

# The Economic Impact of Aspergillosis: Analysis of Hospital Expenditures and Payer Reimbursements

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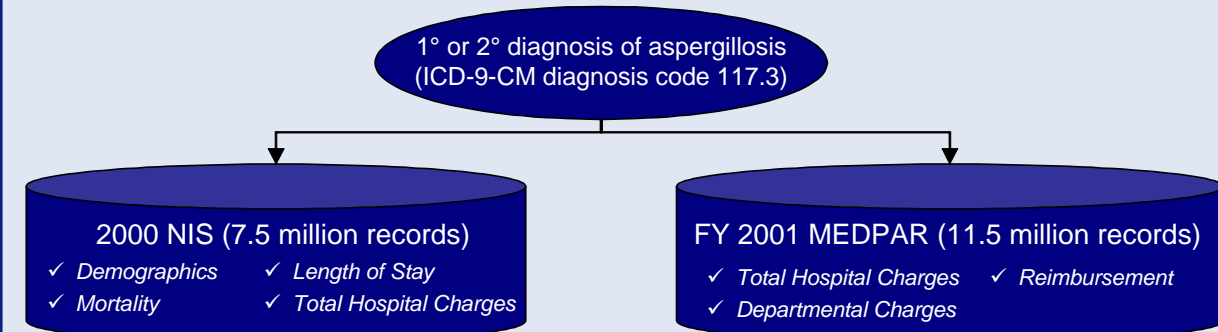
## Background and Purpose

- Invasive aspergillosis is a devastating disease with high morbidity and mortality among the immunocompromised.
- Total costs of aspergillosis were estimated at \$674.1 million in the US in 1998.<sup>a</sup>
- Further characterization and quantification of costs from the inpatient hospital provider perspective is necessary to focus limited resources in meeting the challenges of the disease.
- The purpose of this study was to measure the impact of aspergillosis on hospital expenditures and reimbursement within clinically relevant patient subgroups.

## Methods

- We extracted hospital discharge data for patients with a primary or secondary diagnosis of aspergillosis from the 2000 Nationwide Inpatient Sample<sup>b</sup> (NIS) and 2001 Medicare Provider Analysis and Review<sup>c</sup> (MEDPAR) file (Figure 1).

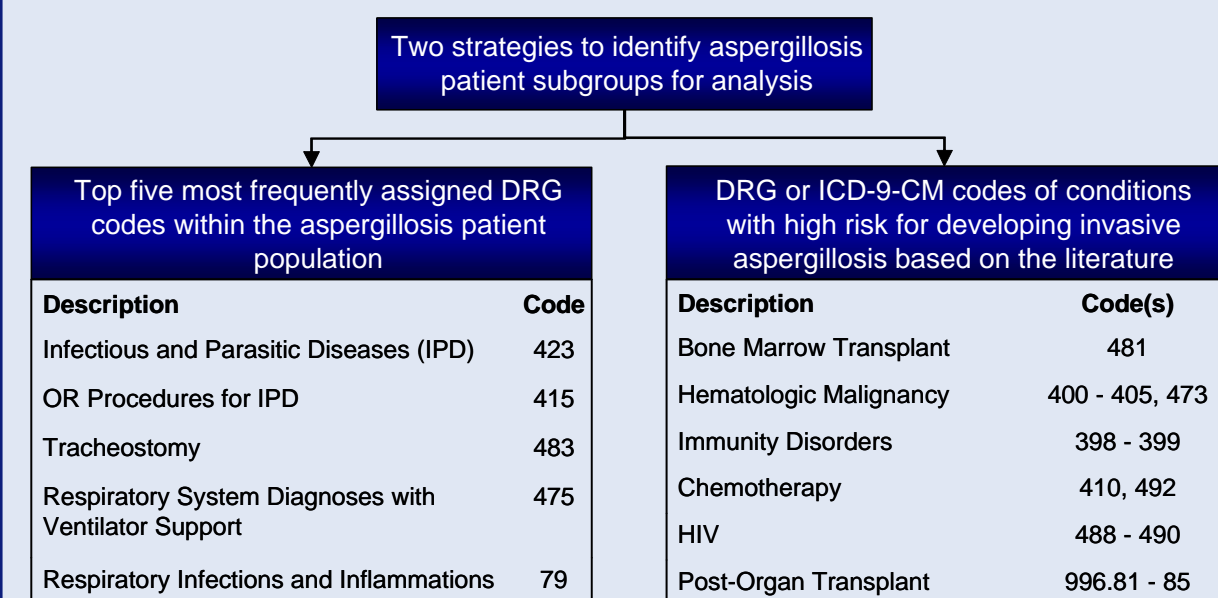
**Figure 1**  
Data Analysis Methodology



