

# Analysis of the Treatment Costs of Malignant Tumor Diseases in China's Hunan Province Based on "System of Health Account 2011"

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## Research Article

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## Abstract

**Objective:** To calculate and analyze the treatment costs of malignant tumors in Hunan Province in 2019, and to provide data support for the formulation and implementation of policies by the health department.

**Methods:** Refer to the "2019 Hunan Province Health Finance Annual Report" and "2019 Hunan Province Health Statistics Summary", based on the "System of Health Account 2011", calculate and analyze the disease types, beneficiaries, institutional distribution and financing status of malignant tumors diseases.

**Results:** In 2019, the total cost of malignant tumor treatment in Hunan Province was 440,596,800 yuan. The top five were malignant tumors of digestive organs (40.10%), malignant tumors of respiratory and intrathoracic organs (17.62%), and malignant tumors of breast (12.24%), female genital organ malignant tumors (9.88%) and lip, oral cavity and pharynx malignant tumors (6.87%). The 35 to 79-year-old age group has higher treatment costs. The costs are concentrated in general hospitals. Funding sources mainly come from government financing and family health expenditure. The main influencing factors of malignant tumor hospitalization expenses are gender, length of stay, age, drug proportion, institution level and medical institution type.

**Conclusions:** The disease burden of malignant tumors is relatively serious; primary medical and health institutions lack health resources; and household health expenditure accounts for a relatively high proportion. Therefore, hierarchical diagnosis and treatment should be promoted reasonably, focused on key diseases and populations, and medical security policies should be improved to ensure that patients with malignant tumors and their families' economic burden of disease can be reduced.

## 1. Introduction

With the advent of the new media network economy, people have changed a lot in their lifestyles and eating habits, appearing a lot of chronic non-communicable illnesses, causing severe influence on people's health. Especially for the emergence of major chronic diseases such as malignant tumors, which is extremely dangerous to people's health, increasing economic burden, bringing the severe financial crisis to families, even in society<sup>[1]</sup>. The rising costs of cancer treatment and supportive care are a concern for health care systems, patients, and their families. Due to the large economic burden of cancer care, it is important to have an accurate estimate of the costs associated with cancer and understand who bears those costs<sup>[2-3]</sup>.

Taking malignant tumors as an example, this article combines the disease types, different patient age groups, and treatment institutions to account for the treatment costs of malignant tumors in Hunan province, mainly based on the "System of Health Account 2011" developed by the international organization. The purpose of this article is to understand the current situation of economic burden precisely and provide a reference basis for the relevant department to formulate policies.

## 2. Data Source And Accounting Methodology

### 2.1 Data source

The data in this study consist of two main parts, aggregate data and sample data, and these two parts of data mainly derive from official statistics and field research. The aggregate data is from the 2019 Annual Report on Health Finance in Hunan Province, Summary of Health Statistics in Hunan Province 2019 and government health input monitoring system<sup>[4-6]</sup>. This was supplemented by on-site research on health costs in Hunan Province, and the apportionment coefficients were obtained by analyzing health cost data in the sample areas, including patient case data obtained from the information systems and case systems of hospitals, public health institutions, and primary health care institutions, all based on the first diagnosis for patients suffering from multiple malignant diseases<sup>[7]</sup>.

### 2.2 Accounting methodology

This study collecting and organizing data through Excel, and accounting for apportionment to obtain the total cost of malignant tumor treatment in the province based on "System of Health Account 2011", summarized the beneficiary population (gender, disease, and age), institutional flow and financing of the treatment cost<sup>[8]</sup>. A multi-factor linear regression analysis was also performed using SPSS25.0 statistical software to analyze the factors affecting hospitalization costs<sup>[9]</sup>.

## 3. Results And Analysis

### 3.1 Malignant neoplastic disease cost scale

The 2019 total treatment cost of malignant tumor in Hunan province was 44,659.68 ten thousand yuan, which accounted for 2.96% of the total treatment cost in Hunan Province<sup>[10]</sup>. 58.61 ten thousand yuan for outpatient expenses, which accounted for 0.13% of the treatment cost of malignant tumor. And hospitalization cost was 44601.07 ten thousand yuan, which accounted for 99.87% of the treatment cost of the malignant tumor.

