Costs Associated with Neutropenia in Elderly Patients Treated First-Line for Advanced Non-Small Cell Lung Cancer

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ISPOR 13th Annual International Meeting
Toronto, Ontario, Canada, May 3 - 7, 2008

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- Research funding provided by Eli Lilly and Company
Background and Rationale

- Lung cancer is the leading cause of cancer mortality in the United States\(^1\)
- Non-small cell lung cancer (NSCLC) is the most common form, accounting for 80-85% of all cases
- More than half (55%) of NSCLC patients are diagnosed at an advanced stage (Stage IIIB or IV)\(^2\)
- Chemotherapy is a standard treatment approach and is often associated with complications


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Background and Rationale (cont)

- Neutropenia and febrile neutropenia (N/FN) are major complications associated with chemotherapy
  - Neutropenia (N) = low neutrophil count, increased risk of infection
  - Febrile neutropenia (FN) = low neutrophil count + fever, indicating infection is spreading
- Monitoring and treatment of N/FN place an economic burden on the health care system
- Limited data available describing N/FN related costs and medical resource use in NSCLC patients treated with first-line chemotherapy
Objectives

- Evaluate costs and medical resource use related to neutropenia and febrile neutropenia (N/FN) during first-line chemotherapy in Stage IIIB/IV NSCLC patients
- Compare costs related to N/FN, other costs not related to N/FN, and total health care costs during first-line chemotherapy

Study Overview

- Retrospective database analysis
- Data source
  - Surveillance, Epidemiology and End Results (SEER) – Medicare linked database
  - Medicare claims available from 1998-2005
- Population
  - Stage IIIB/IV NSCLC patients (incident cases from 1998-2002)
  - Medicare-eligible patients aged 65 years or older
- Study groups
  - Neutropenia
  - Febrile neutropenia
  - No neutropenia/febrile neutropenia
Study Overview (cont.)

- Study follow-up
  - Costs and resource use assessed during first-line chemotherapy
  - First-line treatment defined as initial regimen administered
    - Doublet (2 agents within 8 days)
    - Singlet
  - End of first-line chemotherapy
    - Switch to second-line (new agent not given during first-line is administered)
    **OR**
    - Earlier of patient’s death or 30 days following the last first-line administration

Patient Inclusion Criteria

- Diagnosis of advanced NSCLC (Stage IIIB/IV)
- Age 65 years or older
- No other tumor diagnosis prior to NSCLC
- Receipt of first-line chemotherapy
- Complete enrollment in Medicare Parts A and B
- Not enrolled in Medicare HMO
- Absence of claim indicating patient had neutropenia within 6 months prior to 1st –line chemotherapy
Identification of Neutropenia/Febrile Neutropenia

- N/FN identified during period of 1st-line chemotherapy in Medicare claims
  - Primary or secondary ICD-9-CM diagnosis code for neutropenia (288.x)
- Patients subset into mutually exclusive N/FN groups
- Febrile neutropenia (FN)
  - Presence of outpatient/physician services record indicating treatment for infection following initial N diagnosis
  - OR
  - Presence of inpatient record indicating neutropenia
- Neutropenia (N)
  - The subset of patients not classified as Febrile Neutropenia

Cost Measures

- Neutropenia/Febrile Neutropenia - related costs
  - Identified using primary or secondary ICD-9-CM diagnosis codes indicating N/FN (288.x) on claim for the following care:
    - Inpatient
    - Outpatient
    - Physician services
  - G-CSF therapy assumed to be related to N/FN
  - Follow-up for N/FN costs starting at 1st claim for N/FN
- Other costs
  - Inpatient, outpatient, & physician services claims without 288.x
  - Hospice and SNF claims
  - Follow-up for other costs began at start of 1st-line chemo
Study Flow-Diagram

8,854 aged 65 years or greater
NSCLC diagnosis from 1998-2002
receiving first-line chemotherapy
(after implementation of remaining inclusion criteria)

5,138 diagnosed with NSCLC at stage IIIB/IV

Neutropenia
740 (14.4%)

Febrile Neutropenia
488 (9.5%)

No Neutropenia/Febrile Neutropenia
3,910 (76.1%)

Patient Characteristics

<table>
<thead>
<tr>
<th>Study Groups</th>
<th>Neutropenia (N) First-line</th>
<th>Febrile Neutropenia (FN) First-line</th>
<th>No N/FN First-line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size</td>
<td>740</td>
<td>488</td>
<td>3,910</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>73.8</td>
<td>73.9</td>
<td>73.4</td>
</tr>
<tr>
<td>Female (%)</td>
<td>42.6%</td>
<td>39.3%</td>
<td>41.6%</td>
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<tr>
<td>Stage IIIB at diagnosis (%)</td>
<td>35.7%</td>
<td>37.7%</td>
<td>35.1%</td>
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<tr>
<td>Stage IV at diagnosis (%)</td>
<td>64.3%</td>
<td>62.3%</td>
<td>64.9%</td>
</tr>
<tr>
<td>Median survival (months) from first-line start</td>
<td>8.1</td>
<td>6.1</td>
<td>6.3</td>
</tr>
<tr>
<td>Charlson comorbidity (mean)</td>
<td>3.7</td>
<td>3.7</td>
<td>3.9</td>
</tr>
</tbody>
</table>
Medical Service Utilization Related to Neutropenia/Febrile Neutropenia

% Hospitalized

Mean Hospital LOS (days)

% Receiving G-CSF Therapy

Mean Physician Visits

Mean Costs Related to Neutropenia/Febrile Neutropenia
Mean Costs Per Month of Follow-up

<table>
<thead>
<tr>
<th></th>
<th>N/FN Related Costs Per Month</th>
<th>Other Costs Per Month</th>
<th>Total Costs Per Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>$518</td>
<td>$5,779</td>
<td>$6,296</td>
</tr>
<tr>
<td>FN</td>
<td>$2,640</td>
<td>$5,904</td>
<td>$8,544</td>
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<tr>
<td>No N/FN</td>
<td>$25</td>
<td>$6,226</td>
<td>$6,252</td>
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</tbody>
</table>

Limitations

- Claims used for billing purposes, potential for diagnostic and procedural coding inaccuracies
  - Neutropenia inferred from administrative codes
  - Assumed that all inpatient care with 288.x code related to FN
- Only services covered by Medicare were included in analyses (Oral Rx meds not included in analyses)
- Analysis limited to Medicare patients aged 65 years and older
Summary

- Among 1st-line patients:
  - 23.9% developed N/FN
    - 14.4% neutropenia
    - 9.5% febrile neutropenia
  - 76.1% did not develop N/FN
- N/FN related costs were $2,000 higher per month for FN compared to N or no N/FN
- N/FN related costs accounted for 31% of monthly costs for FN patients compared to only 8% for N