

How the resource allocation and inpatient behavior affect the expenditures of terminal malignant tumor patients?

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Research article

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Abstract

Background: The inappropriate use of medical resources and escalating health expenditures of severe diseases patients has been a great concern in China's health system especially among terminal stage. This study aims to analyze how the resource allocation and hospitalization behavior affect the expenditures of terminal malignant tumor patients, and provide evidences on resource allocation and utilization. **Methods:** An analysis framework of influencing factors of medical expenses was built according to Andersen's Behavioral Model. Hospitalization expenditures of malignant tumor patients who died in medical institutions were tracked in Shanghai in 2016. We use path analysis to analyze the influencing factors of hospitalization expenditures at terminal stage. **Results:** Results demonstrated that hospital services and expenditures during the terminal stage were primarily in tertiary hospitals. The top three influencing factors were length of stay, number of admissions and level of medical institutions. While the influence of demographic characteristics (age, gender, type of medical insurance, etc.) was relatively low. **Conclusions:** Data suggest that hospitalization expenditures and patients' economic burden can be reduced through adjusting allocation of medical resources and service utilization, as well as reducing unnecessary hospitalization days.

Background

Malignant tumor is one of the most harmful chronic non-communicable diseases worldwide, causing serious conditions, multiple complications and excessive economic burden among patients. It has become the leading cause of death in China since 2009[i]. The specific mortality rate of malignant tumor (265.02/100,000) ranked second in all causes of death, accounting for 30.52% of the total number of deaths in 2017 in Shanghai[ii]. With incidence of malignant tumor continues to grow, researches on the influencing factors of medical expenditures of malignant tumor patients during the terminal stage has been increasing. We conducted an impact analysis of hospitalization behavior on terminal malignant tumor patients and their hospital expenditures, thus to provide evidence for a sound allocation of health funding and to improve its utilization efficiency.

Factors including gender, age, type of malignant tumor, time to death, medical institution, number of admissions, length of stay(LOS) and with/without surgery could affect the expenditures of terminal malignant tumor patients. According to Shugarman LR's research, among patients with lung cancer, colon and rectal cancer, women generated higher medical expenditures than men. The gender difference of medical expenditures was more prominent in patients of 68-74 years old due to the interaction of gender and age[iii]. Among patients dying from oral cancer, those who were under 65 years old consumed 819 dollars more than those 65 years old or above in Taiwan Region of China[iv]. Expenditures varied largely among patients of different malignant tumors, from 14,216 Euros for liver cancer to 26,712 Euros for tumors of hematopoietic and lymphoid tissue. Expenditures of brain malignant tumor were about 20 times of that of prostatic cancer during the first month after diagnosis. Observed by Blakely T, medical expenditures related closely with the disease stage, demonstrating a shape of 'U' from diagnosis to death. Medical expenditures were high during the first month after diagnosis, and decreased to a relatively low

level in the following stages, and increased again during the last month before death[v]. Reeve R found that those who died at home consumed lower medical expenditures than those who died in hospitals[vi]. Researchers also revealed that LOS, hospital level and with/without surgery were main factors that directly influence hospital expenditures[vii],[viii]. With/without surgery⁶, type of disease and age[ix] could influence hospitalization expenditures through utilization of hospital service indirectly.

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Methods

2.1 Ethics statement

The study was approved by the institutional ethics committee of Shanghai Health Development Research Center, Shanghai, China.

2.2 Analysis framework

Andersen's Behavioral Model posits that health service utilization is influenced by predisposing, enabling, and need factors[i]. Predisposing factors are mainly demographic characteristics. Enabling factors include individual resources (e.g. household income, health insurance, etc.) and social resources (e.g. access to medical resources and their prices, etc.). Need refers to subjective and objective health status[ii], [iii]. Among those factors associated with medical expenditures, gender and age belong to the predisposing factors, type of medical insurance is an enabling factor, while type of malignant tumor is classified as a need factor. Patients' utilization of health service, level of medical institutions, LOS, number of admissions and with/without surgery directly affect hospitalization expenditures. Given that predisposing factors and need factors can be slightly changed, we focused on analyzing enabling factors such as medical insurance and health service utilization behavior. The analytic framework is shown in Figure 1.

