

ORIGINAL ARTICLE

The impact of esophageal candidiasis on hospital charges and costs across patient subgroups

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ABSTRACT

Objective: Assess the impact of esophageal candidiasis on US hospital inpatient charges, length of stay (LOS), and costs across clinically relevant subgroups.

Methods: Total hospital charge (THC) and LOS data extracted from the 2005 National Inpatient Sample (NIS) were compared for patients with and without esophageal candidiasis within the top 20 most commonly assigned Diagnosis Related Groups (DRGs) for the disease. Total hospital costs were estimated using hospital charges in the 2005 Medicare Provider Analysis and Review (MEDPAR) file and hospital cost-to-charge ratios published in the Center for Medicare and Medicaid Service's (CMS) 2005 Inpatient Prospective Payment System Standardization File.

Results: Across 274 DRGs, 45 727 esophageal candidiasis patients were identified. Mean age was 50.8 years; 52.5% were female, 59.3% Caucasian. Median LOS was 7 days; median THC was \$25 649.

Of all esophageal candidiasis cases identified, 65% fell into the top 20 most commonly assigned DRGs. Within this subset, HIV-related DRGs

accounted for 22% of the esophageal candidiasis cases. The difference in mean THC and LOS for esophageal candidiasis patients in HIV-related DRGs was not significant. However, total hospital costs were higher for esophageal candidiasis patients in this subset (\$11 886 vs. \$10 534, $p < 0.01$). The remaining 78% of esophageal candidiasis cases were assigned to 19 non-HIV-related DRGs. Mean LOS, THC, and total hospital costs were significantly higher for esophageal candidiasis patients within these 19 non-HIV-related DRGs, (8.4 vs. 6.1; \$35 704 vs. \$23 874, and \$10 917 vs. \$7474, $p < 0.01$ in all cases).

Conclusions: Esophageal candidiasis affects a wide range of patient groups; it increases LOS and total charges within non-HIV-related hospitalizations. Although the costs presented in this study are estimates, they do suggest a significant increase in cost among esophageal candidiasis cases. Future studies on treatment and preventive care strategies for esophageal candidiasis should not be limited to HIV patients, but instead performed across a wider range of disease settings.

Introduction

Esophageal candidiasis is a life-threatening bloodstream infection caused by an overgrowth of *Candida* organisms in the esophageal mucosal surfaces. Historically,

Candida albicans has been the most common cause of the disease. However, in recent years there has been a change in the etiology of candidemia with infections due to non-*albicans* species, such as *C. krusei* and *C. glabrata* becoming increasingly common¹.

It is often difficult to recognize symptoms for esophageal candidiasis because it occurs in concomitance with other diseases²; however, several risk factors are associated with esophageal candidiasis. HIV is the risk factor that is most commonly associated with the disease³. Other factors that have been identified include compromised immune systems caused by cancer, diabetes mellitus, and severe burns, as well as the administration of broad-spectrum antibiotic treatments, the use of certain invasive devices, abdominal surgery, and organ transplants. The recent rise in the overall number of immunocompromised patients has increased the number of patients who are at high risk for esophageal candidiasis⁴. As a result, esophageal candidiasis has become the fourth most common nosocomial infection in the US over the last two decades⁵.

There are many treatments available for esophageal candidiasis. Current therapeutic options include: fluconazole, conventional and liposomal amphotericin B, and more recently, agents such as micafungin, caspofungin and voriconazole³. However, despite the availability of effective antifungal therapy, the mortality rate for pediatric and adult esophageal candidiasis patients during the year 2000 increased 10.0 and 14.5%, respectively⁶. Crude mortality has been estimated to be as high as 61% and attributable mortality at 49% for all episodes of nosocomial candidemia between 1997 and 2001⁷.

A handful of studies have attempted to estimate the cost associated with esophageal candidiasis. Rentz *et al.* published a study in 1998 which calculated that each case of nosocomial candidemia costs Medicare \$34 123 per patient and private insurers \$44 536 per patient; the major cost component is the increase in length of stay (LOS). The national annual costs of candidemia were then calculated using their estimated incidence in the United States of 2.43 per 100 000 populations per year. The result exceeded \$200 million per year⁸. A study published in 2005 by Morgan *et al.* demonstrated that mortality attributable to candidemia ranged between 19 and 24%. However, the mean mortality rate decreased when patients received adequate treatment. The cost of hospitalization was estimated at \$22 000 for patients who received adequate treatment. When these results were extrapolated to the US population using the studies' estimated overall incidence of 8 per 100 000 individuals, the annual total costs exceeded \$300 million⁹.

