Session # 5

Susan Gerhardt, Jason Gourlas, John Myers
Our Team
Our Team Captain
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- Susan Gerhardt, MSN, RN, Nursing Director, STICU/NSICU, UHS
- Jason Gourlas, BS, PA-C, Faculty Associate, UTHSCSA
- Charles Reed, MSN, RN, Patient Care Coordinator, STICU/NSICU
- Henri Stewart, BSN, RN, Staff Nurse, STICU
- Heather Carefoot, BSN, RN, Staff Nurse, STICU
- Randy Beadle, BSN, RN, Patient Care Coordinator, STICU/NSICU
- Nanette Larson, BSN, RN, Patient Care Coordinator, STICU/NSICU
- John Myers, MD, FACS, Associate Professor, UTHSCSA

And all of the nursing staff in the Surgical Trauma ICU at UHS without whom we could not accomplish our goal.
Aim Statement

Our original Aim Statement:
Reduce the incidence of self-extubation (SE) in the Surgical Trauma Intensive Care Unit (STICU) by 50% in 4 months.

Due to the complexity of human and system factors our Aim Statement was revised to:
Seek to understand the reasons for SE in the STICU and then reduce SE by 50% by the end of 2010.
Background

• Unplanned extubation (UE) includes SE and accidental extubation (AE).
• Unplanned extubations (UE) have been reported to occur in 1 to 16% of patients\textsuperscript{1-3}
• Complications of UE include laryngospasm, laryngeal edema, aspiration pneumonia, bronchospasm, respiratory failure, and sometimes results in death.\textsuperscript{2}
• Rates of adverse events following UE have been reported as ranging from 5% to 28%\textsuperscript{3}
• SE results in prolonged mechanical ventilation (MV), longer ICU and hospital stay, and increased need for care\textsuperscript{1-3}

\textsuperscript{1} Krinsley, J. & Barone, J. (2005). The Drive to Survive. \textit{CHEST} vol. 128 (2) 560-566
Selected Project Analysis Tools

We realized that nurses and mid-levels/physicians might have two different but important perspectives so, both groups went through the process separately.

• Flowchart: We chose to use this tool because it allowed us to visualize the “As Is Process” for dealing with mechanically ventilated patients from arrival to the ICU to liberation from the ventilator.
• Fishbone: We looked at multiple factors that increase the risk for or set up patients to SE. Ours looked more like a whalebone diagram.
• Brainstorming: When both were completed, we got together and looked for similarities.
• We gathered data on our rates of SE and the circumstances surrounding them.
Is patient on conventional vent settings?
- SIMV or CMV
- PEEP 10 or less
- O₂ 40%

Yes → Sedation Holiday

Is order already in?
- Yes → RT comes
- No → Patient on CPAP

Wait & see in room

Did MD change the settings?
- Yes → Patient on CPAP
- No → Order entered for change

RT finds changes and calls MD for order

If no order in 2 hours, RT changes settings back

Did the patient do OK?
- Yes → Run ABG
- No → Run ABG

Return vent to previous settings

Collaborate MD/RN/RT

Monitor patient

E

Extubate End.

Run ABG

Show MD

Collaborate MD/RN/RT

Decide to extubate?
- Yes → Collaborate on sedation plan
- No → Collaborate on sedation plan

E

Nurse doesn't know
RT doesn't know
No documentation
AS IS Process For Care of Intubated Patient on SICU
Physician Version
as of May 18, 2010

Start, Patient admitted to ICU

Intern paged

Is sedation ordered?

No → Write order (MD or RN) → Give PRN until drip arrives

Yes

Are drips hanging?

No → Order PRN (verbal order) → Wait for drips → Hang drips

Yes → Titration period

Patient restrained (2 point wrist is usual)

Patient gets agitated

Is order titratable (RN)?

No → RN calls/pages MD → MD shows up or calls back

Yes → RN adjusts

Spontaneous breathing trial?

Yes → Order halol

No → Patient doing well?

Yes → Restraint increased, if needed

No → Exstube, Stop.

* Other type of restraint, if patient requires
  MD may be told not to use particular type of restraint by nurse coordinator
  lose and soft by design
  no standard criteria for using posey, neuro, etc.
  no standard for application of restraint
  no standard for where to affix to bed
  people along the continuum (family, ancillary services) leave patient unrestrained
Physician
As Is
Page 2

Early morning, RN asks/calls/pages

Is sedation break appropriate?