2.3 Source of data

The research population is malignant tumor patients who died in medical institutions from January 1st to December 31st, 2016, in Shanghai, China. Terminal stage refers to two years before death. The types of malignant tumor are defined by the main diagnose of the patients' last hospitalization records before their death. Hospital service utilization and expenditures data are extracted from Health Information Network of Information Center of Shanghai Municipal Health Commission. The data platform collects medical records and expenditures of all patients in medical institutions across Shanghai.

2.4 Analysis method

We used SPSS 18.0 to conduct statistical analysis. Chi-squared test was applied for categorical data. Pearson correlation coefficient was used to demonstrate correlation between variables. Path analysis model was fitted by multiple linear regression models. The significance level α was set as 0.05.

Path analysis is a derivation from multiple linear regression, explaining relationship quantitatively through covariance structure among variables. In a path analysis model, exogenous variable is affected by external variables, and endogenous variable is affected by internal variables. In this study, hospitalization expenditures and LOS were defined as endogenous variables. Logarithmic transformation was used, where $Y_1 = \lg$ hospitalization expenditures, $Y_2 = \lg$ LOS.

The influence of exogenous variables on Y_1 : Direct path coefficient = the standardized regression coefficient;

The indirect influence of exogenous variables on Y_1 : Indirect path coefficient = direct path coefficient of independent variable $Y_2 \times$ (correlation between X and Y_2);

Total path coefficient = direct path coefficient + indirect path coefficient.

Residual path coefficient $P_e = \sqrt{1 - R^2}$, R^2 is the determination coefficient of the regression equation.

Numeric data were included in the model as continuous variable. Unordered categorical variables were included as dummy variables. Level of medical institutions was classified into 7 combinations based on patients' choices. First-level and unrated hospitals and community health service centers were merged into 'first-level' in the model. Exogenous variables and value assignments can be found in Table 1.

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Results

3.1 General information

In 2016, there were 13, 835 patients died from malignant tumor in medical institutions of Shanghai, among which male accounted for 62.49%. The average age was 70.42 ± 12.70 years old. The leading types of malignant tumor were lung cancer (24.17%), gastric cancer (9.37%), colon cancer (7.05%), pancreatic cancer (5.98%) and liver cancer (5.83%). The number of admissions in the last 2 years of life amounted to 74, 500. The proportion of admissions to tertiary hospitals, secondary hospitals, first-level and unrated hospitals, community health service centers were 56.58%, 35.76%, 4.64% and 3.02% respectively. The median LOS were 7 days, 13 days and 15 days in tertiary, secondary, first-level and unrated hospitals respectively. Chi-squared test demonstrated that there was significant difference in constitution of gender and age among different levels of medical institutions ($P < 0.05$). Women and those aged 65 and above were more likely to be hospitalized in lower level institutions.

Hospital services of terminal malignant tumor patients were concentrated in institutions located in central urban areas (Figure 2). Among the top 5 hospitals with the largest number of admissions, the first one was Pulmonary Hospital (accounted for 5.27% of the total number of admissions), followed by Zhongshan Hospital (4.42%), Chest Hospital (3.63%), the Tenth People's Hospital (3.51%) and Shanghai East Hospital (2.85%). 15 of the top 20 medical institutions were tertiary hospitals, and the other 5 ones were secondary hospitals. Admissions to these 20 hospitals accounted for 53.52% of the total.

Among 13, 835 terminal malignant tumor patients in 2016, 44.87% patients were hospitalized in one single hospital and were not transferred to another hospital in the last 2 years of life, the majority of which chose tertiary hospitals. Around 90% of the patients were hospitalized in no more than three different medical institutions. Less than 1% of patients transferred to more than seven medical institutions.

At the municipal level, a large number of patients were transferred to tertiary hospitals. Hospitals in central urban areas were closely connected with each other, receiving a large number of patients transferred from other hospitals. That was probably due to the central geographic location therefore it was convenient for referral. While at the district level, the figure demonstrated different patterns. In suburbs like Jinshan, Fengxian and Qingpu District, patients were mainly hospitalized within the district, and the majority of patients were transferred into regional tertiary hospital in these suburbs.

3.2 Hospitalization expenditures of different levels of institutions

Medical services for malignant tumor patients were mainly provided by tumor hospitals and oncology departments of comprehensive hospitals. Among them, the number of beds in tertiary hospitals accounted for 55.55% of the total number of beds in Shanghai, while the proportion of admissions and hospitalization expenditures accounted for 56.58% and 56.94%. Per-admission hospitalization expenditures ranged from RMB 21, 000 to RMB 235, 000 Yuan among different levels of hospitals, while the number was RMB 7, 900 yuan in community health service centers. Per-day hospitalization expenditures of tertiary hospitals were 2.10 times of that of first-level and unrated hospitals, 9.96 times of that of community health service institutions (Figure 3).

