Preventing re-hospitalizations for COPD

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Conflicts of interest

• Pharmaceutical industry
  – No speaker or consultant fees
  – Invited to participate as site investigator in Phase IV clinical trial in asthma

• National Institutes of Health
  – NHLBI AsthmaNet
  – NHLBI COPD Clinical Research Network
  – NHLBI COPD Outcomes based Network for Clinical Effectiveness and Research Translation
Outline

• The numbers

• Tale of 3 studies

• Lessons learned

• (some) Unanswered questions and next steps
The numbers (2008)

- 822,500 hospitalizations for COPD (ICD9 codes)
  - LOS 4.7 days / hosp
  - Cost $7,500 / hosp, $6.1 billion total costs
- Insurance
  - 69% Medicare, 10% Medicaid
  - 16% Private
  - 3% Uninsured
- Discharge location
  - Home 67%, Other facility 13%, Deaths 1.6%, Other

Wier, L.M., AHRQ HCUP, Statistical Brief #106, 2011
<table>
<thead>
<tr>
<th>Secondary diagnoses</th>
<th>All COPD</th>
<th>Medium COPD</th>
<th>Without acute exacerbation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number (%)</strong></td>
<td><strong>Rank</strong></td>
<td><strong>Number (%)</strong></td>
<td><strong>Rank</strong></td>
</tr>
<tr>
<td>Essential hypertension</td>
<td>415,800</td>
<td>1</td>
<td>158,300</td>
</tr>
<tr>
<td>Current and/or past use/abuse of tobacco</td>
<td>379,700</td>
<td>2</td>
<td>135,300</td>
</tr>
<tr>
<td>Coronary atherosclerosis and other heart disease</td>
<td>245,600</td>
<td>3</td>
<td>86,500</td>
</tr>
<tr>
<td>Disorders of lipid metabolism</td>
<td>228,400</td>
<td>4</td>
<td>87,300</td>
</tr>
<tr>
<td>Diabetes mellitus without complication</td>
<td>207,600</td>
<td>5</td>
<td>80,800</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>196,900</td>
<td>6</td>
<td>66,900</td>
</tr>
<tr>
<td>Fluid and electrolyte disorders</td>
<td>178,700</td>
<td>7</td>
<td>65,300</td>
</tr>
<tr>
<td>Cardiac dysrhythmias</td>
<td>170,600</td>
<td>8</td>
<td>59,500</td>
</tr>
<tr>
<td>Esophageal disorders</td>
<td>166,500</td>
<td>9</td>
<td>66,500</td>
</tr>
<tr>
<td>Respiratory failure</td>
<td>153,300</td>
<td>10</td>
<td>47,500</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>147,000</td>
<td>11</td>
<td>41,000</td>
</tr>
<tr>
<td>Mood disorders (depressive and bipolar disorders)</td>
<td>141,500</td>
<td>12</td>
<td>54,400</td>
</tr>
</tbody>
</table>

Note: More than one secondary diagnosis may be recorded during a hospital stay.

Note: The distribution of other COPD discharges is statistically different from the distribution of acute exacerbation discharges at p < 0.05.

