American Journal of Nursing Science
2021; 10(1): 86-90
http://www.sciencepublishinggroup.com/j/ajns
doi: 10.11648/j.ajns.20211001.26
ISSN: 2328-5745 (Print); ISSN: 2328-5753 (Online)

Influencing Factors of Hospitalization Costs in Adult Patients with Bronchiectasis

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To cite this article:
Yanxiu Lei, Lineng Zhou, Yanli Yang, Ting Li. Influencing Factors of Hospitalization Costs in Adult Patients with Bronchiectasis. *American Journal of Nursing Science.* Vol. 10, No. 1, 2021, pp. 86-90. doi: 10.11648/j.ajns.20211001.26

Received: January 15, 2021; **Accepted**: February 15, 2021; **Published**: February 26, 2021

Abstract: Objective: To explore Influencing factors of hospitalization costs in adult patients with bronchiectasis. Methods: The data were collected from public hospitals in China between May 2016 and December 2019, the information collected includes the following: total hospitalization cost, age, sex, blood routine, length of stay, and complications. Result: A total of 462 effective cases were collected in this study, including 234 males (50.65%) and 228 females (49.35%). In hospitalization costs, single total hospitalization cost is 13610.87 yuan per capita, among them the quartile is 7453.50 yuan, the median is 9893.51 yuan, upper quartile is 14153.62 yuan. Base on the proportion of hospitalization costs in adult patients with bronchiectasis, the drug cost was the highest (40.53%), the test cost was the second (20.59), and the nursing cost was the lowest (2.59%). In results of univariate analysis of cases with different characteristics, chronic obstructive pulmonary disease (COPD), smoking history, age, duration of hospitalization, and the percentage of neutrophils were statistical significance ($p < 0.05$). independent factors. Conclusion: independent factors of hospitalization costs in adult patients with bronchiectasis included hospitalization duration, smoking history, COPD, and high neutrophil percentage. Therefore, medical staffs should control and avoid those factors in treatment of adult patients with bronchiectasis.

Keywords: Bronchiectasis, Hospitalization Costs, Complications

1. Introduction

Bronchiectasis is a respiratory infection and bronchial obstruction caused by a variety of causes, that It destroys the bronchial structure and causes pathological and persistent dilation of the bronchus. Common symptoms include cough, expectoration, hemoptysis, and recurring lung infections [1]. Base on the report, Bronchiectasis is a clinically common disease, and its number of sick is even one of the top 10 diseases of respiratory disease [2, 3]. In recent years, the global incidence of bronchiectasis is on the rise. An American retrospective study showed that the incidence of bronchiectasis rose by 8% from 2001 to 2012, there had 139 patients with incidence of bronchiectasis per 100,000 patients [4]. Besides, A German study indicated that the average hospitalization rate for patients with bronchiectasis was 9.4 per 100,000 [5]. In China, Zhou's research shown that 1.2% (135/10811) of the population had been diagnosed with bronchiectasis from the survey of 10811 people who were aged 40 years and above from 7 provinces of China, such as Beijing, Shanghai, Guangdong and so on [6]. Due to bronchiectasis disease treatment costs are not cheap, reducing treatment cost is a significative study for patients with bronchiectasis as prevalence of this disease is on the rise every year.

As for treatment cost of bronchiectasis, treatment of bronchiectasis is expensive as it contributes to recurrent lung infections, even acute exacerbations. Bronchiectasis not only reduce patients' quality of life but also increase their financial burden [7, 8]. According to the report, the average annual cost of patients with bronchiectasis is 4671.9 euros, and the treatment payment increases with the severity of the patient's disease [7]. However, the results of many similar surveys are different, and their data were significantly different. Therefore, study of hospitalization costs in patients with bronchiectasis is worth. The aim of this study was to assess factors of hospitalization costs in adult patients with bronchiectasis.