The out-of-pocket payment in Shanghai includes the self-paid expenditures beyond the scope of medical insurance and copayment within the insurance coverage. The out-of-pocket payment rate of tertiary hospitals was the highest (30.58%), and the rate increased by level of institutions. The patients' copayment rate ranged from 15.98% to 17.22% in the secondary and tertiary hospitals, and that of first-level hospitals and community health service centers ranged from 7.94% to 8.01%. However, self-paid rate beyond the scope of medical insurance of tertiary hospitals was 13.36%, which was much higher than that of first-level (5.52%) and secondary hospitals (8.23%). The rate of community health service centers was only 0.8% (Figure 4).

3.3 Correlation between service utilization and expenditures

In our research, the number of hospitalizations for each terminal malignant tumor patients varied from 1 to 51 times in the last 2 years of life, the median was 7 times. Patients' number of admissions was positively correlated with total hospitalization expenditures ($r=0.6927$). The interval of hospitalization days ranged from 1 to 726 days, the median was 9 days. Patients' hospitalization days were associated with the increase of hospitalization expenditures ($r=0.7792$). Thus the number of admissions and LOS were both correlated with total hospitalization expenditures.

3.4 Path analysis on influencing factors of terminal malignant tumor patients' hospitalization expenditures

In the first equation, Y_1 (lg hospitalization expenditure) was defined as dependent variable, Y_2 (lg LOS) and other exogenous variables were defined as independent variables, multiple stepwise regression analysis was conducted ($F=2556.576$, $P=0.000$, $R_a^2=0.758$). In the second equation that Y_2 (lg LOS) was set as the dependent variable, test of the model also got a significant result ($F=377.166$, $P=0.000$, $R_a^2=0.303$). Fitted path models were as follows:

$$Y_1=3.417+0.676Y_2+0.499X_7+0.322X_{5-6}+0.320X_{5-5}+0.301X_6+0.177X_{5-2}+0.169X_{5-4}-0.131X_{5-1}+0.124X_{5-3}-0.101X_2-0.064X_{4-3}-0.061X_{3-2}+0.008X_{4-4}-0.008X_1+0.006X_{4-2}-0.053X_{4-1}-0.005X_{4-5} \quad (1)$$

$$Y_2=1.470+0.518X_7+0.117X_6-0.108X_{5-6}-0.099X_{3-1}-0.095X_{5-5}-0.091X_{4-1}-0.078X_{3-2}+0.055X_2-0.052X_{5-3}-0.047X_{5-4}+0.043X_{5-1}-0.041X_{4-3}+0.026X_1-0.025X_{4-5}-0.024X_{4-4}-0.020X_{4-2} \quad (2)$$

The standardized regression coefficient of model (1) showed that factors influencing malignant tumor patients' hospitalization expenditures in order were LOS, number of admissions, level of medical institutions and with/without surgery. The effect of influencing factors in model (2) showed that number of admissions, level of medical institutions, with/without surgery, insurance scheme, type of malignant tumor, gender and age not only influenced hospitalization expenditures directly, but also affected hospitalization expenditures through their impact on LOS indirectly. The results suggested that demographic characteristics, namely age (-0.101), gender (-0.008), type of malignant tumor and insurance scheme (-0.061) had less impact on hospitalization expenditures compared with utilization factors. The impact of LOS ranked first, followed by number of admissions, level of institutions and with/without surgery. Those who were hospitalized only in tertiary hospitals and in both tertiary and secondary hospitals generated higher expenditures. As shown in Table 2 and Figure 5.

Discussion

4.1 Differences of hospitalization utilization and expenditures among institutions

Hospitalization utilization and expenditures of malignant tumor decedents mainly occurred in tertiary hospitals in Shanghai. The institutional distribution of hospital service and expenditures basically corresponded with bed allocation. Tertiary hospitals owned the most beds, and terminal patients tended to choose these hospitals. Along with the requirement of curtailing LOS by the government, patients in tertiary hospitals were usually transferred to secondary hospitals in central urban areas after acute stage.