### 3.2 Disease distribution of malignant tumor treatment expense

As shown in Table1, the top five of malignant tumor treatment costs in Hunan Province in 2019 were malignant tumors of digestive organs (40.10%), malignant tumors of respiratory and intrathoracic organs (17.62%), malignant tumors of the breast (12.24%), malignant tumors of female genital organs (9.88%) and malignant tumors of the lip, mouth, and pharynx (6.87%), above-mentioned malignant tumors occupy 86.71% of the treatment cost of malignant tumors. The disease distribution of inpatient and outpatient costs is consistent with the distribution of treatment costs. Among outpatient costs, malignant tumor of breast and female reproductive organs accounted for a considerable proportion, 33.15% and 27.63% respectively. The highest proportion of

hospitalization expenses was 40.24% for malignant tumors of digestive organs, while respiratory and intrathoracic organ malignant tumors ranked second, accounting for 17.67%. (Table 1)

Table 1  
Disease distribution of malignant tumor treatment costs in Hunan province in 2019

Disease type	Treatment cost (ten thousand yuan)	Composition(%)	Outpatient cost(ten thousand yuan)	Composition(%)	Hospitalization cost(ten thousand yuan)	Composition(%)
digestive organs	17954.36	40.20	7.18	12.26	17947.18	40.24
respiratory and intrathoracic organs	7886.51	17.66	7.15	12.21	7879.36	17.67
lip, mouth and pharynx	3077.34	6.89	4.45	7.60	3072.89	6.89
breast	5479.13	12.27	19.41	33.15	5459.72	12.24
female genital organs	4423.74	9.91	16.18	27.63	4407.56	9.88
male genital organs	1181.22	2.64	1.15	1.96	1180.07	2.65
bone and articular cartilage	104.06	0.23	0.16	0.27	103.90	2.32
urinary system	1270.49	2.84	1.43	2.44	1269.06	2.85
mesothelial tissue and soft tissue	294.56	0.66	0.17	0.29	294.39	0.66
eye, brain and central nervous system	470.98	1.05	0.11	0.19	470.87	1.06
lymphatic, hematopoietic and related tissues	13.70	0.03	0.01	0.02	13.69	0.03
Unspecified, secondary and other unspecified	457.27	1.02	1.13	1.93	456.14	0.10
thyroid and other endocrine glands	2046.255	4.58	0.03	0.05	2046.23	0.46

### 3.3 Age distribution of malignant tumor treatment expense

The treatment expenses are mainly based on hospitalization expenses in different age groups, the total cost of hospitalization was 44601.07 ten thousand yuan, the outpatient cost was 58.61 ten thousand yuan and the 35-59 and 60-79 age groups accounted for a significant proportion, 43.98% and 48.11% respectively. The disease expenses distribution of hospitalization and outpatient is consistent with the treatment expenses, accounting for a higher proportion in 35-59 and 60-79 age groups, and the combined percentage of this two groups reached 95.22% and 92.09%. Their outpatient and hospitalization expenses are higher than the other age groups. The shares of people under 35 years old and over 80 years old are smaller. (Table 2)

Table 2  
Age distribution of malignant tumor treatment cost in Hunan province in 2019

Age group	Treatment cost(ten thousand yuan)	Composition(%)	Outpatient cost(ten thousand yuan)	Composition(%)	Hospitalization cost(ten thousand yuan)	Composition(%)
0-14	49.94	0.1	0.38	0.63	49.57	0.11
15-34	1107.12	2.48	0.87	1.48	1106.25	2.48
35-59	19641.06	43.98	31.38	53.78	19609.54	43.97
60-79	21485.67	48.11	24.29	41.44	21461.38	48.12
Over 80	2375.89	5.32	1.56	2.66	2374.33	0.53
Total	44659.68	100	58.61	100	44601.07	100

