AECOPD: Strategies to Reduce Readmission for COPD

Sanjay Sethi MD
Vice Chair of Research
Professor and Division Chief
Pulmonary, Critical Care and Sleep Medicine
University at Buffalo, SUNY
Staff Physician, VA WNY HealthCare System,
Buffalo, NY, USA
ssethi@buffalo.edu
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Objective

• Identify interventions to reduce readmission rates for patients hospitalized with an acute exacerbation of COPD.
Reducing Readmission

• Global reduction in COPD exacerbations
• Better management of comorbidities
• Specific reduction in readmission following an index admission with COPD as a primary diagnosis
• Time period of 30 days
CMS COPD Readmissions Measures

- Introduced readmission and mortality measures for non-federal acute-care hospitals and critical access hospitals in 2013
  - Unplanned readmission rate within 30 days of discharge
  - Mortality rate within 30 days of admission
- Adopted for Inpatient Quality Reporting Program in FY2014, in addition to:
  - Acute myocardial infarction
  - Heart failure
  - Pneumonia
  - Total hip and knee arthroplasty complication and readmission
- Cost of care of readmitted COPD patients is 18% higher than those without readmission

CMS, Centers for Medicare and Medicaid Services
Chronic Obstructive Pulmonary Disease (COPD) Measures
Reducing Readmission

• Frequency of Readmission
• Causes of Readmission
• Predicting Readmission
• Preventing Readmission
# Most Frequent Medical Reasons for Rehospitalization, According to Condition at Index Discharge (Medicare Claims Data)

<table>
<thead>
<tr>
<th>Condition at Index Discharge</th>
<th>30-Day Rehospitalization Rate (%)</th>
<th>Reasons for Rehospitalization (%)</th>
<th>5th to 10th Most Frequent</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>21.0</td>
<td>Most Frequent: Heart failure (8.6)</td>
<td>GI problems, nutrition-related or metabolic issues, septicemia, GI bleeding, renal failure, urinary tract infection (17.0)</td>
</tr>
<tr>
<td>Heart failure</td>
<td>26.9</td>
<td>2nd Most Frequent: Pneumonia (7.3)</td>
<td>Acute MI, COPD, arrhythmias, circulatory disorders, GI bleeding, GI problems (14.0)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>20.1</td>
<td>3rd Most Frequent: Psychoses (4.3)</td>
<td>Nutrition-related or metabolic issues, GI problems, respiratory or ventilation problems, pulmonary edema, GI bleeding, urinary tract infection (14.9)</td>
</tr>
<tr>
<td>COPD</td>
<td>22.6</td>
<td>4th Most Frequent: COPD (3.9)</td>
<td>Respiratory or ventilation problems, GI problems, nutrition-related or metabolic issues, arrhythmias, GI bleeding, acute MI (12.5)</td>
</tr>
<tr>
<td>Psychoses</td>
<td>24.6</td>
<td>5th to 10th Most Frequent: Pneumonia (4.3)</td>
<td>Chest pain, nutrition-related or metabolic issues, depression, GI problems, COPD, organic mental conditions (7.0)</td>
</tr>
<tr>
<td>GI problems</td>
<td>19.2</td>
<td>5th to 10th Most Frequent: Heart failure (4.2)</td>
<td>Major bowel surgery, urinary tract infection, septicemia, GI bleeding, COPD, chest pain (13.4)</td>
</tr>
</tbody>
</table>

COPD = chronic obstructive pulmonary disease; GI = gastrointestinal; MI = myocardial infarction
Rates of Readmission: Western PA

Readmissions in Western PA, 2005-06

Diagnosis at Initial Admission

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th># Readmitted</th>
<th>% Readmitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHF</td>
<td>3,000</td>
<td>10.00%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>2,500</td>
<td>8.00%</td>
</tr>
<tr>
<td>Depression</td>
<td>2,000</td>
<td>6.00%</td>
</tr>
<tr>
<td>COPD</td>
<td>1,500</td>
<td>5.00%</td>
</tr>
<tr>
<td>Kidney Failure</td>
<td>1,000</td>
<td>3.00%</td>
</tr>
<tr>
<td>Abnormal Heartbeat</td>
<td>750</td>
<td>2.50%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>500</td>
<td>1.67%</td>
</tr>
<tr>
<td>Asthma</td>
<td>250</td>
<td>0.83%</td>
</tr>
</tbody>
</table>
Causes of Readmission following index COPD admission: Western PA

- COPD: 37%
- Other Lung Condition: 21%
- Non-Pulmonary Diagnosis: 42%

Source: Pittsburgh Regional Health Initiative Analysis of Pennsylvania Health Care Cost Containment Council Data
Q. Which of the following Biomarkers has been shown to be predictive of 30 day readmission for COPD exacerbation?