Although these figures underscore economic impact of the disease in aggregate, they fail to identify how the costs affect clinically relevant subgroups of patients with candidemia. Analyses within clinically relevant subgroups are necessary to estimate more accurately the economic impact of esophageal candidiasis in certain patients, and to develop an efficient therapeutic

response for both prevention and treatment of this disease. The aim of this study is to measure the cost of esophageal candidiasis across different patient populations, from a US hospital's perspective, using historical claims data.

Methods

Study design

In this retrospective claims database analysis, economic data were estimated and reported using two data sources: the 2005 Nationwide Inpatient Sample (NIS) and the Medicare Provider Analysis and Review (MEDPAR) file for fiscal year 2005.

Databases

The NIS was developed as part of the Healthcare Cost and Utilization Project (HCUP), and is the largest all-payer inpatient care database that is publicly available in the US¹⁰. The 2005 NIS consists of approximately 8 million discharges from 1053 hospitals in 37 states, representing a stratified sample of 20% of all US community hospitals. Each record in the NIS contains information about a patient's hospital stay, documenting demographics, specific diagnoses and procedures, patient disposition, payer type, and overall hospital charges. All analyses were performed on the NIS, with the exception of those involving total hospital costs.

The MEDPAR dataset, acquired from the Centers for Medicare and Medicaid Services (CMS), contains detailed charge information for 100% of Medicare beneficiaries using hospital inpatient services (approximately 11.5 million records). Particularly useful to this study were data elements in each record that were not captured by the NIS, including specific categories of hospital charges as well as reimbursement amounts. While the patient populations represented by the NIS and MEDPAR data were distinct, a comparison of total hospital charges within various DRGs generally showed similar values and distributions between the two databases. Therefore, the MEDPAR file was primarily used to estimate total hospital costs. Both the NIS and MEDPAR datasets are publicly available and do not include patient identifying information.

Identification of esophageal candidiasis

For all analyses, patients were considered to have esophageal candidiasis if they had a primary or secondary discharge diagnosis of esophageal candidiasis, using the International Classification of Diseases, 9th Revision, Clinical Modifications (ICD-9-CM code 112.84). It

was necessary to include discharges with secondary diagnoses of esophageal candidiasis because the disease is often comorbid with immunocompromising conditions that are reported as a primary diagnosis.

A socio-demographic profile of esophageal candidiasis was generated by examining patient age, race, and gender. Mean and median THC and LOS were reported. National esophageal candidiasis incidence projections were calculated using NIS weighted estimates.

Identification of clinically relevant subgroups

The DRG classification system groups clinically similar hospital cases that use similar resources. The system provides a natural framework to identify clinically relevant subgroups associated with esophageal candidiasis and to assess the impact of the disease on hospital charges and costs. The top 20 most commonly assigned DRGs for esophageal candidiasis patients were identified based on the prevalence of esophageal candidiasis among DRG groups in the NIS dataset. DRGs were analyzed as HIV- and non-HIV-related DRG subgroups in order to distinguish the impact of the disease between groups traditionally considered and not considered at high risk for infection. Mean and median THC and LOS were generated based on NIS data.

Patient subgroup analyses

Hospital cases are assigned to DRGs according to the patient diagnosis and condition. For example, patients with gastrointestinal hemorrhaging are commonly assigned to DRG 175 (GI Hemorrhage). However, when a patient presents with a comorbid condition such as esophageal candidiasis, they may be assigned to a separate corresponding DRG to account for the added complexity of the case. Patients with gastrointestinal hemorrhaging and esophageal candidiasis are not assigned to DRG 175, but instead to DRG 174 (GI Hemorrhage with Complications or Comorbidities). Roughly half of the DRGs identified in this analysis represented clinical classification for hospital cases with significant complications.

In order to ensure that we analyzed the impact of esophageal candidiasis across the entire scope of clinically relevant subgroups, we also performed a sub-analysis on THC and LOS grouping both the top 20 clinically relevant DRGs with corresponding counterparts. MEDPAR data were used to estimate costs for the top 20 most commonly assigned DRGs. Hospital-specific charge-to-cost ratios published in CMS's 2005 Inpatient Prospective Payment System

Standardization File were multiplied by reported charges to estimate costs.