### 3.4 Institution distribution of malignant tumor treatment cost

From the institutional configuration of costs, the treatment expenses of a malignant tumor are mainly concentrated in general hospitals, accounting for as much as 85.46%, and it's treatment cost mainly concentrated in hospitalization expense. Maternal and child health hospitals ranked the second, accounting for 5.57%, followed by Chinese medicine hospital accounting for 4.6%, the proportion of specialized hospital is low, accounting for 2.86%, and primary health care institutions have the lowest percentage of oncology treatment cost, only 1.50%. (Table 3)

Table 3  
Institution distribution of malignant tumor treatment cost in Hunan province in 2019

Institution	Amount(ten thousand yuan)	Proportion (%)	Outpatient cost (ten thousand yuan)	Proportion (%)	Hospitalization cost (ten thousand yuan)	Proportion(%)
Chinese medicine hospital	2054.95	4.60	2.45	4.18	2052.50	4.60
Maternal and child health hospital	2487.33	5.57	13.03	22.23	2474.30	5.55
General hospital	38166.56	85.46	5.32	9.07	38161.24	85.56
Specialized hospital	1278.98	2.86	0.17	0.29	1278.81	2.87
Primary health care institution	671.86	1.50	37.64	64.22	634.22	1.42

### 3.5 Components of funding program for malignancy treatment cost

The treatment expenses of malignant tumors in Hunan province were mainly from the government program funding accounting for 60.78%, the mandatory medical program accounted for a considerable proportion(53.91%); the household health expenditure also accounted for a relatively high proportion, 34.3%, and the share of voluntary health care payment program was low, only 4.92%. (Table 4)

Table4 Components of funding program for malignancy treatment cost in Hunan province in 2019

Funding program	Billion	Proportion(%)
<b>Government program and mandatory health financing program</b>	<b>43.86</b>	<b>60.78</b>
Government program	4.96	6.87
Mandatory health insurance program	38.9	53.91
<b>Voluntary health cure payment program</b>	<b>3.55</b>	<b>4.92</b>
Voluntary health insurance program	3.25	4.50
Funding programs for non-profit institutions providing services to households	0.18	0.25
Enterprise financing program	0.12	0.17
<b>Family health expenditure</b>	<b>24.75</b>	<b>34.30</b>

### 3.6 Disease distribution of malignant tumor treatment cost in different age groups

The disease distribution of malignant tumors in different age groups has different features. Among them: the treatment cost of malignant tumors in the 0-14 age group accounted for a considerable proportion(61.7%) in the malignant tumors of the eye, brain and central nervous system; the treatment cost in the 15-34 age group mainly concentrated in malignant tumors of digestive organs (26.5%), malignant tumors of the breast (20.14%), malignant tumors of female genital organs (15.33%), and thyroid and other endocrine glands (15.85%); From the age distribution of disease, malignant tumors of the breast and malignant tumors of the female genital organs accounted for a larger proportion in the age groups of 15-34 and 35-59 years old, with a combined proportion of 35.47% and 34.69%, respectively. The malignant tumor treatment costs in 60-79 and over 80 age groups have the same disease distribution, the malignant tumors of digestive organs accounted for a significant proportion, 47.18% and 43.02% respectively, followed by respiratory and intrathoracic organ malignancies; It is noteworthy that the proportion of treatment costs for malignant tumors of male genital organs in the age group of 80 years or older was the highest among all age groups (15.90%). (Table 5)

Table5 Disease distribution of malignant tumor treatment cost in different age groups in Hunan province in 2019