Yes

RN starts sedation break

No

Is spontaneous breathing trial appropriate?

Yes

Does MD start breathing trial?

No

Write order

Yes

Write order

Continue MD Rounding

Patient doing well?

No

Resume sedation

Titrated to Ramsey score of 2-4

B

Yes

Leave patient unsedated

Want to extubate?

No

Go to morning report

Nurse calls with update/problem

Does MD leave morning report?

No

Patient at risk for self-extubation

Yes

Go to patient room

Someone calls attending

Yes

Extubate, Stop.

Rounds 6:30 to 8 or 8:30
Morning report up to 3 hours, especially on Wed
MDs also have patient in TICU, PACU, or other locations

• Sedation breaks start at variable times
• MD may be off unit
• Interns are on unit about 5:30, before rounds at 6:30
• Order set - VAP prevention not all MDs know about
• Order set not used on all patients, even though it should

• Involvement of MD in sedation break is nurse dependent
• Depends on experience, assertiveness of nurse
• Depends on patient

* Not pre-ordered

* On vent protocol - no order

* Process not documented
  May not tell RT/RN
  May not be able to find RN
  May tell covering RN
  May not document on vent log
Causes of Unplanned Extubations on SICU as of May 25, 2010

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How Will We Know That a Change is an Improvement?

Protocol

Patient Factors

Environment

Family anxious

- Sometimes makes patient anxious
- Patient gets agitated
- Nurse has to care for family and patient
- May not understand what nurse says/memos
- Education
- Family issues before SICU stay
- Can't express what they want
- Causes agitation

- Family under the influence
- Alpha dog - nurse vs. mona/laugirlfriend
- Some insist on waking patient up
- Squeeze hand
- Ask questions

- Room to room
- Being bagged
- Disconnected from vent
- Someone holding tube
- Inadequate staff
- One person doing multiple things
- Patient feels movement, change in vent pattern - wakes up

- Moving Patient
- Transporting off unit
- Less static, RN, tech
- RT pushing vent
- Someone doing multiple things
- Push bed
- Push IV pole
- Seagull patient

- Unrestrained
- Positioning/procedure painful
- Not enough
- Pain
- Not restrained appropriately
- Unrestrained
- Staff reaching across beds

- Constraints of size in CT, MRI
- Adequate slack on machines
- Restraint possible?
- Type of procedure
- Arm position (over head)

- To diagnostic test
- Moving to table
- Tube dislodged
- Run out of sedation
- Especially if PRN
- Nurse thinks pt is OK
- Nurse thinks what she takes is OK
- Patient gets more agitated

- Inadequate Sedation
- Some patient don't respond well
- Venous
- Patient individual make-up
- Inappropriate choice of agent
- Patient drug/ETOH abuse history
- Requires more sedation
- Alcohol withdrawal

- Sedation regimen ordered PRN instead of cdp
- Patient can get oversedated

- Staff

- Equipment

- Patient intubated
- ET tube not positioned well
- Patient determined
- High temperature to meds
- Drug/alcohol abuse
- MD reluctant to give more
- Grab's in-line suctioning
- No one able to tube out

- Pain meds turned off during sedation holiday
- Sedation holidays start at same time
- 1 nurse with 2 patients on sedation holiday at same time
- CPAP trial/sedation holiday straddle shifts
- Set up for problems
- Lots of interventions at shift change
- Doing sedation holiday? CPAP trial on both sides at the same time
- MDS start rounds on B-side
- Takes 2-3 hours for MDS to get to C-side
- MDS off floor: for a long time (Report, MIS)
- Unit MDS hearing about patients on floor
- Standard educational process for MDS
- Process for sedation break not well defined

- Improperly secured tube
- ET tube tape
- Need 2 people to change (RN, RT, tech)
- No standard way to tape
- Some not around circumference
- Flap
- Intermittent pressure
- Wouldn't refuse to do without support
- Not paying attention

- No protocol
- Repositioning
- Procedural
- Family unified

- 1 nurse with 2 Sedation Holidays
- Occur at same time

- MD not available for assessment
- Sedation ordered
- Lack of experience
- Lack of knowledge of alternative meds
- Type of med
- On rounds
- Don't deviate from numerical order
- Only 2 people on critical care team all the time
- Residents rotate
- Off floor
- In conference
- In Q/R
- Other patient visit