1) Elevated Serum C-Reactive protein at Admission
2) Elevated Serum C-Reactive protein at Discharge
3) Elevated White blood cell count at Admission
4) Elevated White blood cell count at Discharge
Risk Factors for Readmission

- Clinical Factors
- Biomarkers
- Treatment of Exacerbation
- Transition of Care
Clinical Risk Factors for Readmission

- Increased age
- Previous admission
- Charlson index $\geq 2$
- Higher Katz (dependency)index
- Lower FEV$_1$
- Worse Health Status
- Worse Dyspnea
- Home O$_2$ use
- Cor pulmonale
- Pulmonary Hypertension

Clinical Risk Factors for Readmission

- Decreased Physical activity
- Increased Respiratory Muscle load (PTI)
- Peripheral muscle strength
- Respiratory muscle strength
- Depression
- Use of psychotropic drugs
- Socioeconomic status
- Being Single
- Increased cured meat consumption
- Serum Magnesium

Clinical Predictors for Readmission

- Most look at 12 month (some at 3 month) readmission rates
- Most risk factors are non-modifiable
- Potentially modifiable
  - Muscle strength
  - Physical activity
Identifying Patients at Risk for Readmission

Risk factors

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>n</th>
<th>PPV (95% CI)</th>
<th>NPV (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRP at discharge ≥7.6 mg/L and Presence of diabetes and ≥1 prior hospitalization for AECOPD</td>
<td>n=24</td>
<td>1.000 (1.000 to 1.000)</td>
<td>1.000 (1.000 to 1.000)</td>
</tr>
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</table>

Crisafulli et al, COPD in press
Q. Which of the following Biomarkers has been shown to be predictive of 30 day readmission for COPD exacerbation?

1) Elevated Serum C-Reactive protein at Admission
2) Elevated Serum C-Reactive protein at Discharge (≥7.6 mg/l)
3) Elevated White blood cell count at Admission
4) Elevated White blood cell count at Discharge
Preventing Readmission

• Optimizing Acute Care of Exacerbation
• Optimizing Transition of Care
• Additional Interventions
Q. Which of the following interventions at discharge is now controversial in the prevention of readmission for COPD exacerbation?

1) Patient Education
2) Prompt follow-up visit
3) Access to Maintenance Medications
4) Early Pulmonary Rehabilitation
Optimizing Acute Care

- Appropriate Antibiotic treatment
- Appropriate Steroid use
- Appropriate Maintenance Medication on Discharge
- Smoking Cessation
- Patient Education
  - Disease Process
  - Danger Signals
  - Inhaler Technique
  - Oxygen use
Pittsburgh Regional Health Initiative (PRHI) Model for Reduction of COPD Readmission
PRHI Model

HOSPITAL

Treat Exacerbation

Improved Patient Education

Discharge

Transition

COMMUNITY CARE

ER Used As Solution to Problems

MD Treatment When/If Office Visit Occurs

Admission

Readmission
PRHI Protocol

**Hospital Care Protocol**
- Identify as COPD Patient
- Treat Exacerbation
- Address Root Causes:
  - Medication skills
  - Smoking cessation
  - Other
- Improved Patient Education

**Community Care**
- ER Used As Solution to Problems
- MD Treatment When/If Office Visit Occurs

Admission → Discharge
Readmission
Transition
Optimizing Acute Care

• Appropriate Antibiotic treatment
• Appropriate Steroid use
• Appropriate Maintenance Medication on Discharge
• Smoking Cessation
• Patient Education
  – Disease Process
  – Danger Signals
  – Inhaler Technique
  – Oxygen use
PRHI Model

**HOSPITAL**
- Identify as COPD Patient
- Treat Exacerbation
- Address Root Causes:
  - medication skills
  - smoking cessation
  - other
- Improved Patient Education

**COMMUNITY CARE**
- ER Used As Solution to Problems
- MD Treatment
- RN Care Manager
- Medication Access
- Prompt Follow-up:
  - Home Visit
  - PCP Visit

**Admission**
**Discharge**
**Readmission**
**Transition**
Optimizing Transition of Care

- Discharge Planning
- Appropriate follow up within 7 days
- Telephonic assessments at periodic intervals
- Remote Assessment of symptoms, oxygenation etc.
PRHI Model