Student *t*-tests were performed to identify significant differences between continuous variables. The significance level for this study was set at 1%. General linear models (GLM) were performed on costs to control for demographic variables including age, race, and gender. All analyses were performed using SAS version 9.1 (SAS Institute, Cary, NC, USA).

Results

Esophageal candidiasis patients

Table 1 summarizes patient demographics and the mean (median) LOS and THC for esophageal candidiasis patients in the NIS. Of the 39.1 million projected discharges, 45 727 cases of esophageal candidiasis were identified across 274 DRGs. The mortality rate was 4.9%. The mean age of esophageal candidiasis patients was 60.8 years, with 52.5% female and 65.4% Caucasian. Mean (median) LOS and THC were 10.0 (7.0) and \$46 043 (\$25 649), respectively. Demographics for MEDPAR esophageal candidiasis patients were included as a reference.

Top 20 most commonly assigned DRGs

Of all esophageal candidiasis cases, 65% were reimbursed under the 20 most frequently assigned DRGs; 22% of these were in an HIV-related DRG, and 78% were in non-HIV-related DRGs. The most commonly assigned DRG among esophageal candidiasis patients was HIV-related: *HIV with a major related condition* (DRG 489, *n* = 6494). The other 19 most commonly assigned DRGs were all non-HIV-related (*n* = 23 048).

The five most commonly assigned non-HIV-related DRGs among esophageal candidiasis patients in order of frequency were: esophagitis, gastroenterology and miscellaneous digestive disorders w/cc (with complications or comorbidities) (DRG 182, *n* = 5735); gastrointestinal hemorrhaging w/cc (DRG 174, *n* = 2852); chronic obstructive pulmonary disease (DRG 88, *n* = 2106); nutritional and miscellaneous metabolic disorders, age >17 w/cc (DRG 296, *n* = 1384); and simple pneumonia & pleurisy age >17 w/cc (DRG 89, *n* = 1641). Table 2 contains the number of cases with and without esophageal candidiasis diagnoses for the top 20 most commonly assigned DRGs.

Table 3 contains the mean LOS and THC values for the top 20 most commonly assigned DRGs. The mean LOS and mean THC were found to be significantly higher in esophageal candidiasis patients compared to non-esophageal candidiasis patients within the top 20

Table 1. Esophageal candidiasis patient demographics and characteristics (2005 National Inpatient Sample and 2005 MEDPAR datasets)

Characteristics	2005 NIS	2005 MEDPAR
Patients with EC	45 727	23 023
Mortality rate, <i>n</i> (%)	2 259 (4.9)	1 209 (5.3)
Age (%)		
< 25	1 362 (3.0)	56 (0.2)
25-44	8 930 (19.5)	1 840 (8.0)
45-64	14 021 (30.7)	3 970 (17.2)
65-84	17 350 (37.9)	13 505 (58.7)
> 85	4 060 (8.9)	3 652 (15.9)
Race, <i>n</i> (%)		
White	22 108 (65.4)	17 883 (77.7)
Black	7 142 (21.1)	3 917 (17.0)
Hispanic	3 209 (9.5)	521 (2.3)
Other	1 368 (4.0)	702 (3.0)
Gender, <i>n</i> (%)		
Male	21 722 (47.5)	10 723 (46.6)
Female	24 004 (52.5)	12 300 (53.4)
Hospital charges (\$)		
Mean (SD)	46 043 (146 624)	44 164 (59 893)
Median	25 649	26 202
Length of hospital stay (days)		
Mean (SD)	10.0 (23.52)	10.0 (9.20)
Median	7	7

All figures reported for NIS are weighted to project national estimates

Table 2. Contribution of the top 20 DRGs to total cases of esophageal candidiasis for HIV and non-HIV-related DRGs (2005 National Inpatient Sample)