<table>
<thead>
<tr>
<th>Principal Diagnosis</th>
<th>All COPD*</th>
<th>Acute exacerbation*</th>
<th>Without acute exacerbation*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total stays with COPD as secondary diagnosis</td>
<td>3,827,100</td>
<td>619,200</td>
<td>3,207,900</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>370,800</td>
<td>138,000</td>
<td>232,800</td>
</tr>
<tr>
<td>(9.7%)</td>
<td>(22.3%)</td>
<td>(22.3%)</td>
<td>(7.3%)</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>310,200</td>
<td>80,300</td>
<td>229,900</td>
</tr>
<tr>
<td>(8.1%)</td>
<td>(13.0%)</td>
<td>(13.0%)</td>
<td>(7.2%)</td>
</tr>
<tr>
<td>Respiratory failure</td>
<td>245,100</td>
<td>132,600</td>
<td>112,500</td>
</tr>
<tr>
<td>(6.4%)</td>
<td>(21.4%)</td>
<td>(21.4%)</td>
<td>(3.5%)</td>
</tr>
<tr>
<td>Septicemia</td>
<td>145,300</td>
<td>39,200</td>
<td>106,100</td>
</tr>
<tr>
<td>(3.8%)</td>
<td>(6.3%)</td>
<td>(6.3%)</td>
<td>(3.3%)</td>
</tr>
<tr>
<td>Coronary atherosclerosis</td>
<td>128,100</td>
<td>7,300</td>
<td>120,800</td>
</tr>
<tr>
<td>(3.3%)</td>
<td>(1.2%)</td>
<td>(1.2%)</td>
<td>(3.8%)</td>
</tr>
<tr>
<td>Cardiac dysrhythmias</td>
<td>115,100</td>
<td>11,600</td>
<td>103,500</td>
</tr>
<tr>
<td>(3.0%)</td>
<td>(1.9%)</td>
<td>(1.9%)</td>
<td>(3.2%)</td>
</tr>
<tr>
<td>Acute myocardial infarction</td>
<td>107,000</td>
<td>18,600</td>
<td>88,400</td>
</tr>
<tr>
<td>(2.8%)</td>
<td>(3.0%)</td>
<td>(3.0%)</td>
<td>(2.8%)</td>
</tr>
<tr>
<td>Nonspecific chest pain</td>
<td>85,400</td>
<td>4,300</td>
<td>81,100</td>
</tr>
<tr>
<td>(2.2%)</td>
<td>(0.7%)</td>
<td>(0.7%)</td>
<td>(2.5%)</td>
</tr>
<tr>
<td>Cancer of bronchus; lung</td>
<td>72,700</td>
<td>11,400</td>
<td>61,300</td>
</tr>
<tr>
<td>(1.9%)</td>
<td>(1.8%)</td>
<td>(1.8%)</td>
<td>(1.9%)</td>
</tr>
<tr>
<td>Complication of device; implant or graft</td>
<td>70,500</td>
<td>3,400</td>
<td>67,100</td>
</tr>
<tr>
<td>(1.8%)</td>
<td>(0.5%)</td>
<td>(0.5%)</td>
<td>(2.1%)</td>
</tr>
<tr>
<td>Aspiration pneumonia; food/emesis</td>
<td>68,600</td>
<td>16,900</td>
<td>51,700</td>
</tr>
<tr>
<td>(1.8%)</td>
<td>(2.7%)</td>
<td>(2.7%)</td>
<td>(1.8%)</td>
</tr>
<tr>
<td>Acute renal failure</td>
<td>61,900</td>
<td>10,100</td>
<td>51,800</td>
</tr>
<tr>
<td>(1.6%)</td>
<td>(1.6%)</td>
<td>(1.6%)</td>
<td>(1.8%)</td>
</tr>
</tbody>
</table>
More numbers: COPD #3 cause of readmissions in Medicare beneficiaries

<table>
<thead>
<tr>
<th>Condition</th>
<th>Type of hospital admission</th>
<th>Number of admissions with readmissions</th>
<th>Readmission rate</th>
<th>Average Medicare payment for readmission</th>
<th>Total spending on readmissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart failure</td>
<td>Medical</td>
<td>90,273</td>
<td>12.5%</td>
<td>$6,531</td>
<td>$590,000,000</td>
</tr>
<tr>
<td>COPD</td>
<td>Medical</td>
<td>52,327</td>
<td>10.7%</td>
<td>6,587</td>
<td>345,000,000</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>Medical</td>
<td>74,419</td>
<td>9.5</td>
<td>7,165</td>
<td>533,000,000</td>
</tr>
<tr>
<td>AMI</td>
<td>Medical</td>
<td>20,866</td>
<td>13.4</td>
<td>6,535</td>
<td>136,000,000</td>
</tr>
<tr>
<td>CABG</td>
<td>Surgical</td>
<td>18,554</td>
<td>13.5</td>
<td>8,136</td>
<td>151,000,000</td>
</tr>
<tr>
<td>PTCA</td>
<td>Surgical</td>
<td>44,293</td>
<td>10.0</td>
<td>8,109</td>
<td>359,000,000</td>
</tr>
<tr>
<td>Other vascular</td>
<td>Surgical</td>
<td>18,029</td>
<td>11.7</td>
<td>10,091</td>
<td>182,000,000</td>
</tr>
<tr>
<td><strong>Total for seven conditions</strong></td>
<td></td>
<td><strong>318,760</strong></td>
<td></td>
<td></td>
<td><strong>$2,296,000,000</strong></td>
</tr>
<tr>
<td><strong>Total DRGs</strong></td>
<td></td>
<td><strong>1,134,483</strong></td>
<td></td>
<td></td>
<td><strong>$7,980,000,000</strong></td>
</tr>
<tr>
<td><strong>Percent of total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>28.8%</strong></td>
</tr>
</tbody>
</table>