Although patients had a lower economic burden in first level and below hospitals, only 7.65% of hospitalizations happened in these institutions. On the one hand, it may due to the limited resources of lower level institutions. Tumor beds of secondary and tertiary hospitals accounted for 86.14% of total tumor beds in Shanghai, while beds of first level and below hospitals only accounted for 13.86%. There

were no tumor beds in community health service centers, but hospice care beds were set which mainly provide services for terminal malignant tumor patients. On the other hand, the relatively weak ability and policy limitation on medical equipment has restricted the service delivery of community health service centers. Community hospice care mainly covered supportive treatment such as pain relieving. Medicines for regular nutritional support (e.g. lipid emulsion) were not available, which can hardly meet the needs of terminal patients.

The per-admission expenditures among different levels of medical institutions varied little. However, the per-day hospitalization expenditures were highest in tertiary hospitals, which was double that of first-level hospitals, 10 times that of community health service centers. The proportion of out-of-pocket was also the highest in tertiary hospitals. The differences can be explained by the severity of the disease, treatment method as well as charging standards of different levels of medical institutions. Tertiary hospitals usually provide acute treatment for malignant tumor patients and refer them to lower level medical institutions for rehabilitation. Treatment expenditures are, to a large extent, influenced by doctors' beliefs and practice habit[i]. Tertiary hospitals mainly provide intensive treatment with high technology, while symptomatic treatment and supportive therapy are provided in first-level hospitals and community health service centers[ii]. The charging standard of medical services increases with the level of medical institutions. For instance, hospitalization examining fee in first-level hospital is RMB 18 yuan per day; while in tertiary hospital, it is RMB 50 yuan per day. Ward of grade C costs RMB 28 yuan per day in first-level hospitals, while costs RMB 58 yuan per day in tertiary hospitals. High level hospitals are equipped with advanced medical devices, having more skilled specialists, new technology and treatment methods, hence prices of related services in these institutions are set at a higher level.

4.2 Influencing factors of hospitalization expenditures and their interactions

The results of path analysis showed that predisposing factors, namely age, gender, type of medical insurance, and type of malignant tumor have less impact on hospitalization expenditures compared with utilization factors. Correlation analysis also demonstrated that the number of admissions and LOS were positively related with hospitalization expenditures. This study emphasized on the optional way to reduce terminal malignant tumor patients' hospitalization expenditures through adjusting and controlling service utilization.

(1) LOS and number of admissions

The impact of LOS on hospitalization expenditures ranked the first. LOS was positively related to hospital expenditures²⁶, and it was also the medium factor²⁶ through which other variables can influence hospitalization expenditures^{9,10}. Several researches in China demonstrated that malignant tumor patients had a certain proportion of unnecessary hospitalizations, for instance, long hospitalization day without treatment before surgery, resulting in the increase of expenditures such as bed fee and comprehensive service fee[iii][iv][v]. In 2016, there were 19 malignant tumor patients that had long-term hospitalization in terminal stage (the total hospitalization day reached 730 days). There were 1% of

patients stayed more than 426 days, and 5% of patients stayed more than 208 days. According to the interview of key informers, some patients just need supportive care and considered medical institutions as elderly homes. As to the number of admissions, it not only impacted hospitalization expenditures directly, but also influenced hospitalization expenditures through LOS.

(2) Level of medical institutions

Taking patients hospitalized only in first-level hospitals as the reference, patients choosing other institutions brought higher expenditures. Patients hospitalizing only in tertiary hospitals had the largest direct path coefficient, that is, when other factors were controlled, their hospitalization expenditures at terminal stage were the highest. However, level of medical institutions was negatively associated with LOS, partly due to the high proportion of severe diseases and short LOS of tertiary hospitals. The median LOS was 7 days in tertiary hospitals and 13 days in secondary hospitals. Expenditures of patients hospitalized in both secondary and tertiary hospitals were the second highest.

(3) With/without surgery

Among utilization factors, the total path coefficient of surgery was 0.301, both direct and indirect path coefficients were positive. Hospital expenditures of patients who had surgery were higher than those who didn't. Its influence on hospital expenditures ranked the fourth, mainly caused by high cost of operation, post-operative nursing, drugs and high-value consumables⁵ which was consistent with the results of NL Keating, et al^{7,15}.

(4) Demographic characteristics

Total path coefficient of the influence of age on hospitalization expenditures was -0.101, meaning that elderly patients generated lower hospitalization expenditures. A plausible explanation was that elderly patients tended to receive less aggressive treatments^{5,[vi],[vii]}. Total path coefficient of gender is -0.008, that was, men generated higher hospitalization expenditures than women, which was probably due to higher prevalence of unhealthy habits among men. Women's relatively poor economic status and Chinese traditional preference for men also had an impact^{8,[viii]}.