2. Methods

2.1. Participants Enrollment and Survey Methods

This study is a retrospective study, that we explored the influencing factors of hospitalization costs in adult patients with bronchiectasis by collecting patient records. The data were collected from public hospitals in China between May 2016 and December 2019, the information collected includes the following: total hospitalization cost, age, sex, blood routine, length of stay, and complications.

The inclusion criteria of this study contrast: (1) patients' age was 18 years old or older; (2) patients were diagnosed as bronchiectasis based on the European Respiratory Society guidelines for the management of adult bronchiectasis [9]; The withdraw criteria of this study contrast: (1) patients' age was younger than 18 years old; (2) some fact leaded to their bronchiectasis, such as bronchial asthma, pulmonary malignancy, pulmonary interstitial fibrosis, lobectomy in the past; (3) The length of hospital stay is less than 2 days; (4) patients did not received related treatment; (5) The patient has an immune deficiency.

2.2. Statistical Analysis

SPSS 16.0 software was used for statistical processing, and χ^2 test was used among counting data groups. In addition, The continuous variables accord with normal distribution were described by the means with standard deviation (SD), and t-test was applied to analyze variables factors. Besides, Logistic regression was used to analyze the related influencing factors of hospitalization costs. The selected test level was α=0.05, and $P < 0.05$ was considered statistically significant. Table 1 displays Variables and assignments.

Table 1. *Variables and assignments.*

Variables	Items	assignments
y	Hospitalization cost (RMB)	1=<15000, 2=≥15000
x_1	Chronic obstructive pulmonary disease (COPD) (complications)	1=Yes, 2=No
x_2	Past history of hemoptysis	1=Yes, 2=No
x_3	Diabetes mellitus (complications)	1=Yes, 2=No
x_4	Smoking history	1=Yes, 2=No
x_5	Gender	1=Male, 2=Female
x_6	Age (year)	1=≤65, 2=>65
x_7	Hospitalization period (days)	1=≤10 天, 2=>10
x_8	The percentage of neutrophils	1=≤70%, 2=>70%
x_9	Present Hemoptysis (complications)	1=Yes, 2=No

3. Result

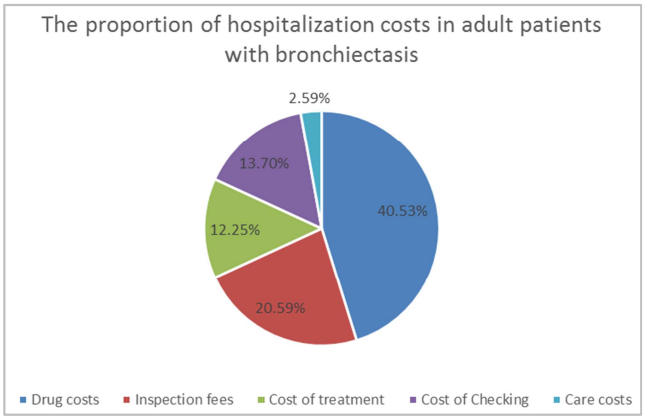

Figure 1. *The proportion of hospitalization costs in adult patients with bronchiectasis.*

A total of 462 effective cases were collected in this study, including 234 males (50.65%) and 228 females (49.35%), that the cases of men and women is roughly equal (male: female = 1:1.026). besides, the patients ranged from 19 to 93 years old, with a mean age of 65.27±14.27 years old. We carried out propensity score matching for age and gender to eliminate the differences of age and gender on results. In hospitalization costs, single total hospitalization cost is 13610.87 yuan per capita, among them the quartile (P_{25}) is 7453.50 yuan, the median (P_{50}) is 9893.51 yuan, upper quartile (P_{75}) is 14153.62 yuan. Figure 1 displays hospitalization costs in adult patients with bronchiectasis. The drug cost was the highest (40.53%), the test cost was the second (20.59), and the nursing cost was the lowest (2.59%).

Table 2 blew shows results of univariate analysis of cases with different characteristics, that chronic obstructive pulmonary disease (COPD), smoking history, age, duration of hospitalization, and the percentage of neutrophils were significant difference ($p < 0.05$). On the contrary, the factors were no significant difference ($p > 0.05$), such as past history of hemoptysis, diabetes mellitus, gender, and present hemoptysis.