Note: COPD (chronic obstructive pulmonary disease), AMI (acute myocardial infarction), CABG (coronary artery bypass graft), PTCA (percutaneous transluminal coronary angioplasty), DRG (diagnosis related group). Analysis is for readmissions within 15 days of discharge from the initial inpatient stay. Readmissions are identified using 3M’s software that defines potentially preventable readmissions.

Source: 3M analysis of 2005 Medicare discharge claims data.

MedPAC (Medicare Payment Advisory Commission), Report to Congress, 2007
Summary

1. 800,000 hospitalizations, $7,500 per hospitalization
2. Patients hospitalized for COPD also have HTN, DM, CAD, smoking history, HF
3. Patients with PNA, HF, sepsis, AMI often also have COPD
4. Among the most costly cause of readmissions for Medicare
Outline

• The numbers

• Tale of 3 studies

• Lessons learned

• (some) Unanswered questions and next steps
Glasgow supported self-management trial (GSuST) for patients with moderate to severe COPD: randomised controlled trial

C E Bucknall consultant respiratory physician¹, G Miller research fellow¹, S M Lloyd biostatistician², J Cleland professor of medical education³, S McCluskey senior research nurse¹, M Cotton consultant respiratory physician¹, R D Stevenson consultant respiratory physician¹, P Cotton professor of learning and teaching⁴, A McConnachie deputy director²

¹Department of Respiratory Medicine, Glasgow Royal Infirmary, Glasgow G4 0SF, UK; ²Robertson Centre for Biostatistics, University of Glasgow, Glasgow; ³Division of Medical and Dental Education, School of Medicine, University of Aberdeen, Aberdeen, UK; ⁴Undergraduate Medical School, University of Glasgow
Setting and patients

- 6 Acute Glasgow hospitals and Lanarkshire hospitals
- Patients recently discharged from hospital following AE-COPD
  - FEV<70%, FEV1/FVC<70%
  - Excluded: hx of asthma, or left HF, active cancer, confusion/poor memory

Bucknall CE, BMJ 2012
Intervention

• Both groups
  – “Long term treatment optimized”
  – Inhaler technique teaching
  – Offered smoking cessation advice and pulmonary rehabilitation

• Control group
  – Managed by their physician

• Intervention group – “supported self-management”
  – 4 home visits over 2 mos, then q6 weeks, plus PRN
  – Diary cards to record Sx, then initiate tx with Abx X 7 days and prednisone X 5 days based on algorithm

Bucknall CE, BMJ 2012
Results

| Enrolled / intervention began median 29 days after DC |
| Enrolled / intervention group learned to self-manage using diary cards |
| Only 42% in intervention group learned to self-manage using diary cards |

- N=464, 232/group
- Baseline - balanced
  - Mean 69 YO
  - 37% men
  - FEV1 40% pred
  - 41% lived alone
  - 39% current smoker
  - 59% hosp for COPD past 12 mos
  - 7% LTOT

Bucknall CE, BMJ 2012
Hospitalized or death from COPD, %

Intervention v control: 48% vs. 47%,
Relative hazard 1.05 (0.8 to 1.38)