Disease category	0-14		15-34		35-59		60-79		Over 80
	Expense (ten thousand yuan)	Composition(%)	Expense (ten thousand yuan)						
digestive organs	7.62	15.42	293.23	26.50	6493.68	33.06	10137.74	47.18	1022.09
respiratory and intrathoracic organs	0.76	1.54	36.85	3.33	2600.55	13.24	4835.73	22.51	412.70
lip, mouth and pharynx	3.23	6.54	97.46	8.80	1702.46	8.67	1219.75	5.68	54.45
breast	0.05	0.10	222.89	20.14	4047.81	20.61	1155.23	5.38	53.16
female genital organs	1.29	2.61	169.77	15.33	2765.35	14.08	1450.14	6.75	37.19
male genital organs	0.02	0.04	4.17	0.38	120.29	0.61	678.55	3.16	377.69
bone and articular cartilage	0.47	0.95	12.77	1.15	24.91	0.13	54.45	2.53	11.45
urinary system	0.32	0.65	32.54	2.94	339.03	1.73	704.00	3.28	194.60
mesothelial tissue and soft tissue	0.93	1.88	13.94	1.26	132.10	0.67	129.26	0.60	18.34
eye, brain and central nervous system	30.49	61.70	41.92	3.79	242.48	1.23	106.17	4.94	49.92
lymphatic, hematopoietic and related tissues	0	0	0	0	2.87	0.01	10.44	0.49	0.40
Unspecified, secondary and other unspecified	0.74	1.50	6.09	0.55	173.81	0.88	226.42	1.05	50.21
thyroid and other endocrine glands	3.50	7.08	175.52	15.85	995.72	0.51	777.80	3.62	93.71

### 3.7 Disease distribution of malignant tumor treatment cost by gender

Between the male and female disease distribution, the treatment expenses of malignant tumors of digestive organs are in the top position, which accounted for 49.05% and 29.94% respectively. The malignant tumors of respiratory and intrathoracic organs also accounted for a large proportion(24.51%) in males, followed by malignant tumors of the lip, mouth and pharynx(10.24%) and malignant tumors of male genital organs(4.92%). The second most common malignant tumor in women is breast cancer, reached 26.4%, the proportion of malignant tumors of female genital organs is also high( 21.4%). Totally, except for the malignant tumors of the breast and malignant tumors of the female genital organs, treatment costs for other diseases are higher for men than for women. (Table 6)

Table 6  
Disease distribution of malignant tumor treatment cost by gender in Hunan province in 2019

Disease category	Total (ten thousand yuan)	Composition (%)	Male(ten thousand yuan)	Composition(%)	Female (ten thousand yuan)	Composition(%)
digestive organs	17954.37	40.2	11766.27	49.05	6188.1	29.94
respiratory and intrathoracic organs	7886.51	17.66	5880.1	24.51	2006.41	9.71
lip, mouth and pharynx	3077.35	6.89	2456.86	10.24	620.49	3
breast	5479.13	12.27	21.01	0.09	5458.12	26.4
female genital organs	4423.73	9.91	0	0	4423.73	21.4
male genital organs	1181.23	2.65	1181.23	4.92	0	0
bone and articular cartilage	104.05	0.23	59.2	0.25	44.85	0.22
urinary system	1270.48	2.85	969.41	4.05	301.07	1.46
mesothelial tissue and soft tissue	294.56	0.66	203.91	0.85	90.65	0.44
eye, brain and central nervous system	470.98	1.05	214.51	0.89	256.47	1.24
lymphatic, hematopoietic and related tissues	13.77	0.03	12.63	0.05	1.14	0
Unspecified, secondary and other unspecified	457.27	1.02	270.37	1.13	186.9	0.9

### 3.8 Distribution of malignant tumor treatment cost in different hospitals

As can be seen from the table, the treatment expenses in Chinese medicine hospitals, general hospitals, specialization hospitals and primary medical and health institutions are mainly concentrated in two major diseases: malignant tumors of digestive organs and malignant tumors of respiratory and intrathoracic organs, and the sum of the proportion is above 50%. The most treatment expenses are respiratory and intrathoracic organ malignancies in the Chinese medicine hospital, accounting for 35.42%, followed by the malignant tumors of digestive organs 27.7%. The treatment cost of malignant tumor of breast and malignant tumor of female reproductive organs in maternal and child health hospitals is higher, accounting for 53.4% and 45.38% of the total cost respectively; the treatment cost of malignant tumor of digestive organs in general hospitals ranks first, accounting for 47.14%, followed by 18.18% of malignant tumor of respiratory and thoracic organs and 10.21% of malignant tumor of the breast; the top two treatment costs in specialty hospitals are respiratory and intrathoracic malignant tumors and digestive malignant tumors; the higher treatment costs in primary health care institutions are digestive malignant tumors and respiratory and intrathoracic malignant tumors, accounting for 52.39% of the total. It is noteworthy that the treatment costs of all categories of malignant tumors mainly concentrated in general hospitals. (Table 7)