Description	DRG	Number of cases	
		EC	Non-EC
HIV-related DRG			
HIV with major related condition	489	6 494	59 836
Non-HIV-related DRG			
Esophagitis gastroenteritis and miscellaneous disorders age > 17 w/cc	182	5 734	619 099
GI hemorrhage w/cc	174	2 852	421 538
Chronic obstructive pulmonary disease	88	2 106	712 945
Simple pneumonia and pleurisy age > 17 w/cc	89	1 641	908 893
Nutritional and miscellaneous metabolic disorders age > 17 w/cc	296	1 384	390 866
Respiratory infections and inflammations age > 17 w/cc	79	1 067	245 565
Septicemia age > 17	416	1 045	459 332
Renal failure	316	900	344 688
Heart failure and shock	127	783	987 593
Red blood cell disorders age > 17	395	774	249 596
Diabetes age > 35	294	650	225 091
Rehabilitation	462	637	508 517
Digestive malignancy w/cc	172	614	72 441
Other digestive system diagnoses age > 17 w/cc	188	586	177 066
Complicated peptic ulcer	176	511	28 636
Disorders of pancreas except malignancy	204	475	242 051
Major small and large bowel procedures w/cc	148	453	276 980
Cranial and peripheral nerve damage w/cc	18	420	68 211
Respiratory system diagnosis with ventilator support	475	416	241 486
TOTAL		29 542	7 286 030

All values are weighted to project national estimates. w/cc = with complications or comorbidities

Table 3. Total hospital charges and length of stay by HIV and non-HIV-related DRGs for the top 20 DRGs (2005 National Inpatient Sample)

Characteristic	Esophageal candidiasis	Non-esophageal candidiasis	<i>p</i> -value
Total			
Weighted number of cases	29 542	7 240 432	
Length of hospital stay (days)			
Mean (SD)	8.6 (17.8)	6.1 (14.6)	<0.01
Median	6	4	
Hospital charges (\$)			
Mean (SD)	36 368 (104 904)	24 093 (76 072)	<0.01
Median	22 548	14 324	
HIV-related DRGs			
Weighted number of cases	6 494	59 836	
Length of hospital stay (days)			
Mean (SD)	9.1 (20.6)	8.9 (21.6)	Not significant
Median	6	6	
Hospital charges (\$)			
Mean (SD)	38 716 (115 655)	41 478 (131 868)	Not significant
Median	21 683	22 574	
Non-HIV-related DRGs			
Weighted number of cases	23 048	7 180 596	
Length of hospital stay (days)			
Mean (SD)	8.4 (16.9)	6.1 (14.5)	<0.01
Median	6	4	
Hospital charges (\$)			
Mean (SD)	35 704 (101 621)	23 874 (75 342)	<0.01
Median	22 867	14 277	

Missing values resulted in sample variations across certain variables; percentages were calculated after omitting missing values
Values are weighted to project national estimates

DRGs: 8.6 vs. 6.1, $p < 0.01$; and \$36 368, vs. \$24 093, $p < 0.01$, respectively. Within the HIV-related DRGs, esophageal candidiasis patients had similar LOS, and similar THC compared to non-esophageal candidiasis patients in comparable DRGs. Within the non-HIV-related DRGs, esophageal candidiasis patients had significantly longer LOS and significantly higher THC compared to non-esophageal candidiasis patients in comparable DRGs: 8.4 vs. 6.1, $p < 0.01$; and \$35 704 vs. \$23 874, $p < 0.01$, respectively.

DRGs with corresponding classifications

Table 4 contains the top 20 DRG categories with and the corresponding classification for patients without complications. Eleven sets of DRGs were identified. The mean LOS and mean THC again remained significantly higher in esophageal candidiasis patients compared to non-esophageal candidiasis patients: 8.0 vs. 5.2, $p < 0.01$; \$33 792 vs. \$21 228, $p < 0.01$, respectively (Table 5).

When we expanded our analysis to include corresponding DRG classifications, esophageal candidiasis patients within the HIV-related DRGs presented

significantly longer LOS, 9.1 vs. 7.9 $p < 0.01$. However, differences in mean THC again were not significant between patient with and without the disease, \$38 451 vs. \$36 538. Within the non-HIV-related DRGs, esophageal candidiasis patients had significantly longer LOS and significantly higher THC: 7.5 vs. 5.1, $p < 0.01$; and \$31 854 vs. \$20 919, $p < 0.01$, respectively.

