Developing the Evidence for Airway Management of Critically-Ill Ventilated Patients

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• Current research funding
  • National Institute for Nursing Research
    • 1R01NR014508-01A1
Objectives

1. Describe development of a program of clinical research related to airway management in critically-ill ventilated patients.

2. Articulate the importance of inquiry, collaboration, and team building in conduct of research.
University of Central Florida

• Metropolitan research university
• Established 1963
• 64,000 students
  • 3000 nursing students
• 15,000 degrees/year
• Partnership university
• Access

Scale × Excellence = Impact
Interest in Airway Management

• Bedside influences as teacher and staff nurse
• Clinical Nurse Specialist position
  • Practice changes
  • Product evaluation/new technologies
• Natural instincts / characteristics
  • Skeptic; show me the evidence
  • Is there a better way?

“IF THERE’S A WAY TO DO IT BETTER… FIND IT.”
THOMAS A. EDISON
Limited Evidence Guided Practice

• High-pressure, low volume ETT
  • Deflated ETT cuff every 2 hrs— aspiration?

• Oral care
  • No standards
  • Comfort/hygiene

• Some care still lacks evidence
  • Oral and ETT suctioning
  • Cuff pressure management
  • Repositioning ETT
  • Securement devices
  • Tracheostomy care
Trajectory Highlights
Colonization

• 20 subjects
• Cultures mouth, tracheal aspirate, devices
  • All had VAP pathogens in the mouth
  • 67% positive tracheal cultures
  • Tonsil suction contaminated; 39% MRSA

• Serendipitous findings set the stage …
  • Cuff pressure lower than morning measure; 20% were 10-12 cm H$_2$O lower
  • Copious amount of oral secretions in subset

National Study of Airway Practices: STAMP

• Site and individual practices
• 27 sites; 1667 respondents
• ETT cuff pressure
  • Frequency and method of measurement varied
  • Nurses not aware of value nor importance
• Oral care
  • Lack of oral care, tooth brushing, oropharyngeal suctioning
• Differences in practices between nurses and RTs

Cuff Pressure

• Does ETT cuff pressure decrease over time?
  • Cuff pressure decreased 4 cm H\textsubscript{2}O over a 12h period
• Could continuous ETT cuff pressure monitoring provide a better picture of changes?
  • Challenges of implementing the technology

Cuff Pressure Discoveries

• 10 subjects
• Pressure 20-30 cm H$_2$O only 54% of time
• Out of range
  • 16% High (transient)
  • 30% Low
• Trend to decrease over time
• Duration of intubation a possible factor

Cuff Pressure Intervention
1R21NR010262

• Randomized, repeated measures, crossover design; 32 subjects
• Data collected for 12 hours for 2 days
  • Control Condition—usual care
  • Intervention; adjust cuff pressure using alarm triggers

Cuff Pressure Intervention
1R21NR010262

- Interventions needed for 24/25 subjects
- Average 8 interventions
  - Added air (0.26 mL) to cuffs of 23 subjects
  - Removed air (0.13 mL) from cuffs of 6 subjects
- Control > frequency out-of-range values
- Pressure decreased over time

Oropharyngeal Secretion Volume

- 28 subjects; HOB 30°
- Suctioned deep suction catheter; weigh and measure secretions at baseline, 2h, and 4h
- Ave. 8 mL after 4 h

Cues for ETT Suctioning

- 42 subjects
- Assess hourly for suction cues using respiratory guidelines for suctioning
- Findings
  - Coarse crackles over trachea best indication of need for suction (> 1 mL mucus)
  - Sawtooth waveform indicates need for suction, but not consistently present
  - Coarse breath sounds NOT recommended for assessment

Pepsin / Amylase Markers of Aspiration

• Pilot study 13 subjects
  • Paired oral and tracheal specimens twice in 4 hours

• Development of laboratory
  • Collaboration with pediatric GI specialist!
  • Methods for gathering specimens
  • Decision points for positive and negative values

• Findings
  • Pepsin in tracheal secretions of 54% of subjects
  • Amylase in tracheal secretions of 39% of subjects
  • Aspiration despite cuff pressure and HOB elevation

Oral Suction Intervention to Reduce Aspiration and Ventilator Events: NO-ASPIRATE 1R01NR014508-01A1

• RCT of 520 critically-ill ventilated patients to achieve final sample of 400 patients
  • Deep oropharyngeal suction every 4 hours (experimental group)
  • Oral suction with swab every 4 hours (usual care)
• Outcomes: aspiration and ventilator-associated events
  • Tracheal / oral specimens for α-amylase q12h
  • VAE per CDC definitions
• Logistic regression, survival analysis, and GEE
• Have enrolled 490 subjects to date!

ClinicalTrials.gov Identifier: NCT02284178
Clinical Research in Critical Care is Challenging!

Strategies: Inquiry, Collaboration, Teambuilding ABCDF bundle!
Action

• Self-direction
• Take advantage of opportunities
  • CNS role
  • Better way to do things
• Establish formal affiliation with hospitals
• Establish relationships with IRBs
Build Infrastructure

• Colleagues
• Students
• Other disciplines
• Seek others (e.g., engineering)
• Consultants
Back-to-Basics / Bedside

What is best for the patient?
• Many practices based on OLD data from studies with small sample sizes
• Correlate physiological data with the clinical condition
• Partner with clinicians
Collaborate

• Avoid the “lone researcher”
• Inter-professional teams essential
• Include those practicing at bedside!
• Use national experts as consultants
• Think beyond the usual
  • Pediatric gastroenterologist!
  • Genetic analysis expert!
  • Epidemiologist
Connect, Create, Clever CNS
Discover and Disseminate

• Self-discovery
• Scientific discoveries
  • Must publish and present results
• Don’t accept failure
Funding

• Pilot work
• Clinical studies
• Large-scale studies
  • Intramural
  • Endowed chair funds
  • Professional organizations
  • Corporations/industry
  • Federal government
Future Goals

• Evidence-based nursing care
  • Prevention of microaspiration
    • Endotracheal tube cuff
    • Management of subglottic suction endotracheal tube
  • Best practices for endotracheal suctioning
  • Best practices for management of patient with tracheostomy
• Changes in lung flora over time
Success is as Easy as ABC

- **Act; Ask**
- **Back-to-basics; Bedside approach; Build infrastructure**
- **Collaborate; Connect; Create; Clever; CNS; Colleagues**
- **Discover; Disseminate; Don’t accept failure**
- **Funding critical**