Table7 Distribution of malignant tumor treatment cost in different hospitals in Hunan province in 2109

Disease category	Chinese medicine hospital		Maternal and child health hospital		General hospital		Specialized hospital		Primary health institution
	Expense (ten thousand yuan)	Composition(%)	Expense (ten thousand yuan)	Composition(%)	Expense (ten thousand yuan)	Composition(%)	Expense (ten thousand yuan)	Composition(%)	Expense (ten thousand yuan)
digestive organs	569.38	27.7	1.54	0.06	18279.77	47.14	324.33	25.36	201.58
respiratory and intrathoracic organs	727.83	35.42	4.27	0.17	7049.62	18.18	436.82	34.15	150.45
lip, mouth and pharynx	199.943	9.73	0.45	0.02	2854.83	7.36	68.47	5.35	11.36
breast	141.71	6.9	1328.19	53.4	3958.06	10.21	32.48	2.54	42.56
female genital organs	127.52	6.21	1128.66	45.38	3088.15	7.96	108.46	8.48	94.72
male reproductive organs	94.199	4.58	0.53	0.02	898.91	2.32	111.64	8.73	104.63
lymphatic, hematopoietic and related tissues	1.35	0.07	1.33	0.05	89.34	0.23	26.89	2.10	1.01
Unspecified, secondary and other unspecified	56.41	2.73	16.4	0.66	381.33	0.98	64.68	5.06	4.15
thyroid and other endocrine glands	6.69	0.33	5.92	0.24	860.13	2.22	10.84	0.85	26.66
Others	129.92	6.33	0.044	0	1315.52	3.39	94.37	7.38	34.74

(Note: Others include malignant tumors of bone and articular cartilage, malignant tumors of the urinary system, malignant tumors of the eye, brain and central nervous system)

### 3.9 Analysis of factors influencing the hospitalization cost

Taking the total hospitalization cost as a dependent variable, age, number of days in the hospital, gender, the proportion of medicine, institution level and the type of medical institution were assigned as independent variables. Because the hospitalization expense did not comply with the normal distribution, it needed to be logarithmically converted<sup>[11]</sup>. (Table 8)

Table8 Variable assignment

Variable	Influence factors	Assignment
Y	Total hospitalization cost	Logarithmic conversion
X1	Age	0= $\leq$ 14,1=15-34,2=35-59,3=60-79,4= $\geq$ 80
X2	Number of days in hospital	Actual value
X3	Gender	1=male, 2=female
X4	Drug share(%)	Actual value
X5	Institution level	1=provincial, 2=Municipal, 3=District, 4=County
X6	Medical institution level	1=Chinese medicine hospital, 2=Maternal and child health hospital, 3=General hospital, 4=Specialized hospital, 5=Primary health care institution

Take age, institution level and the type of medical institution as dummy variables, the age group in 35-59 as a reference, institution-level with provincial as a reference, the type of medical institution with the general hospital as reference<sup>[12]</sup>. Results show the hospitalization costs were higher with a long hospitalization day ( $\beta = 0.313$ ) and high drug-to-patient ratio ( $\beta = 0.067$ ), the difference between men and women in hospitalization costs has statistical significance; the hospitalization costs for the age group over 80( $\beta = -0.018$ ) were lower than the 35-59 age group, the hospitalization costs for the age group 60-

79( $\beta = 0.028$ ) were higher than the 35-59, municipal ( $\beta = -0.05$ ) and district ( $\beta = -0.291$ ) hospitalization costs were lower than those at the provincial level; specialty hospitals ( $\beta = -1.089$ ) and primary health care institutions ( $\beta = -3.562$ ) hospitalization costs were lower than those at general hospitals. (Table 9)