According to above factors which were statistical significance, we use unconditional Logistic regression analysis to assess those factors which were base on the result of univariate analysis of cases with different characteristics (Table 3). In this study, the hospitalization cost of patients with bronchiectasis was taken as the independent variable, and the factors which were significant difference were taken as the independent variable. In the result, independent factors which were affect hospitalization costs of adult patients with bronchiectasis include: duration of hospitalization, smoking history, COPD, and the percentage of neutrophils.

Table 2. *Results of univariate analysis of cases with different characteristics.*

Item	characteristics	Case	hospitalization costs (RMB) (Mean±SD)	P value	T value
Chronic obstructive pulmonary disease (COPD) (complications)	Yes	47	16670±1922	0.012	2.52
	No	415	12480±511.7	0.6151	0.503
Past history of hemoptysis	Yes	144	13270±103.2	0.2695	1.105
	No	318	12720±603.9	0.0196	2.34
Diabetes mellitus (complications)	Yes	48	14540±1768	0.1273	1.528
	No	414	12710±512.2	0.001	3.309
Smoking history	Yes	114	14930±1281	<0.001	9.011
	No	348	12220±513		
Gender	Male	234	13650±745.2	0.012	2.52
	Female	228	12120±665.2	0.6151	0.503
Age (years)	≤65	212	11110±513.2	0.2695	1.105
	> 65	250	14400±797.2	0.0196	2.34
Duration of hospitalization (days)	≤10	244	8987±397.2	0.1273	1.528
	> 10	218	17450±902.7	0.001	3.309
The percentage of neutrophils (%)	< 70%	210	11270±725.4	<0.001	9.011
	>70%	242	14250±682.5		
present hemoptysis (complications)	Yes	233	12440±648.7	0.3595	0.9172
	No	229	13360±766.9		

Table 3. *Unconditional Logistic regression analysis of factors related to hospitalization costs.*

Item	β	SE	Waldχ^2	P value	OR value	95%CI
Duration of hospitalization	0.348	0.040	77.447	0.000	1.417	1.311-1.531
Smoking history	0.667	0.327	4.176	0.041	1.949	1.028-3.697
COPD (complications)	0.953	0.416	5.241	0.022	2.594	1.147-5.867
The percentage of neutrophils	0.064	0.014	20.761	0.000	1.066	1.037-1.096

4. Discussion

4.1. Characteristics of Hospitalization Costs in Adult Patients with Bronchiectasis

According to the proportion of hospitalization costs in adult patients with bronchiectasis in this study, drug costs (including western medicine costs and traditional Chinese medicine costs) accounted for the largest proportion (40.53%). This may be because patients with bronchiectasis have chronic, recurrent infections and multiple drug resistance, patients require higher levels of antibiotics. Furthermore, high levels of antibiotics are more expensive and are associated with longer duration of use. Base on the report, sensitive bacterial infections in patients with bronchiectasis include pseudomonas aeruginosa, escherichia coli, and acinetobacter baumannii, that were also the reasons for the high cost [10]. In addition, most of drug costs comes from medical treatment. Unless medical treatment fails to control the patient's condition, doctors use other treatments for patients such as surgery [11]. Besides, the inspection fee also accounted for 20.59%, which was mainly due to the relatively long hospital stay of the patients after admission due to the need for repeated blood drawing and examination. Checking fees are also a major component of hospitalization costs (13.70%), that include CT, MRI, B ultrasound, Heart electroencephalography, and so on.