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Conclusions

Hospitalization utilization and expenditures of terminal malignant tumor patients were concentrated in tertiary hospitals in Shanghai. There was little difference of per-admission expenditures among different levels of medical institutions. However, per-day expenditures and self-paid rate in tertiary hospitals were the highest. The influencing factor analysis demonstrated that LOS, number of admissions and level of medical institutions were the top 3 influencing factors of terminal patients' hospitalization expenditures. Expenditures of patients hospitalized in tertiary hospitals, and in both secondary and tertiary hospitals were higher; while those hospitalized in first-level hospitals and community health service centers generated lower expenditures. With/without surgery ranked the 4th among influencing factors. Demographic characteristics (age, gender, type of medical insurance, etc.) had less influence compared with utilization factors.

The variation of terminal malignant tumor patients' hospitalization expenditures is considered as an important indicator of evaluating treatment intensity¹⁶. In the ageing society, the number of chronic disease patients, especially malignant tumor patients, has been increasing. Their demand for medical services grows dramatically, which brings challenges to the delivery of health services and patients' affordability. Statistical analysis demonstrated that total hospitalization expenditures and burden of terminal patients can be reasonably reduced through improvement of medical resource allocation and utilization. Firstly, it is suggested to increase tumor beds in low level institutions and to change the inverted structure of medical resources. First-level hospitals and community health service centers have

lower hospitalization expenditures and out-of-pocket payment, hence economic burden of patients can be reduced by transferring more patients to these institutions. Secondly, it is proposed to strengthen secondary hospitals' treatment ability and to avoid referring patients to tertiary hospitals^[i]. Thirdly, multiple measures should be taken to improve efficiency and to relieve patients' economic burden while providing quality care^[iii]. It is recommended to implement clinical pathway and prompt examinations to shorten waiting time before surgery, so as to reduce unnecessary bed days^{24,26}. For incurable terminal patients, more at home care should be provided instead of staying in hospitals²⁰.

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Abbreviations

LOS: length of stay

UEBMI: Urban Employee Basic Medical Insurance

URBMI: Urban Resident Basic Medical Insurance

NRCMS: New Rural Cooperative Medical System

Declarations

Availability of data and materials

The data that support the findings of this study are available from Information Center of Shanghai Municipal Health Commission but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Information Center of Shanghai Municipal Health Commission.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

FL designed the analysis framework and substantively revised the manuscript. BZ was a major contributor in writing the manuscript. PS analyzed the data regarding hospital utilization. CJ was in charge of acquisition of data and revision. All authors read and approved the final manuscript.

Ethics approval and consent to participate

The data we used in this study were retrieved from the administrative data platform of Shanghai Municipal Health Commission, on which the medical record data are collected under the Regulation of Shanghai Health and Family Planning Statistics Survey. The data we collected have gone through desensitization process and were not linked to specific individual. The data presented in this study represented a whole group of population instead of specific participant. Hence either written or verbal consent of each participant was not applicable in this case. The data collecting process was approved by the institutional ethics committee of Shanghai Health Development Research Center, Shanghai, China.

Consent for publication

Not applicable.

Acknowledgements

Data of this study were collected from Information Center of Shanghai Municipal Health Commission, including patients' hospitalization records of all medical institutions in Shanghai. However, we were unable to retrieve other demographic data, for instance, family scale, income and resident mode^{[i],[ii]}. Thus, these factors are not included in the analysis. However, this study focuses on controllable utilization factors while most demographic factors are uncontrollable, thus the results till provide a reference for optimizing health resource allocation and utilization.