Estimated hospital costs in the top 20 DRGs

Using the 2005 MEDPAR data, there were 14 566 esophageal candidiasis patients and 4 360 000 non-esophageal candidiasis patients within the same top 20 DRGs (Table 6); 9.3% of cases were assigned to an HIV-related DRG, and 90.7% were assigned to non-HIV-related DRGs. Estimated total hospital costs were significantly higher for esophageal candidiasis patients compared to non-esophageal candidiasis patients for both the HIV- and non-HIV-related DRG subgroups; \$11 836 vs. \$10 538, $p < 0.01$; \$10 538, vs. \$7473, $p < 0.01$, respectively. After controlling for age, sex, and race, estimated total hospital costs were still significantly higher for esophageal candidiasis patients

Table 4. Contribution of DRGs with corresponding classifications to total cases of esophageal candidiasis for HIV and non-HIV-related DRGs (2005 National Inpatient Sample)

Description	DRG		Number of cases	
	w/cc	w/occ	EC	Non-EC
HIV-related DRG				
HIV with major related condition	489	490	6 607	80 623
Non-HIV-related DRG				
Esophagitis gastroenteritis and miscellaneous disorders age > 17	182	183	6 108	943 822
GI hemorrhage	174	175	2 852	491 477
Simple pneumonia and pleurisy age > 17	89	90	1 641	1 026 543
Nutritional and misc. metabolic disorders age > 17	296	297	1 384	483 101
Respiratory infections and inflammations age > 17	79	80	1 067	262 899
Complicated peptic ulcer	176	177 178	790	44 031
Digestive malignancy	172	173	614	79 228
Other digestive system diagnoses age > 17	188	189	586	222 665
Major small and large bowel procedures	148	149	453	350 520
Cranial and peripheral nerve damage	18	19	420	95 359
TOTAL			22 522	4 089 588

All values are weighted to project national estimates. w/cc = with complications or comorbidities; w/occ = without complications or comorbidities

Table 5. Total hospital charges and length of stay by HIV and non-HIV-related DRGs for DRGs with corresponding classifications (2005 National Inpatient Sample)

Characteristic	Esophageal candidiasis	Non-esophageal candidiasis	p-value
Total			
Weighted number of cases	22 522	4 089 588	
Length of hospital stay (days)			
Mean (SD)	8.0 (17.5)	5.2 (12.6)	<0.01
Median	6	4	
Hospital charges (\$)			
Mean (SD)	33 792 (103 324)	21 228 (67 614)	<0.01
Median	20 034	12 914	
HIV-related DRGs			
Weighted number of cases	6 607	80 623	
Length of hospital stay (days)			
Mean (SD)	9.1 (20.5)	7.9 (19.8)	<0.01
Median	6	5	
Hospital charges (\$)			
Mean (SD)	38 451 (114 857)	36 538 (119 559)	Not significant
Median	21 682	19 874	
Non-HIV-related DRGs			
Weighted number of cases	15 915	4 008 965	
Length of hospital stay (days)			
Mean (SD)	7.5 (16.0)	5.1 (12.3)	<0.01
Median	5	4	
Hospital charges (\$)			
Mean (SD)	31 854 (97 814)	20 919 (65 954)	<0.01
Median	19 524	12 820	

Missing values resulted in sample variations across certain variables; percentages were calculated after omitting missing values
Values are weighted to project national estimates

Table 6. Estimated total hospital costs by HIV and non-HIV-related DRGs for the top 20 DRGs (2005 MEDPAR)

Characteristic	Esophageal candidiasis	Non-esophageal candidiasis	<i>p</i> -value
Total			
Number of cases	14 566	4 360 000	
Mean hospital costs (\$)	11 038	7 486	<0.01
Adjusted by age, gender, race	10950 (71.26)	7486 (4.11)	<0.01
HIV-related DRGs			
Number of cases	1 354	17 904	
Mean hospital costs (\$)	11 836	10 538	<0.01
Adjusted by age, gender, race	11 886 (349.96)	10 534 (96.18)	<0.01
Non-HIV DRGs			
Number of cases	13 212	4 340 000	
Mean hospital costs (\$)	10 957	7 473	<0.01
Adjusted by age, gender, race	10 917 (74.60)	7 474 (4.12)	<0.01

Missing values resulted in sample variations across certain variables; percentages were calculated after discounting missing values

compared to non-esophageal candidiasis patients for both the HIV- and non-HIV-related DRG subgroups \$11 886 vs. \$10 534, $p < 0.01$; \$10 917 vs. \$7474, $p < 0.01$, respectively.

Discussion

Esophageal candidiasis is diagnosed in a number of different disease settings including malignancies, immunological disorders, diabetes mellitus, and even in immunocompetent, apparently healthy subjects¹¹. However, the disease has been more commonly associated with HIV/AIDS because of its designation as an 'AIDS indicator condition' in the Centers for Disease Control and Prevention (CDC) 1993 Classification System and its high prevalence in that disease setting. This misperception has potential implications on estimates of the overall economic impact, as well as the management of the disease.