Table9 Multiple linear regression analysis of factors influencing hospitalization costs of patients with malignancy in Hunan province in 2019

Independent variable	Partial regression coefficient	Standard error	Standard partial regression coefficient	t value	P
(Constant)	9450.531	332.883		28.39	<0.01
Gender	1516.15	181.341	0.036	8.361	<0.01
Hospitalization days	396.41	5.52	0.313	71.809	<0.01
Drug share	5995.408	388.41	0.067	15.436	<0.01
Age(35-59as reference)					
0-14	733.14	1196.729	0.003	0.613	0.54
15-34	220.309	566.201	0.002	0.389	0.697
60-79	1194.816	200.554	0.028	5.958	<0.01
Over 80	-1746.761	457.958	-0.018	-3.814	<0.01
Institution level(provincial as reference)					
Municipal	-2086.839	453.649	-0.05	-4.6	<0.01
District	-14630.867	477.546	-0.291	-30.638	<0.01
County	716.42	480.039	0.014	1.492	0.136
Medical institution category(general hospital as reference)					
Chinese medicine hospital	36111.61	341.670	0.987	2.587	<0.01
Maternal and child health hospital	35679.23	128.965	0.975	1.324	<0.01
Specialized hospital	-36887.58	468.443	-1.008	-1.089	<0.01
Primary health cure institution	-37494.7	384.619	-1.025	-3.562	<0.01
a. Dependent variable: Total amount					

## 4. Discussion

### 4.1 Reasonably promote graded treatment, guide health resources downward

Primary health care facilities usually conduct routine checkups for diseases, preventive care, playing an important role in the daily treatment and management process<sup>[13-14]</sup>, but we can see the treatment costs of malignant tumors concentrated in the general hospital in Hunan in 2019, which accounted for 85.66% of the total, the primary health care facilities only accounted for 1.48%, the reason maybe lies in the improvement of people's living standard and increased health awareness<sup>[15]</sup>. At the same time, the treatment standard for diseases is increasing, and secondly, as the number of disease categories increases and the ease of disease treatment, the current diagnosis and treatment level and service capable creation still exists shortage. They are difficult to achieve therapeutic results, and difficult to effectively play its critical role in the prevention and treatment of malignant tumor diseases. Therefore, it is necessary for the relevant department to inputs health resources(medical software facilities, construction of human resources, etc.) as much as possible to the primary health care facilities, achieve the primary institution's prevention health mechanism and do a good job of follow-up rehabilitation and policy support and guidance<sup>[16-17]</sup>, fully cooperate with the policy of graded treatment, promote the cooperation and mutual promotion between hospitals and primary health care facilities, rationalize the allocation of health care resources, improve the operation efficiency of primary health care institutions and obtain higher cost-effectiveness<sup>[18]</sup>.

### 4.2 Strength disease prevention and control of malignant tumors for key diseases and key populations

Except for the age group over 80, the incidence rates of malignant tumors are increasing with age in other stages, the highest cost of malignant neoplasm disease is in the age group of 60-79 years old, and the proportion of the cost of middle-aged and young people aged 35-59 years old should not be neglected, their bad habits of smoking, alcohol and staying up late will greatly induce the prevalence of cancer, making a lot of families facing the compress of the financial crisis, even harming people's health and well-being to a certain extent, therefore, it is important to pay attention to these people; Secondly, we can see the hospitalization costs were proportional to the increasing age from the elderly population and the young and middle-aged population's expenses distribution of diseases, the outpatient expenses is opposite, decreasing constantly with increasing age<sup>[19-20]</sup>. Therefore, in the future health planning for the control strategies of chronic diseases in Hunan province, the government should pay more attention to analyze the research for treatment expenses of malignant tumor diseases, improving the correctness of malignant tumors incidence prediction and focusing on key diseases and populations<sup>[21]</sup>. At the same time, starting from the related risk factors, vigorously popularize educational activities on health knowledge of diseases, making up for the lack of awareness among the masses, making people aware of tumors can be prevented and controlled to a certain extent<sup>[22-23]</sup>, and appropriately adopt some policies and

preferential ways to advocate people to have regular health checkups and chronic disease screening to improve immunity and effectively curb the occurrence of common diseases<sup>[24]</sup>.