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Tables

Table 1: Variables and value assignments of the regression model

Variable	Assignment	Variable code
Gender	1=male 2=female	X_1
Age	Actual value (years old)	X_2
Type of medical insurance	Urban Employee Basic Medical Insurance (UEBMI)	$X_{3-1}=1 X_{3-2}=0$
	Urban Resident Basic Medical Insurance (URBMI)	$X_{3-1}=0 X_{3-2}=1$
	New Rural Cooperative Medical System (NRCMS)	reference
Type of malignant tumor	Lung cancer	$X_{4-1}=1 X_{4-2}=0 X_{4-3}=0 X_{4-4}=0 X_{4-5}=0$
	Gastric cancer	$X_{4-1}=0 X_{4-2}=1 X_{4-3}=0 X_{4-4}=0 X_{4-5}=0$
	Liver cancer	$X_{4-1}=0 X_{4-2}=0 X_{4-3}=1 X_{4-4}=0 X_{4-5}=0$
	Colon cancer	$X_{4-1}=0 X_{4-2}=0 X_{4-3}=0 X_{4-4}=1 X_{4-5}=0$
	Pancreatic cancer	$X_{4-1}=0 X_{4-2}=0 X_{4-3}=0 X_{4-4}=0 X_{4-5}=1$
	Others	reference
Level of institution	First-level and secondary	$X_{5-1}=1 X_{5-2}=0 X_{5-3}=0 X_{5-4}=0 X_{5-5}=0 X_{5-6}=0$
	First-level, secondary and tertiary	$X_{5-1}=0 X_{5-2}=1 X_{5-3}=0 X_{5-4}=0 X_{5-5}=0 X_{5-6}=0$
	First-level and tertiary	$X_{5-1}=0 X_{5-2}=0 X_{5-3}=1 X_{5-4}=0 X_{5-5}=0 X_{5-6}=0$
	Secondary	$X_{5-3}=0 X_{5-3}=0 X_{5-3}=0 X_{5-4}=1 X_{5-5}=0 X_{5-6}=0$
	Secondary and tertiary	$X_{5-3}=0 X_{5-3}=0 X_{5-3}=0 X_{5-4}=0 X_{5-5}=1 X_{5-6}=0$
	Tertiary	$X_{5-3}=0 X_{5-3}=0 X_{5-3}=0 X_{5-4}=0 X_{5-5}=0 X_{5-6}=1$
Surgery	First-level	reference
	0=No 1=Yes	X_6
Number of admissions	Actual value	X_7
Length of stay	$Lg(Y_2)$	Y_2

Table 2 Influencing factors of terminal malignant tumor patients' hospitalization expenditures in Shanghai in 2016

variable	Direct path coefficient	Indirect path coefficient	Total path coefficient	Rank	Correlation coefficient with Y ₁	Correlation coefficient with Y ₂
Gender	-0.027	0.019	-0.008	13	-0.028	0.028
Age	-0.065	-0.036	-0.101	10	-0.192	-0.053
Residents' type of medical insurance	-0.042	-0.019	-0.061	12	-0.100	-0.028
Type of malignant tumor						
Lung cancer	-0.016	-0.037	-0.053	15	-0.052	-0.055
Gastric cancer	0.010	-0.003	0.006	14	0.013	-0.005
Liver cancer	-0.018	-0.047	-0.064	11	-0.074	-0.069
Colon cancer	0.011	-0.003	0.008	13	0.000	-0.004
Pancreatic cancer	0.017	-0.022	-0.005	16	-0.009	-0.032
Level of medical institutions						
First-level and secondary	0.081	0.050	0.131	7	-0.058	0.074
First-level and tertiary	0.128	-0.004	0.124	8	-0.040	-0.006
First-level, secondary and tertiary	0.110	-	0.110	9	0.085	0.099
Secondary	0.228	-0.059	0.169	6	-0.152	-0.087
Secondary and tertiary	0.294	0.026	0.320	4	0.139	0.039
Tertiary	0.333	-0.011	0.322	3	0.126	-0.017
Surgery	0.175	0.126	0.301	5	0.392	0.187
Number of admissions	0.150	0.348	0.499	2	0.577	0.515
Lg LOS	0.676	-	0.676	1	0.793	1.000