4.2. Influence of Hospitalization Duration on Cost of Patients with Bronchiectasis

The valid data of this study were collected from 462 adult patients with bronchiectasis. The hospitalization period was 11.45±5.75 days. Of those, the minimum length of hospitalization was 3 days and the maximum was 55 days, with 218 patients (47.2%) staying for more than 10 days. Those results were similar to Liu's report result [12]. Additionally, Sanchez-Munoz's report shows that there was a shortened hospital stay in patients with bronchiectasis in recent years, but still is longer than the average hospitalization days [13]. The cost of hospitalization increases with the length of the stay, it means that patients have greater financial pressure. Therefore, medical personnel should shorten the hospital stay of patients by better treatment plans and simplify treatment procedures.

4.3. Influence of Smoking History on Hospitalization Costs of Patients with Bronchiectasis

In this study, 114 patients had a smoking history, the smoking history factor also can increase hospitalization duration. Smoking increases the risk of lung inflammation, the main reason is that smoke contains tar and nicotine, which can damage bronchial mucosal cells, thus disrupting the cleaning movement of cilia and reducing the ability of alveolar phagocytes to kill bacteria. Finally lead to the occurrence of bronchial mucosa congestion, edema and inflammation [14-17].

4.4. Effects of Copd (Complications) on Hospitalization Costs in Patients with Bronchiectasis

Bronchiectasis is the cause and comorbidities of COPD. According to some reports, the incidence of bronchiectasis with COPD was between 4% and 72%. Furthermore, patients

with bronchiectasis and COPD have poorer lung function, that they had more difficulty breathing, higher rate of deterioration, and higher mortality rate compare with common patients with bronchiectasis [18-22]. There had 47 (10.17%) patients with bronchiectasis and COPD. According to the results of Logistic regression analysis, those patients had higher hospitalization costs as they not only worse and need more treatment, that this result was similar to Sanchez-Munoz's study result [22].

4.5. Effect of Percentage Neutrophils on Hospitalization Costs in Patients with Bronchiectasis

Persistently high level of neutrophils means more persistent infection and more severe bronchiectasis, so the patients requiring longer antibiotic treatment. Some reports showed that neutrophils are reprogrammed in patients with persistent bronchiectasis, resulting in prolongation of the neutrophils, thereby reducing their ability to kill, phagocyte and kill bacteria, and thus perpetuating the bronchiectasis infection [23]. The persistence of a large number of neutrophils in sputum was also associated with the severity of bronchiectasis [24]. In this study, 242 (52.38%) patients had neutrophils whose percentage was above 70% of the normal range, and the treatment cost of these patients was also higher.

5. Conclusion

In conclusion, independent impact factors of hospitalization costs in adult patients with bronchiectasis included hospitalization duration, smoking history, COPD, and high neutrophil percentage. Therefore, medical staffs should control and avoid those factors in treatment of adult patients with bronchiectasis, such as application of antibiotics, optimization of hospitalization process, shorten the length of stay, smoking cessation. Nurses should provide related knowledge to patients with bronchiectasis.

References

[1] Cai BQ, He QY, Gao ZC, et al. Expert consensus on the diagnosis and treatment of adult bronchiectasis (2012 Edition). Chinese Journal of Critical Care Medicine (Electronic). 2012; 5 (05): 315-328.

[2] Tian CY, Gao Y. Statistical analysis of disease and death of respiratory and critically ill patients in a hospital. Chinese Medical Record. 2020; 21 (01): 64-66.

[3] Zhang YQ. Investigation on the disease composition of inpatients in respiratory department of a third-class A hospital in Liaoning from 2012 to 2016. Chinese Medical Record. 2018; 19 (11): 48-51.

[4] Weycker D, Hansen GL, Seifer FD. Prevalence and incidence of noncystic fibrosis bronchiectasis among US adults in 2013. Chron Respir Dis. 2017; 14 (4): 377-384.

[5] King P. The pathophysiology of bronchiectasis, Int. J. Chronic Obstr. Pulm. Dis. 2019; 4: 411–419.

[6] Zhou YM, Wang C, Yao WZ, et al. Investigation on the prevalence and risk factors of bronchiectasis among residents aged 40 and older in 7 provinces and cities in China [J]. Chinese Journal of Internal Medicine. 2013; 52 (5): 379-382.

