

# Pneumonia as a complication of Rib Fractures in Trauma

**Allan D. Lamb, DO, FACOS**  
**Trauma Medical Director**



---

Oakwood Southshore  
Medical Center

**Trauma Services**

# Pneumonia

---

- **\$ 40.2 billion cost in 2005**
- **8<sup>th</sup> leading cause of death**
- **55,477 deaths from pneumonia in 2006**
- **Trauma patients susceptible from stress and weakened immune system, in addition to direct injury**
- **Well known complication of rib fractures, especially in elderly**

# Problem

---

**OSMC pneumonia rate (complication) associated with rib fractures was 5.2%**

**Significant outlier in MTQIP data 2011.**

**Above NTQIP benchmark of 4.9%**

**2011-2012 quality improvement project began in October, 2011.**

**Goal was a rate of 3.9%**

# Guidelines developed

---

**Patient group identified**

**2 or more rib fractures**

**Patients requiring admission to the hospital**

**Hospital LOS > 1 day**

**Initial intervention, begun November, 2011**

**Changed Incentive Spirometer to Acapella device.**

# Acapella device

## acapella® product family features



Standard-sized port will accommodate most medication nebulizers

{acapella® duet only}



Clear coloring aids in visual recognition of cleanliness

{acapella® duet only}



One-way inspiratory valve allows inhalation without removal from the patient's mouth

{all acapella® products}



Expiratory resistance / frequency dial permits therapy to be customized to meet patient's clinical needs.

{all acapella® products}



Distal fitting allows easy fit with 22mm I.D. connections

{all acapella® products}

Proximal 22mm O.D. connection allows use with a mouthpiece or mask

{all acapella® products}

# October 2011- January 2012

- Initial reporting period
  - 22 patients
  - 50.77 average age
  - 5.5 day average LOS
  - 16 average ISS
  - 2.81 average Chest AIS
  
- 4.40% pneumonia rate (down 0.8 %)

# Guidelines revised

---

**Acapella continued**

**On-Q pain pump with marcaine inserted  
for continuous rib block. Para spinal  
insertion position**

**Increased staff awareness (physician, nurse  
and RT)**

# On-Q pain pump

---



# February 2012 to May 2012

- Follow up reporting period
  - 31 patients
  - 56.29 average age
  - 4.58 average LOS (down.92 days)
  - 20.5 average ISS (higher severity)
  - 2.52 average Chest AIS (lower severity)
  
- 3.23% pneumonia rate (down 1.17%)

## Further guideline revision

---

**Acapella continued**

**On-Q pain pump continued**

**BiPap utilize at night 2100 – 0800  
for pulmonary support and to  
maintain lung recruitment**

# BiPAP



# June 2012 to September 2012

- Final reporting period
  - 15 patients
  - 51.91 average age
  - 3.6 day average LOS (down additional .98 day)
    - **overall LOS decrease of 1.9 days**
  - 12.07 average ISS (lower injury severity)
  - 2.73 average Chest AIS (Higher chest injury)
- Pneumonia rate 0% (down 3.2%)

# Rib Fracture Protocol

---

## **Inclusion**

**2 or more rib fractures**

**Hospital admission**

**>1 day LOS**

## **Intervention**

**Acapella**

**On-Q Pain pump with marcaine, para spinal insertion**

**BiPap support at night 2100 – 0800 throughout admission**

# Results

- 1 year study period
- 68 patients
- LOS decreased from 5.5 to 3.6 day average
  - 1.9 day decrease
- Average age 53
- Average ISS 16.04
- Average Chest AIS 2.7
- 12 month pneumonia average 0.64%
  - 4.56% decrease with 0% in final 4 months

# Conclusion

- Aggressive control of pain with On-Q pain catheters in para spinal position
- Respiratory support and recruitment with Acapella vibratory PEP therapy system (\$40 cost)
- Maintenance of recruited air space with BiPAP therapy overnight with full face mask (\$50 cost)
- Combined, these therapies are synergistic and drastically reduce the incidence of pneumonia.
- There is reduced morbidity, mortality and length of stay with minimal cost, more than covered by decreased LOS

# Summary

- **Rib Fracture Protocol is effective and beneficial**
  - **Decreased length of stay by 1.9 days**
  - **Decreased ICU stay by 1.34 days**
  - **Decreased Ventilator support by 1.18 days**
  - **Decreased pneumonia rate by 4.56%**



---

Oakwood Southshore  
Medical Center

**Trauma Services**