- We performed sub-analyses on aspergillosis patients on the basis of DRG or ICD-9-CM diagnosis codes (Figure 2) using two separate grouping strategies: (1) by clinically relevant conditions that are known risk factors for invasive aspergillosis, and (2) by the most frequent DRGs that were assigned within the aspergillosis population.
- Non-aspergillosis patients within the same DRG or ICD-9-CM diagnosis category were used for comparison. For each DRG category analyzed, we calculated the percentage of charges reimbursed (PCR) by Medicare, defined as:

$$PCR = \frac{\text{Reimbursement}}{\text{Total Hospital Charges}} \times 100$$

**Figure 2**  
Aspergillosis Patient Subgroup Identification Strategy



Note: Patients were grouped based on DRG assignment, with the exception of post-organ transplant categories, which could not be captured easily by DRG; therefore ICD-9-CM codes were used.

## Descriptives

- Out of 7.5 million records in the NIS, we identified 1,944 cases of aspergillosis spread over 171 DRGs, which projects a US incidence rate of 33.8 per million per year.
- Patients hospitalized for aspergillosis had a mean length of stay (LOS) of 17.5 days and a mean total hospital charge (THC) of \$82,425 (Table 1).

**Table 1**  
Description of Aspergillosis Cases (N=1,944)

Mean Age	54.5 years (SD ± 19.9 years)
Age Distribution	
< 18 years	7.1%
18 – 44 years	20.9%
45 – 64 years	35.7%
65+ years	36.4%
Gender	
Male	56.4%
Female	43.6%
Race	
White	71.5%
Black	14.8%
Mean Length of Stay	17.5 days (SD ± 20.0 days)
Mean Total Hospital Charges	\$82,425 (SD ± \$129,823)

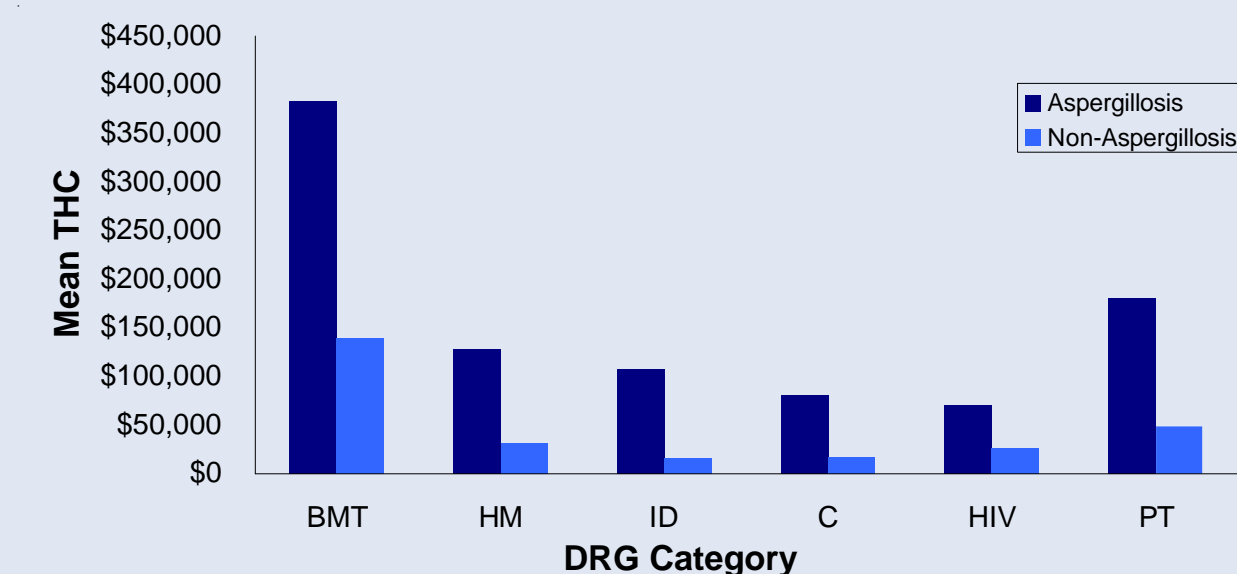
Note: Data from 2000 NIS. Percentages may not add up to 100 percent due to rounding. Values are weighted to project national estimates.