**HOSPITAL**
- Identify as COPD Patient
- Treat Exacerbation
- Address Root Causes: medication skills, smoking cessation, other
- Improved Patient Education

**COMMUNITY CARE**
- Prompt Response to Exacerbations: Action Plan, 24/7 Phone Support
- MD Treatment
- RN Care Manager
- Medication Access
- Prompt Follow-up: Home Visit, PCP Visit

Flow:
- Admission
- Discharge
- Transition
- Readmission
PRHI Model

% of Patients Admitted for COPD Exacerbation and Readmitted within 30 Days for COPD or Pneumonia
UPMC St. Margaret, 2008-2009

- 44% Reduction
- 30 Readmissions Prevented
- $160,000+ Saved
- Net Savings of $80,000+ After Cost of Care Mgr
PRHI Resource

www.PaymentReform.org       www.PRHI.org
Is Early Rehabilitation Helpful?

**Screened (n=1204)**
- Excluded (n=815):
  - >4 admissions (n=289)
  - Refused (n=330)
  - Musculoskeletal limitation (n=121)
  - Neurological limitation (n=75)

**Randomised (n=389)**
- Allocated to intervention (n=196)
  - Withdrew (n=14)
    - Died during trial (n=0)
    - Died after withdrawn (n=5)
  - Died during trial (n=3)
  - Died after withdrawn (n=3)

**Randomised (n=389)**
- Allocated to usual care (n=193)
  - Withdrew (n=10)
    - Died during trial (n=3)
    - Died after withdrawn (n=3)
  - Died during trial (n=2)
  - Died after withdrawn (n=0)

**Patient admitted to hospital and randomised to intervention**
- Inpatient stay
  - Non-volitional training
  - Volitional training
    - SPACE for COPD self-management manual introduced using motivational interviewing

- 30 minutes daily NMES (50 Hz)
- Sit to stand test
  - Yes
    - Perform ISWT/ESWT or timed walk if unable to perform
  - No
    - Bed based exercises
      - Yes
        - Sitt to stand test
        - No

- Daily progressive strength training
  - Arm exercises
  - Biceps curls/triceps pull ups
  - Leg exercises
  - Sit to stand, step ups
  - Inner range quadiceps/knee extension

- Repetitions
  - 3x8 repetitions each exercise every day
  - Progression
    - Once patient could manage 3x8 comfortably (Borg RPE <13), increase weight lifted by 0.5 kg
    - Where possible, lower limb resistance training using “multi-gym” equipment:
      - 3x8 repetitions of 70% 1RM

**Discharge**
- Withdrew (n=24)
  - Died during trial (n=3)
  - Died after withdrawn (n=2)

**6 weeks**
- Withdrew (n=13)
  - Died during trial (n=2)
  - Died after withdrawn (n=0)

**6 weeks**
- Withdrew (n=13)
  - Died during trial (n=12)
  - Died after withdrawn (n=11)

**Post-discharge**
- Continued daily training with progression
  - NMES
  - Timed walks at prescribed speed
  - Upper limb strength training and sit to stand
  - SPACE for COPD self-management manual

**12 months**
- Admission to hospital data analysed (n=196)
  - Lost to follow-up (n=0)

**12 months**
- Admission to hospital data analysed (n=193)
  - Lost to follow-up (n=0)

**NAMES**=neuromuscular electrical stimulation; **SPACE**=Self-management programme of Activity, Coping and Education; **COPD**=chronic obstructive pulmonary disease; **ISWT**=incremental shuttle walk test; **ESWT**=endurance shuttle walk test; **RPE**=rating of perceived exertion; **RM**=repetition maximum

Greening N J et al. BMJ 2014;349:bmj.g4315
Cumulative Incidence of Hospital Readmission

- Usual care
- Early rehabilitation
Eighty deaths (21%) occurred in the study population during the follow-up period.
Q. Which of the following interventions at discharge is now controversial in the prevention of readmission for COPD exacerbation?

1) Patient Education
2) Prompt follow-up visit
3) Access to Maintenance Medications
4) Early Pulmonary Rehabilitation
Conclusions

• COPD Readmission is a substantial problem with associated significant health-care costs

• Multi-faceted approach is logical
  – appropriate acute care
  – patient education
  – improving transition of care
  – close follow-up

• More evidence is needed to identify critical aspects of a reduction in readmission intervention