Geographic Isolation Shows Higher Risk for Chronic Obstructive Pulmonary-Disease Related Mortality: A Cohort Study

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Introduction
Evidence suggests that among persons with chronic illnesses such as cardiovascular disease, patients living in rural areas suffer worse health outcomes due to factors including longer wait times, lower rates of percutaneous intervention (when admitted for acute myocardial infarction), and being seen at smaller volume hospitals.¹⁻⁴ Such patients may also experience reduced access to medical advances due to their relatively slow distribution to physicians in rural settings.⁵

Admissions for chronic obstructive pulmonary disease (COPD) are the fourth most common reason for acute medical hospitalization nationwide,⁶⁻⁷ while research indicates that increasing rates of COPD mortality will constitute the third leading cause of death by 2020.⁸ Studies of non-US countries with large rural populations have indicated higher COPD rates among rural populations, though to date few studies have sought to determine whether rural COPD patients in the US reflect these same disparities.

Key Findings

- Veterans with COPD living in isolated rural areas of the US are at a 42% greater risk for COPD exacerbation-related mortality than those living in urban areas.
- Mortality was not found to be increased for those living in non-isolated rural areas.
- Hospital characteristics (e.g., hospital COPD patient volume) had a very small effect on urban-rural disparity in COPD mortality.

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In light of increasing COPD mortality in the US and evidence that rural patients may experience poorer clinical outcomes in relation to urban patients, this study sought to 1) determine whether COPD-related mortality is higher among Veterans living in rural areas, and 2) assess whether urban-rural disparities in COPD mortality are affected by hospital characteristics.

Methods

Data sources
The Veterans Affairs (VA) Patient Treatment File was used to identify all consecutive COPD admissions in the VA system from October 2006 to September 2008.

Study Sample
The sample included patients identified with principal diagnoses of COPD exacerbation, acute or chronic bronchitis, chronic obstruction of the airway not diagnosed under another category, or acute and chronic respiratory failure. The final sample was n=26,591 admissions.

Data Elements and Outcome
The primary outcome measured was 30-day mortality from the day of admission, with the primary independent variable being rural residence, the latter being defined using a ZIP-code approximation of the Rural-Urban Commuter Area (RURC) codes. RURC codes create 30 discrete categories along the urban-rural spectrum which in this study were collapsed into 3 designations: urban (n=18,809), rural (n=1,919), and isolated rural (n=919).

Hospital-Level Variables
Two hospital variables having possible effects on the relation between a patient’s rural status and COPD mortality were included: hospital volume and hospital rurality. The former was determined by the number of COPD-related admissions to each VA hospital over the three-year study period, with hospitals being divided into three tertiles: low admission (35-235), medium admission (236-399), and high admission (>400), each containing 43 hospitals. Rurality was calculated as mean COPD hospital admissions in RUCA-designated rural areas, categorized as major urban (1–15%) rural (16–38%), and major rural (<39%).

Patient-Level Variables
Race, gender, age, and admission source were gathered as variables. Five distance categories were also included, determined by travel time to the nearest VA hospital, as were six laboratory values: serum sodium, albumin, blood urea nitrogen, hematocrit, white blood cell count, an arterial PaCO₂.
Findings

Unadjusted Mortality
Unadjusted results show higher mortality for isolated rural and rural Veterans relative to urban Veterans, indicating that isolated rural Veterans are 42% more likely to die within 30 days of admission relative to urban veterans. Overall unadjusted mortality for Veterans from isolated rural areas was 5.0%, for those from rural areas was 4.0%, while for those from urban areas was 3.8%. Hospital characteristics had no effect on this result.

Adjusted Mortality
Adjusting only for illness severity, isolated rural Veterans were more likely to die after admission relative to urban veterans. Most prominently, mortality was increased in rural hospitals with lower volumes of COPD but remained similar among major rural hospitals with higher volumes. Surprisingly, longer travel distances were associated with lower 30-day mortality.

LIMITATIONS
This study consisted of a mostly male subject population with numerous co-morbid conditions, thus limiting its generalizability. The study’s results were also based solely on administrative data that did not include certain physiologic variables (e.g., pulmonary function tests in relation to patient mortality).

Impact

- Workforce and policy leaders need to be aware that Veterans with COPD living in isolated rural areas suffer a higher mortality rate than do those living in other areas. This awareness is a first step toward establishing a more equitable distribution of resources across the urban-rural spectrum.

- More importantly, further research using spatial techniques is needed to substantiate these findings on a granular level and to determine specifically which resources are lacking for COPD patients in rural settings.

References