In our study, we identified over 274 DRGs associated with esophageal candidiasis cases, covering a broad spectrum of diagnoses and comorbidities. Indeed, esophageal candidiasis was most prevalent among the HIV-related DRGs, occurring in roughly 9% of all cases assigned to the HIV DRGs. However, HIV-related DRGs accounted for only 14% of all esophageal candidiasis cases, while the remaining top 20 DRGs represented 51%.

Furthermore, there did not seem to be a relationship between the prevalence of esophageal candidiasis within a DRG and the charges and costs attributable to the disease. Despite the high prevalence of

esophageal candidiasis in the HIV-related DRGs, the THC and LOS for esophageal candidiasis cases were not significantly higher than charges for cases without esophageal candidiasis. The largest increases in charges were found among DRGs with relatively low prevalence of the disease.

When we expanded our analysis to include clinically relevant DRGs that comprised cases lacking complications, many of the trends persisted. Although the difference in LOS among the HIV-related DRGs was significant, this is likely due to the inclusion of non-esophageal candidiasis cases lacking complications with shorter hospital stays. The analysis suggests that, irrespective of the DRG assignment for HIV cases, the differences in charges between esophageal candidiasis and non-esophageal candidiasis patients are not significant. After estimating costs using MEDPAR data, we did find a significant increase among the HIV-related DRGs. However, the incremental increase in costs attributable to esophageal candidiasis was small in comparison to other non-HIV-related DRGs analyzed.

Limitations

One of the limitations of this study was the use of the DRG system of classification, a historic cluster of diagnosis-related groups that sometimes do not reflect current patterns of disease and treatment practices. However, by unmasking the cost of esophageal candidiasis and its prevalence across multiple DRGs, we have highlighted the risks of over-reliance on the DRG system and have offered alternative methodologies for measuring the true cost

of esophageal candidiasis. Also, we are only able to infer that esophageal candidiasis is responsible for the observed increases in costs within the DRGs analyzed. It is possible that esophageal candidiasis patients' immunocompromised status is the underlying mechanism in cases where esophageal candidiasis significantly drove up costs within a DRG.

This study also focused uniquely on inpatient hospital charges and costs. We did not look at outpatient patterns of care and resource utilization, although we can expect the cost to be similarly high. In addition, we did not look at the breakdown of charges and costs by category (e.g., room and board, drugs, diagnostic tests) and how those varied by DRG. In keeping with the findings of this study, future analyses focusing on outpatient costs should look at the incidence of esophageal candidiasis across a broad range of settings, not just infectious disease clinics or HIV treatment centers. Additional studies need to address other potential drivers of costs and trends in esophageal candidiasis rates over time across DRGs. For example, is esophageal candidiasis on the rise in certain clinical settings and on the decline in others?

The NIS dataset represents data from a 20% sample of hospitals with the inherent limitations associated with potential sample bias. The estimates presented in this study may be affected by the patient demographics of the participating institutions. A limitation of using the MEDPAR database is that it is comprised of predominantly older patients, i.e., patients 65 years old or older on Medicare. The average age in the MEDPAR dataset for patients with esophageal candidiasis was between 73 and 75, while it is around 60 in the HCUP NIS data, thereby limiting our ability to understand the full impact of age on cost.

Finally, all costs were estimated using MEDPAR data and cost-to-charge ratios supplied with the dataset. The ratios are hospital-specific and are calculated on a methodology set by CMS. These ratios are not specific to individual hospital cases. Also, costs were controlled for demographic variables, but we recognize other factors may explain the difference in costs estimated for esophageal candidiasis patients, such as hospital ownership (private vs. non-profit, urban vs. rural, etc.). In order to understand better the true impact of esophageal candidiasis on clinically relevant subgroups, a more detailed analysis controlling for demographic variables as well as other possible confounding factors should be conducted.

Conclusion

Esophageal candidiasis has a substantial impact on inpatient hospital charges, length of stay, and cost for a wide range of clinically relevant non-HIV/AIDS patient groups. As the heterogeneity of esophageal candidiasis is becoming better understood, it is apparent that alternatives to a one-size-fits-all therapeutic solution for esophageal candidiasis need to be found. Future studies and treatment guidelines for esophageal candidiasis should ensure that adequate attention is given to the disease both within and outside of the HIV/AIDS setting.

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