Bucknall CE, BMJ 2012
Lesson #1: Interventions to prevent re-hospitalizations may have no effect

- Intervention too late
  - 29 days after DC
- Intervention too weak
  - 42% able to self-manage
- Intervention incomplete
  - No home exercise program
- Measurement error
  - COPD-specific vs. all-cause
  - Power - Relative hazard 1.05 (0.8 to 1.38)
Integrated care prevents hospitalisations for exacerbations in COPD patients

A. Casas*, T. Troosters+, J. Garcia-Aymerich#, J. Roca*, C. Hernández*, A. Alonso*, F. del Pozo†, P. de Toledo†, J.M. Antó#, R. Rodríguez-Roisín*, M. Decramer+ and members of the CHRONIC Project

ABSTRACT: Hospital admissions due to chronic obstructive pulmonary disease (COPD) exacerbations have a major impact on the disease evolution and costs. The current authors postulated that a simple and well-standardised, low-intensity integrated care intervention can be effective to prevent such hospitalisations.

Therefore, 155 exacerbated COPD patients (17% females) were recruited after hospital discharge from centres in Barcelona (Spain) and Leuven (Belgium). They were randomly assigned to either integrated care (IC; n=65; age mean ± SD 70 ± 9 yrs; forced expiratory volume in one second (FEV1) 1.1 ± 0.5 L, 43% predicted) or usual care (UC; n=90; age 72 ± 9 yrs; FEV1
Setting and patients

- Two tertiary hospitals in Barcelona/Spain and Leuven/Belgium

- Patients
  - Hospitalized for AE-COPD
  - Excluded
    - Not living in area
    - Severe comorbid illness
    - Logistical limitations (e.g., no phone)
    - Admitted to nursing home
Intervention

• Usual care
  – Managed by their physician

• Integrated Care
  – 2 hr education by RN before DC
    • COPD, use of meds/non meds, tx for exacerbations
    • Customized treatment plan
  – Barcelona – Home visit primary care team (MD, nurse, social worker) within 72 h of DC
  – Leuven – Home visits by GPs. Study physician contacted GPs to provide additional recommendations.
  – Phone calls q1 week X 4, then at 3 and 9 months to reinforce self-management
  – RN case manager at call center, web access to medical records

Casas A, ERJ 2006
Results

• N=155, 65 intervention, 90 usual care
• Baseline
  – Mean 70 YO
  – 83% men
  – FEV1 42% pred
  – 26% current smoker
  – 17% LTOT
• Intervention began before DC

HR for readmission IC v UC: 0.55 (95% CI 0.34-0.87)

No differences in deaths, IC v UC: 19 v 16%

Casas A, ERJ 2006
Lesson #2: Interventions can prevent re-hospitalizations

- Why did the intervention succeed?
  - Timing of intervention (prior to DC)?
  - Enhanced self-management (but not reported)?
  - Expertise of providers at home visits?

- Measurement error?
  - Lack of masking
  - Type I error?
BREATH Trial  Study #3

A Comprehensive Care Management Program to Prevent Chronic Obstructive Pulmonary Disease Hospitalizations
A Randomized, Controlled Trial

Vincent S. Fan, MD, MPH; J. Michael Gaziano, MD, MPH; Robert Lew, PhD; Jean Bourbeau, MD, MSc; Sandra G. Adams, MD, MS; Sarah Leatherman, MS; Soe Soe Thwin, PhD, MS; Grant D. Huang, PhD, MPH; Richard Robbins, MD; Peruvemba S. Srlam, MD; Amir Sharafkhaneh, MD; M. Jeffery Mador, MD; George Sarosi, MD; Ralph J. Panos, MD; Padmeshri Rastogi, MD; Todd H. Wagner, PhD; Steven A. Mazzuca, PhD; Colleen Shannon, MPH; Cindy Colling, MPH, MS; Matthew H. Liang, MD, MPH; James K. Stoller, MD, MS; Louis Fiore, MD, MPH; and Dennis E. Niewoehner, MD