- Shift change
- Lack of communication
- Neuro MDs want half-tape
- Nurse not in view of patient - coming for 2 patients
- Nurse covering
- Help with admission
- Isolation

- Intern calls nurse
- Refuses to call faculty
- Residents reluctant to extubate until rounds

- Equipment

- Miles away from bed
- Special beds have sticky thing that is sticky - pesky
- How tight to tie
- Improper restraint level
- Needs needles
- Equipment change from night to day
- Stryker bed
- 25 minute set up time
- Nemesys bed
- Medical emergency
- Patient mental status change
- Standard to at least
- Then increase
- Nurse didn't think patient
The Results

• We gleaned from these tools and looking at the data of our patients involved in SE that, although our sedation protocol wasn’t being used, it was also inadequate.
• There was no standardization in our spontaneous breathing trial (SBT) process resulting in patients possibly remaining intubated longer than necessary.
• The literature that we looked at corroborated that SE was associated with inadequate sedation. It also suggested that timely provider extubation would reduce SE.  

Interventions

• We revamped our sedation protocol and order sets for sedatives/analgesics. This provided the nursing staff more direction regarding titration to a patient’s needs. It also serves as a reference should orders prove to be inappropriate/ inadequate.

• We instituted a plan involving the charge nurses and unit secretaries to better capture the incidence of SE.

• We formulated a SBT algorithm to coincide with our sedation protocol.
Sedation & Analgesia for the Mechanically Ventilated Patient

**Anticipate length of time sedation required**
- **Continuous Infusion**
  - **Analgesia**
    - Fentanyl (10 mcg/ml) 50 - 200 mcg/hr
  - **SECOND CHOICE**
    - Morphine 2-4 mg q 1hr
  - **THIRD CHOICE**
    - Dexmedetomidine 4 mcg/hr 0.20.7 mcg/hr

**Difficult to control patient**
- **Consider Alternate and Adjunctive Medications**
  1. Trazodone
  2. Propranolol
  3. Haldol
  4. Risperidone

**DAILY SEDATION INTERRUPTION**
- **CONTRAINDICATIONS TO SEDATION INTERRUPTION:**
  - Undergoing active treatment for elevated ICP
  - Receiving neuromuscular blocking agents
  - Hypoxemia PEEP > 10 or FiO2 > 60%
  - ARDS
  - Patients identified at increased risk of self-extubation should not be turned during the sedation interruption.

**UHS MODIFIED RAMSEY SEDATION SCALE**
- **Level 1A - Awake - Anxious/Agitated/Restless**
- **Level 1B - Awake - Very Agitated/Does not calm/Blites ETT**
- **Level 1C - Awake - Dangerous Agitation/Pulls tubes/Combative**
- **Level 2 - Awake - Cooperative/Oriented**
- **Level 3 - Awake - Responds to Commands**
- **Level 4 - Asleep - Brisk response to tactile stimulation/loud noise**
- **Level 5 - Asleep - Sluggish response to tactile stimulation/loud noise**
- **Level 6 - Asleep - No response to tactile stimulation/loud noise**

**FENTANYL TITRATION**
- **BOLUS:** 2500 mcg/250 ml
- **Call HO for rate > 200 mcg/hr**

**MORPHINE TITRATION**
- **BOLUS:** 50 mcg every 5 minutes until desired level
- **Call HO for rate > 200 mcg/hr**

**MIDAZOLAM TITRATION**
- **BOLUS:** 0.5 mg every 5 minutes until desired level
- **Call HO for rate > 4 mcg/hr**

**PROPOFOL TITRATION**
- **BOLUS:** 0.5 mg/kg until desired level
- **Call HO for rate > 50 mcg/kg/min**

**LORAZEPAM TITRATION**
- **BOLUS:** 0.5 mg every 5 minutes until desired level
- **Call HO for rate > 4 mcg/hr**

**DEXMEDETOMIDINE TITRATION**
- **BOLUS:** 0.25-0.50 mcg/kg over 2-5 minutes every 30 minutes until desired level
- **Call HO for rate > 0.7 mcg/kg/hr**