### **4.3 Improve medical insurance policies and reduce family health expenditure**

The proportion of family health expenditure of malignant tumors costs in Hunan province is 34.30%, while the proportion of voluntary health care payment scheme is very low, especially the enterprise financing scheme is only 0.17%. It can be seen that the financing structure of malignant tumor cost in Hunan Province is not reasonable, the proportion of family health expenditure is too high, while the enterprise financing scheme is at a low level, which makes people face a huge economic obstacle. Therefore, it is necessary for government departments to establish relief and assistance mechanisms for special groups and special disease treatment costs, focus on investment in cancer disease prevention to avoid catastrophic expenditures<sup>[25]</sup>, and appropriately increase the proportion of public financing to comprehensively review the financing structure of malignant tumor treatment costs<sup>[26]</sup>; At the same time, a solid medical security policy should be formulated to enhance the reimbursement of tumor diseases and try to increase the popularity of urban workers' and urban and rural residents' medical insurance, so that people can enjoy the benefits brought by social medical insurance<sup>[27]</sup>; Secondly, the knowledge of commercial health insurance should be popularized and promoted comprehensively, and more families or enterprises with good economic status should be encouraged to take out insurance. This will not only make it easier to transfer payments between different insurance policies, but also improve people's ability to resist disease risks, thus effectively reducing the proportion of family health expenditures, greatly improving people's quality of life, and promoting sustainable economic development<sup>[28]</sup>.

### **4.4 Hospitalization days and drug share have a significant impact on hospitalization costs for patients with malignancy**

From the conclusion of multiple linear regression analysis, the larger beta values of hospitalization days and medication ratio have a greater impact on hospitalization costs and make it easier for patients to bear an excessive medical burden. Especially for rural families, it may even lead to the phenomenon of "poverty due to illness" and "return to poverty due to illness". Therefore, for patients with malignant tumors, medical institutions should improve the quality and level of medical services, shorten the average hospitalization days<sup>[29-30]</sup>, strengthen quality management, and eliminate excessive medical treatment<sup>[31]</sup>. As for the situation of high drug ratio, payment methods such as bed-day payment, payment by disease type, capitation payment and total prepayment should be improved to reduce the occurrence of doctor-induced "large prescription" behavior<sup>[32]</sup>. At the same time, we should highlight the characteristics of Chinese medicine "treating the untreated disease", give full play to the advantages of Chinese medicine in health protection, and reduce the burden of drug costs on patients, so as to promote the health of residents and improve their quality of life<sup>[33-34]</sup>.

## **5. Conclusion**

This study on the medical expense of malignant tumor patients in Hunan province revealed that the economic burden of health expenses of malignant tumor patients is relatively heavy. Our study emphasizes the importance of reducing the economic burden of Hunan residents and identifies the main factors which influence the hospitalization costs. We suggest that hierarchical diagnosis and treatment should be promoted reasonably, focused on key diseases and populations, and medical security policies should be improved to ensure that patients with malignant tumors and their families' economic burden of disease can be reduced, last but not least, the government should increase investment for health care.

## **Declarations**

### **Acknowledgement**

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### **Author contributions**

JLL, ZJW drafted the manuscript and performed the statistical analysis. YD helped revise the manuscript. YZ did some translation help. DHC gave date support. All authors read and approved the final manuscript.

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### **Availability of data and materials**

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

### **Ethics approval and consent to participate**

The study was approved by Ethics Committee of The First Hospital of Hunan University of Chinese Medicine. All participants provided verbal consent prior to participation in the study. All methods were carried out in accordance with relevant guidelines and regulations, and the Ethics Committee of The First Hospital of Hunan University of Chinese Medicine granted that informed consent could be waived.

### **Consent for publication**

All authors consent for publication.

## Competing interests

The authors declare that they have no competing interests

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