[7] De La Rosa D, Martinez-Garcia M A, Olveira C, et al. Annual direct medical costs of bronchiectasis treatment: Impact of severity, exacerbations, chronic bronchial colonization and chronic obstructive pulmonary disease coexistence. Chron Respir Dis. 2016; 13 (4): 361-371.

[8] Goeminne P C, Hernandez F, Diel R, et al. The economic burden of bronchiectasis - known and unknown: a systematic review. BMC Pulm Med. 2019; 19 (1): 54.

[9] Polverino E, Goeminne PC, Mcdonnell MJ, et al. European Respiratory Society guidelines for the management of adult bronchiectasis. The European respiratory journal. 2017; 50 (3): 1700629.

[10] Li CX, Han MF, Zhou XP, et al. Study on the distribution of pathogenic bacteria in patients with bronchiectasis associated with infection and direct economic loss caused by drug resistance. Journal of Clinical Pulmonary Surgery. 2018; 23 (09): 1680-1683.

[11] Nakajima T, Yoshino I. Massive Hemoptysis; Clinical Approach and Surgical Treatment. Kyobu Geka. 2015; 68 (8): 665-670.

[12] Liu B, Zhou RQ, Xing QF. Analysis of risk factors of elderly COPD complicated with bronchiectasis. Chinese Journal of Lung Diseases (Electronic Edition). 2019; 12 (03): 301-305.

[13] Sanchez-Munoz G, Lopez De Andres A, Jimenez-Garcia R, et al. Time Trends in Hospital Admissions for Bronchiectasis: Analysis of the Spanish National Hospital Discharge Data (2004 to 2013). PLoS One. 2016; 11 (9): e0162282.

[14] Xu X. Risk factors of COPD in middle-aged and elderly smoking population in rural areas. Practical Preventive Medicine. 2014; 21 (03): 376-378.

[15] Xu J. Effect of smoking on pulmonary function and airway inflammatory response in patients with emphysema. Chinese Journal of Experimental Diagnostics. 2016; 20 (08): 1302-1304.

[16] Wang F, Zhou YP, Xia JJ, et al. The relationship between smoking and pulmonary structure changes in patients with chronic obstructive pulmonary disease. Clin Pulmonol. 2018; 23 (01): 17-20.

[17] Zou Y, Chen X, He B, et al. Neutrophil extracellular traps induced by cigarette smoke contribute to airway inflammation in mice [J]. Exp Cell Res. 2020: 111888.

[18] Dou S, Zheng C, Cui L, et al. High prevalence of bronchiectasis in emphysema-predominant COPD patients. Int J Chron Obstruct Pulmon Dis. 2018; 13: 2041-2047.

[19] Cui JJ. Etiological analysis of 92 patients with bronchiectasis and its relationship with disease severity. 2017.

[20] Chalmers J D, Aliberti S, Filonenko A, et al. Characterization of the "Frequent Exacerbator Phenotype" in Bronchiectasis. Am J Respir Crit Care Med. 2018; 197 (11): 1410-1420.

[21] Martinez-Garcia M A, Miravitlles M. Bronchiectasis in COPD patients: more than a comorbidity?. Int J Chron Obstruct Pulmon Dis. 2017; 12: 1401-1411.

[22] Sanchez-Munoz G, Lopez-De-Andres A, Hernandez-Barrera V, et al. Bronchiectasis in patients hospitalized with acute exacerbation of COPD in Spain: Influence on mortality, hospital stay, and hospital costs (2006-2014) according to gender. PLoS One. 2019; 14 (1): e0211222.

[23] Bedi P, Davidson D J, Mchugh B J, et al. Blood Neutrophils Are Reprogrammed in Bronchiectasis. American journal of respiratory and critical care medicine. 2018; 198 (7): 880-890.

[24] Drost N, D'silva L, Rebello R, et al. Persistent sputum cellularity and neutrophils may predict bronchiectasis. Can Respir J. 2011, 18 (4): 221-224.