Subjective implementation of sedation protocol</td>
<td>Develop weekly process report to create awareness about compliance to new sedation target</td>
<td>Marivel/Cris</td>
<td>Standardize Simplify</td>
<td>11/1/16</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Subjective implementation of sedation protocol</td>
<td>Use of Huddle &amp; Process Report to hardwire the sedation protocol</td>
<td>Nursing Staff</td>
<td>Standardize Simplify</td>
<td>11/1/16</td>
</tr>
</tbody>
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Compliance

Intervention:
• Target RASS of -3 on vent days 0-3
• Goal: 80% intervention adherence
• Compliance
  – November 56%
  – December 73%
Post-Intervention

* Excluding toxic ingestions, pre & post interventions UPE were 0.9 vs. 0.46
Financial Return on Investment

• Every UPE extends MV days and LOS by 6.8 days and 11 days, respectively and costs $35,520 per UPE.

• Expected UPE over intervention time = 1.1/100 vent days = 3.9 UPEs

• Actual UPE over intervention time = 2

• ROI = (3.9-2) x $35,520 = $67,488 (amount saved over 2 month period)
  – Based on cost of UPE within literature

• Conservative ROI based on intensive care charges at UHS
  – Ventilator and room - $53, 863 amount saved
Conclusions

- Sedation intervention has trended towards decreased UPE.
- Positive ROI
- Additional time needed to confirm success of intervention
Thank you for your time!

Questions?
References