## Hospital Expenditures

### Specific High-Risk DRG Categories

- Compared to non-aspergillosis patients, cases involving aspergillosis had 1.7 to 6.9 times higher mean THC (Figure 3), 1.3 to 5.5 times higher mean LOS, and 2.7 to 8.5 times higher mortality.
- Among all patients, mean THC for those with aspergillosis ranked above the 90th percentile in all high-risk DRG categories examined.
- Aspergillosis patients with BMT experienced highest incremental increase in expenditures over those without infection (+\$243,248).

**Figure 3**  
Mean Total Hospital Charges (THC) for High-Risk Disease Categories



Note: BMT = Bone Marrow Transplant; HM = Hematologic Malignancy; HIV = Human Immunodeficiency Virus, ID = Immunity Disorders; C = Chemotherapy, PT = Post-Transplant  
p < 0.001 for all patient categories

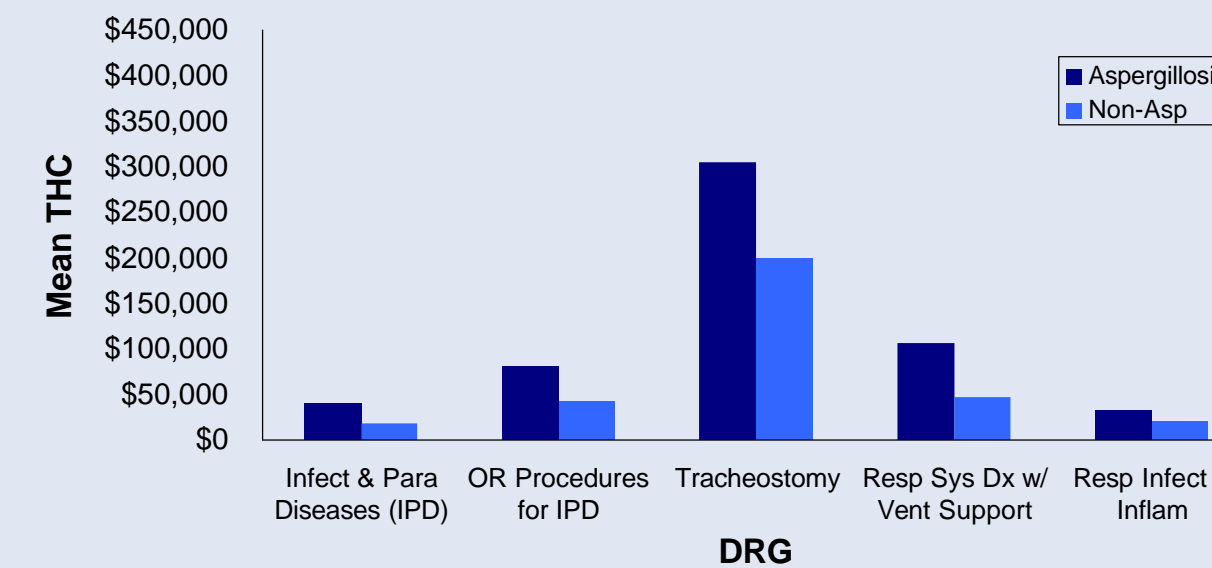
## Results

### Hospital Expenditures

#### Most Frequently Assigned DRGs within the Aspergillosis Patient Population

- Compared to non-aspergillosis patients, cases involving aspergillosis had 1.5 to 2.1 times higher mean THC (Figure 4), 1.2 to 1.6 times higher mean LOS, and significantly higher mortality in all DRGs except DRG 79 (respiratory infections and inflammations).
- Among all patients, mean THC for those with aspergillosis ranked above the 80th or 90th percentile in the five DRG categories examined.
- Aspergillosis patients with tracheostomy (DRG 483) experienced highest incremental increase in expenditures over those without infection (+\$105,702).

**Figure 4**  
Mean THC for Top Five Most Frequently Assigned DRGs



Note: Infectious and Parasitic Diseases (IPD) = DRG 423, OR Procedures for IPD = 415, Tracheostomy = 483, Resp. System Diagnoses with Vent. Support = 475, Respiratory Infections and Inflammations = 79; p < 0.001 for all patient categories

### Reimbursement Patterns

- At the individual patient level (Table 2), hospital charges for cases involving aspergillosis were reimbursed at a significantly lower rate than cases not involving aspergillosis for all DRGs examined (p<0.05), except for BMT and tracheostomy (p=NS).