Ann Intern Med 2012;156:673-683

Courtesy of D. Niewoehner, MD
BREATH Trial: Study Design

- RCT, VA Cooperative Studies Program, of case-manager facilitated self-management vs. usual care
  - Target **960 patients at 20 sites**
  - Study stopped <50% enrollment due to excess adverse events in 1 group
- Major eligibility criterion = COPD-related hospitalization in prior year
- Intervention
  - “Living Well with COPD” (4 individual and 1 group sessions, each 1-1.5 hours)
  - Written action plan with refillable antibiotic and prednisone prescriptions
  - Case manager made calls q1 month X 3 mos, then q3 months; plus PRN by patient
- Primary outcome – 1st COPD hospitalization over 1-3 years

Courtesy of D. Niewoehner, MD

Ann Intern Med 2012;156:673-7
BREATHTrial: Study sites

N = 426 of 960 enrolled across 20 sites

Courtesy of D. Niewoehner, MD
Ann Intern Med 2012;156:673-683
BREATH Trial: Results

Hospitalization for COPD
HR = 1.13 [95% CI, 0.70 to 1.80], P = 0.62

All cause mortality
HR = 3.00 [95% CI, 1.46 to 6.17], P = 0.003

Courtesy of D. Niewoehner, MD
Ann Intern Med 2012;156:673-683
BREATH Trial: Results

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Usual care deaths</th>
<th>Intervention deaths</th>
<th>Hazard ratio (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All cause</td>
<td>10</td>
<td>28</td>
<td>3.00 (1.46-6.17)</td>
<td>0.003</td>
</tr>
<tr>
<td>COPD</td>
<td>3</td>
<td>10</td>
<td>3.60 (0.99-13.08)</td>
<td>0.053</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>2</td>
<td>3</td>
<td>1.62 (0.27-9.72)</td>
<td>0.60</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>7</td>
<td>3.78 (0.78-18.17)</td>
<td>0.096</td>
</tr>
<tr>
<td>Unknown</td>
<td>3</td>
<td>8</td>
<td>2.81 (0.74-10.56)</td>
<td>0.128</td>
</tr>
</tbody>
</table>

Courtesy of D. Niewoehner, MD

Ann Intern Med 2012;156:673-683
BREATH Trial
Was the Education Program Effective?

COPD Knowledge

Self-efficacy

P = 0.71
Baseline
1 year

P = 0.044
Baseline
1 year

Usual care Intervention

Usual care Intervention

Courtesy of D. Niewoehner, MD
Ann Intern Med 2012;156:673-683
Lesson #3: Interventions to prevent re-hospitalizations may be harmful

Possible causes:

1. Chance

2. Imbalance in baseline characteristics (identified and unidentified)
   - Fewer married (44% vs. 52%), more with HF (20 vs. 15%) in intervention group

3. Intervention itself (e.g., delay in seeking medical care)

Courtesy of D. Niewoehner, MD

Ann Intern Med 2012;156:673-683
Outline

• The numbers

• Tale of 3 studies

• Lessons learned

• (some) Unanswered questions and next steps
Lessons learned

1. Some educational interventions may not work

2. Some educational interventions may work
   • Why?

3. Some educational interventions may be harmful
   • Just do it may be incorrect
   • “Quality improvement” that are not evidence based may be injurious
Outline

• The numbers

• Tale of 3 studies

• Lessons learned

• (some) Unanswered questions and next steps
(some) Unanswered questions and next steps

- Who
  - Navigator
- What
  - Comorbidity
- When
  - Start, frequency, duration
- Where
- Cost and cost-effectiveness

- In the meantime
  - Keep it simple
  - Evidence based treatment recommendations in hospital and post DC
  - Provide clear instructions to patient / caregiver before DC
    - Reconcile and teach use of medicines
    - Arrange follow-up
  - Communicate DC instructions with outpatient provider
… there are things we know we know…. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns—the ones we don’t know we don’t know.”

Donald Rumsfeld
On preventing re-hospitalizations for COPD