Preventing the “Revolving Door” of COPD Readmissions

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Objectives

• Identify the key demographic and clinical predictors of severe exacerbations of COPD and readmissions
• Describe novel approaches to prevent COPD readmissions post-hospital discharge
Scope of the Problem

- COPD is the 3rd leading cause of death in the United States
- Expected to become the leading cause of hospitalizations by 2021

What defines “revolving door”?

- frequent severe/hospitalized exacerbation?
- readmission for COPD?
- all-cause readmission?
- time of readmission?

Early Hospital Readmissions after an Acute Exacerbation of Chronic Obstructive Pulmonary Disease in the Nationwide Readmissions Database

- Overall readmissions rate 19.2%
- Early readmission associated with Medicaid, lower income, comorbidity, LOS and SNF

Respiratory diagnosis in 52%
COPD in 28%
PubMed Citations for “COPD Readmission”

Readmission, the Controversy

Demographic/SES Predictors

- Older age
- Non-white race
- Male gender
- Lower income
- Insurance – none and public
“Pulmo-centric” Predictors
- CT emphysema
- Dyspnea
- Inspiratory capacity
- Lower lung function
- PA/A ratio
- PIFR
- Patient reported outcomes
- Risk scores

Comorbidities
- Allergic rhinitis
- Anemia
- Anxiety/depression
- Cardiac disease
- CKD
- Diabetes
- OSA
- Substance abuse
- Vertebral fractures
- Charlson score
- CODEX
- Frailty

Laboratory Predictors
- NT-proBNP
- Electrolyte abnormalities
- Eosinophils
- Neutrophil-lymphocyte ratio
- Pseudomonas infection
Characteristics of Index Event

- Discharge to skilled nursing facility
- ER discharge
- ICU stay
- Length of stay
- Mechanical ventilation
- Pulmonology follow up

Miscellaneous

- Activity level
- Community mobility
- Patient education
- Provider feedback on spirometry
- Lower winter temperatures
- Summer months

Suboptimal Inspiratory Flow Rates Are Associated with Chronic Obstructive Pulmonary Disease and All-Cause Readmissions

- PIF < 60 L/min
- Prevalence of 52%
- Associated with:
  - CAT 29 vs. 6
  - COPD readmissions at 90 days – 28% vs. 14%
  - Days to all-cause and COPD readmission:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Coefficient</th>
<th>P Value</th>
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</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>77.1</td>
<td>0.36</td>
</tr>
<tr>
<td>PIF group (PIF)</td>
<td>-33.6</td>
<td>0.003</td>
</tr>
<tr>
<td>Sex</td>
<td>10.2</td>
<td>0.48</td>
</tr>
<tr>
<td>Age</td>
<td>-0.52</td>
<td>0.63</td>
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<tr>
<td>Charlson Comorbidity Index</td>
<td>2.05</td>
<td>0.82</td>
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<tr>
<td>FEV1, % predicted</td>
<td>1.76</td>
<td>0.12</td>
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</tbody>
</table>

Role of Comorbidities in Treatment and Outcomes after Chronic Obstructive Pulmonary Disease Exacerbations

Charlson index OR 1.24 for readmission or death
And OR 0.90 for treatment with steroid/antibiotics

Depression Is Associated with Readmission for Acute Exacerbation of Chronic Obstructive Pulmonary Disease


Short- and Medium-term Prognosis in Patients Hospitalized for COPD Exacerbation
The CODEX Index

Readmission Rates

- Frailty defined by Reported Edmonton Frail Scale (REFS) – 9 domains
- Moderate/severe frailty in 36%
- Severe frailty OR 5.19 for readmission


Lower physical activity during first week after discharge associated with higher 30-day all-cause readmissions - OR 8.7; p = 0.02.

Community Mobility and Clinical Outcomes

- UAB Life Space Assessment (LSA) measures mobility from bedroom to beyond town
- Restricted total score (<60) predicts mortality, NH admission, QOL in elderly

Restricted Life-Space and All-cause Hospitalization

*Adjusted for age, race, gender, current smoking, FEV₁, and prior severe exacerbations
Restricted Life-Space was associated with a shorter duration to first all-cause hospitalization by a mean ±SE days: 422.4±42.9 vs 549.0±27.1 days


Eosinophils in COPD Exacerbations Are Associated With Increased Readmissions

- 200 cells/μL or 2%
- 12-month COPD-related readmission (OR 0.59 [1.65-7.82]; P = .0013)
- 12-month all-cause readmission (OR 2.32 [1.10-4.92]; P = .0277)
- time to first COPD-related readmission (HR 2.74 [1.56-4.83]; P = .0005)