1. Hold both the sedative and analgesic infusions every morning to allow for an accurate neurological assessment.
2. Schedule odd numbered rooms @ 03:00, and even numbered rooms @ 05:00.
3. Do not interrupt the analgesic infusion in patients who currently follow commands, but reduce the dose by ½.
4. The SCC provider (PG3 or Mlevel) should be immediately called to the bedside to evaluate the patient once there is a change in clinical status including but not limited to agitation, fighting the ventilator, O2 desaturating, or awake and able to follow commands.
5. After the physician or the nurse has evaluated the patient, the infusion(s) THAT ARE NECESSARY for adequate patient sedation and or analgesia is (are) re-started at ½ the previous dose(s) and then titrated up as necessary to the minimal effective dose(s).
6. A spontaneous breathing trial should be done in conjunction with the daily sedation holiday. Please refer to Spontaneous Breathing Trial Protocol for exceptions.

Use Midazolam with caution in: Asians Liver Failure Elderly > 65 yrs
STICU Spontaneous Breathing Trial (SBT) Algorithm
Schedule odd numbered rooms at 03:00, and even numbered rooms at 05:00
Spontaneous breathing trial should be done in conjunction with the daily sedation interruption

Vitals are stable
Appropriate vent settings:
Peep < 10, FIO2 is < 60%
ATC should be on at 100% and set for the appropriate airway type and size

Reduce and/or hold sedation and analgesia.
Verify restraints are secure.
Notify RT to start SBT.
RN and RT to remain at bedside for the first 5mins

SBT Successful

Yes

RSBI < 70
Appropriate O2 sats
Adequate TV (3cc/kg predicted BW)

Obtain ABG if requested

Plan to Extubate

No

Provider is unavailable to extubate

Place back on previous settings.
Restart sedation and analgesia at ½ the original rate

No

Adequate CLT
(see performance guide)

Yes

Patient given extubation instructions

Pt. Extubated

Performance of a Cuff Leak Test (CLT)
- Suction oro/hypopahryn wax well
- Change vent mode to CMV, ATC off and TV at 10cc/kg of predicted BW
- Deflate ETT balloon completely and observe for 5 respiratory cycles
- Cuff leak adequate if there is 20% drop from VTi to VTe

Not adequately ventilating
Agitated
O2 sats <92%
 Fighting ventilator
Ventilator parameters not WDL

Notify provider for assessment

Place patient back on original ventilator settings, sedation and analgesia

Continue to monitor and reassess
Wait at least 1 hr before attempting another SBT

Yes

ICP issues, on a neuromuscular
blockade, hypoxic, O2 sats <92%. VS are not WNL.
Patient is on one of the following modes or settings:
- APRV
- PCV
- Oscillators
- PEEP>10
- FIO2>60%

Continue on current ventilator settings with current analgesia/sedation. Re-evaluate when appropriate

No

Verify SBT orders are in Sunrise

Is the patient’s condition appropriate for SBT

Yes

No

Verify restraints are secure.
Notify RT to start SBT.
RN and RT to remain at bedside for the first 5mins

SBT Successful

Yes

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Appropriate O2 sats
Adequate TV (3cc/kg predicted BW)

Obtain ABG if requested

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Beginning Steps

Teaching:

– Two staff nurses created a teaching tool and, with a group of experienced nurses, taught each nurse individually how to use the sedation/analgesia and SBT protocols.
– Residents were educated as well regarding the proper use of these protocols.
– Both protocols were put on the UHS Clinical Portal for easy reference by staff.
Teaching
Metrics for Potential ROI

• A ventilator day costs approximately $8,000.
• SE requiring re-intubation has been associated with longer total time of mechanical ventilation (17 vs. 6 days), increased ICU stay (22 vs. 9 days) and increased hospital stay (34 vs. 18 days).\(^6\)
• If we can prevent even one SE requiring re-intubation the potential for ROI is significant.

Into the Future

In this process, other variables have been identified as impacting not only SE but also the unplanned removal of other medical devices:

– Inadequate or incorrectly applied restraint devices
– Need for protocol to assess and treat delirium
  • Non pharmacologic interventions
  • Validated delirium scale
In the future: Coed beds

Coed beds:
Provides 1:1 to prevent self extubation by providing companion support as well as increases patient satisfaction
In the future: Sharing oxygen
In the future: Nicotine impregnated ETT