**Table 2**  
Mean Percentage of Charges Reimbursed (PCR) per Case, Aspergillosis vs. Non-Aspergillosis Hospitalizations

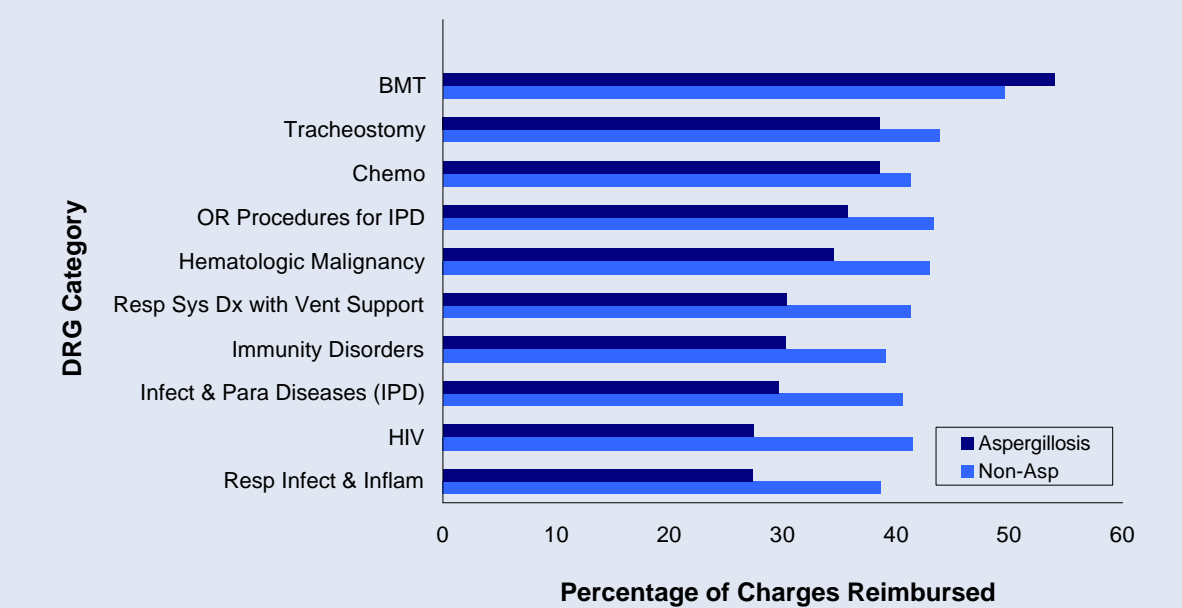
DRG Category	N		Mean PCR per Case (%)		Difference (%)	p-value
	Asp	Non-Asp	Asp	Non-Asp		
<b>High-Risk DRG Categories</b>						
Hematologic Malignancy	158	60,493	40.7	91.7	51.0	< 0.001
HIV	84	19,943	51.9	86.2	34.3	0.001
Chemotherapy	58	35,385	44.5	67.5	23.0	0.036
Reticuloendothelial & Immunity Disorders	19	19,565	29.9	67.8	37.9	0.009
Bone Marrow Transplant	8	826	92.1	77.3	-14.8	0.75
<b>Top 5 Most Frequently Assigned DRGs</b>						
Infectious & Parasitic Diseases	786	6,985	53.7	90	36.3	< 0.001
OR Procedures for Infectious & Parasitic Diseases	354	39,924	54.8	85.9	31.1	< 0.001
Respiratory System Diagnoses with Vent. Support	207	107,590	39.9	79.1	39.2	< 0.001
Tracheostomy	153	43,186	48.6	66.4	17.8	0.054
Respiratory Infections and Inflammations	134	170,693	41.5	69.1	27.6	< 0.001

Note: Data from MEDPAR FY 2001.

### Reimbursement Patterns (2)

- The financial impact of aspergillosis on inpatient hospitals is seen at the DRG level (Figure 5). Overall percentage of charges reimbursed for aspergillosis cases was 35%, compared to 42% for non-aspergillosis cases.
- Incremental hospital expenditures associated with aspergillosis were reimbursed at a mean rate of 26.7%.

**Figure 5**  
Overall Percentage of Charges Reimbursed (PCR) per DRG, Aspergillosis vs. Non-Aspergillosis Hospitalizations



Note: Data from MEDPAR FY 2001.

## Conclusions

- Aspergillosis is associated with increased mortality, length of stay, and hospital charges, affecting a wide range of patient groups and making a strong economic impact across many DRGs.
- The high costs of aspergillosis are accompanied by low rates of reimbursement. At the DRG level, hospital charges for patients with aspergillosis are reimbursed at an average rate of 35%, compared to 42% for non-aspergillosis cases.
- The patients most frequently diagnosed with aspergillosis do not necessarily belong to the high risk groups traditionally associated with the disease. Further research should focus on characterizing these patients and identifying specific drivers of increased hospital costs.

## References

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