Pseudomonas aeruginosa in Chronic Obstructive Pulmonary Disease Patients with Frequent Hospitalized Exacerbations: A Prospective Multicentre Study

- PA was isolated in 18% of cohort
- Prior PA isolation and OCS major risk factors
- Persisted in 70%
- Resistance in 70%


OR = 4.1
Table 1

<table>
<thead>
<tr>
<th>ED Treatment</th>
<th>%</th>
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<tbody>
<tr>
<td>Appropriate</td>
<td>49</td>
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<tr>
<td>Bronchodilator</td>
<td>88</td>
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<tr>
<td>Antibiotic</td>
<td>64</td>
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<tr>
<td>Steroid</td>
<td>71</td>
</tr>
<tr>
<td>Referrals (any)</td>
<td>68</td>
</tr>
<tr>
<td>Primary care</td>
<td>52</td>
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<tr>
<td>Pulmonary</td>
<td>22</td>
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</table>

Table 2

<table>
<thead>
<tr>
<th>Risk Factors for Not Attending Pulmonologist Follow-Up</th>
<th>Adjusted OR (95% CI)</th>
<th>P value</th>
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<tbody>
<tr>
<td>Distant residence</td>
<td>3.0 (1.24-7.28)</td>
<td>0.02</td>
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<tr>
<td>Previous hospitalizations</td>
<td>1.34 (1.02-1.75)</td>
<td>0.03</td>
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<tr>
<td>Recommended in discharge letter</td>
<td>0.21 (0.08-0.56)</td>
<td>0.002</td>
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<tr>
<td>Previous pulmonologist visit</td>
<td>0.82 (0.73-0.93)</td>
<td>0.002</td>
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Table 3

<table>
<thead>
<tr>
<th>Risk Factors Associated with Readmission (90 days)</th>
<th>Adjusted OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No pulm follow up</td>
<td>2.91 (1.06-8.01)</td>
<td>0.04</td>
</tr>
<tr>
<td>Previous hospitalizations</td>
<td>2.24 (1.57-3.19)</td>
<td>&lt;0.001</td>
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<tr>
<td>FEV1</td>
<td>1.21 (0.62-2.37)</td>
<td>0.59</td>
</tr>
<tr>
<td>Disease duration</td>
<td>1.0 (0.99-1.01)</td>
<td>0.72</td>
</tr>
<tr>
<td>Age</td>
<td>1.0 (0.96-1.05)</td>
<td>0.97</td>
</tr>
<tr>
<td>Female sex</td>
<td>1.53 (0.43-5.48)</td>
<td>0.51</td>
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</table>
Preventing the Revolving Door
*Care Across the Continuum*

Role of Respiratory Therapists

- Single-center, prospective, unblinded RCT at Barnes Jewish 2012-2015
- 428 subjects (214 intervention, 214 control), 18-65y with confirmed COPD
- Primary outcome (non-hospitalized emergency department visits and hospital readmissions for a COPD exacerbation during 6-month follow-up)

Intervention and Outcomes

- RT-guided protocol of inpatient management
- 1-hr educational in-service on COPD by RT case manager
- Written action plan

- Reduced readmissions for a COPD exacerbation (20.1% vs 28.5%, p=0.042)
- Reduced in-patient hospital days (306 d vs 523 days, p=0.02) and ICU days (17 d vs 53 days, p=0.02) due to COPD exacerbations
- Mortality was similar for both groups (1.4% vs 0.9%, p>0.99)

Discharge Bundles

Meta-analysis examining evidence base since 2016 for discharge bundles reducing COPD readmissions

4 trials with "moderate-to-high risk of bias"

Core set of discharge interventions?

- Brief intervention for smoking cessation
- Referral to smoking cessation programme
- Respiratory physiotherapy/bronchial exercises
- Diet recommendations
- Hygiene habits recommendations
- Adopted exercise
- Screening for gastro-esophageal reflux disease, depression or anxiety
- Nurse care needs assessment
- Recommend maintenance of home oxygen therapy appliance
- Check O2 saturation on air
- Oxygen alert card
- Document spirometry
- Assessment/trial for pulmonary rehabilitation
- Referral to respiratory specialist care
- Arrange follow-up
- Post-discharge phone call

Transitional Care Interventions

CONCLUSION A 3-month program of combined transitional and long-term management support resulted in fewer COPD-related hospitalizations and emergency department visits and better quality of life at 6 months after discharge.
Summary

- Frequent hospitalization in COPD remains a major driver of costs and mortality even with appropriate medical treatment
- Numerous predictors but non-pulmonary factors are critical
- Well-designed transitional care interventions may be the key