Figures

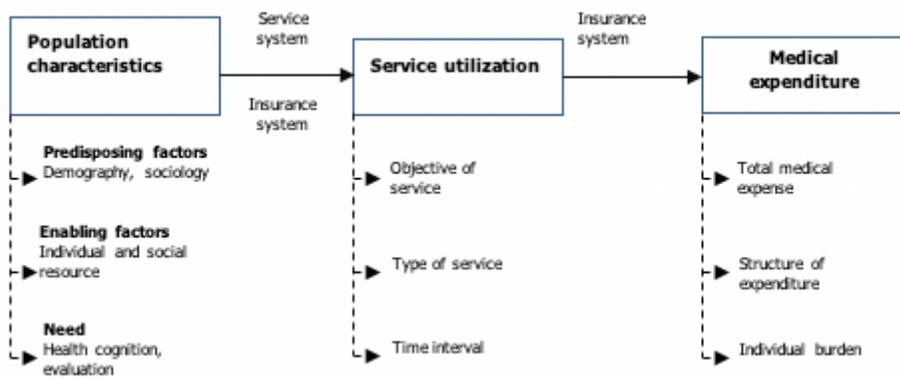


Figure 1

Influencing factor analysis framework of medical expenditures

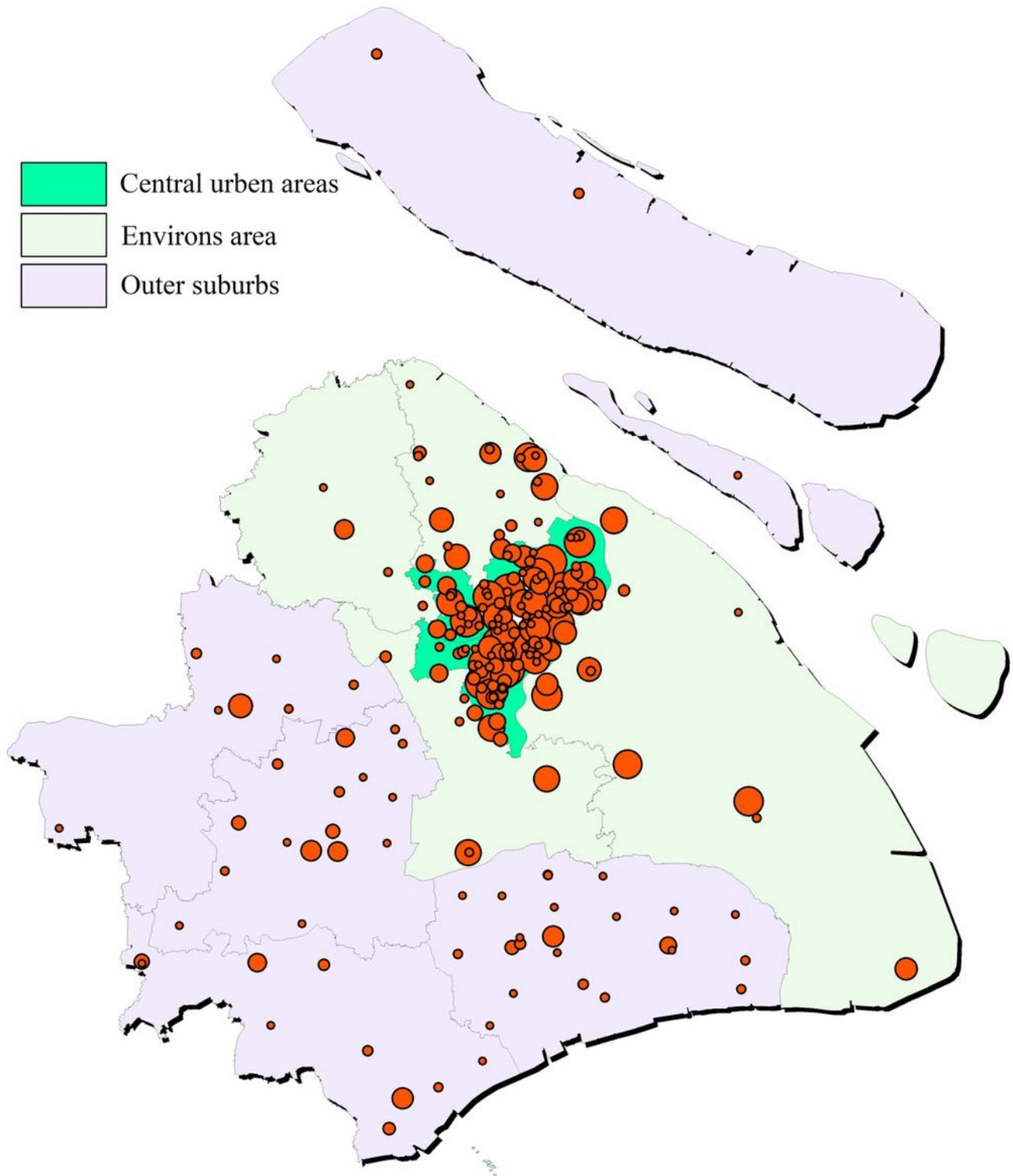


Figure 2

Institution distribution of terminal malignant tumor patients' hospitalization services in Shanghai in 2016. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

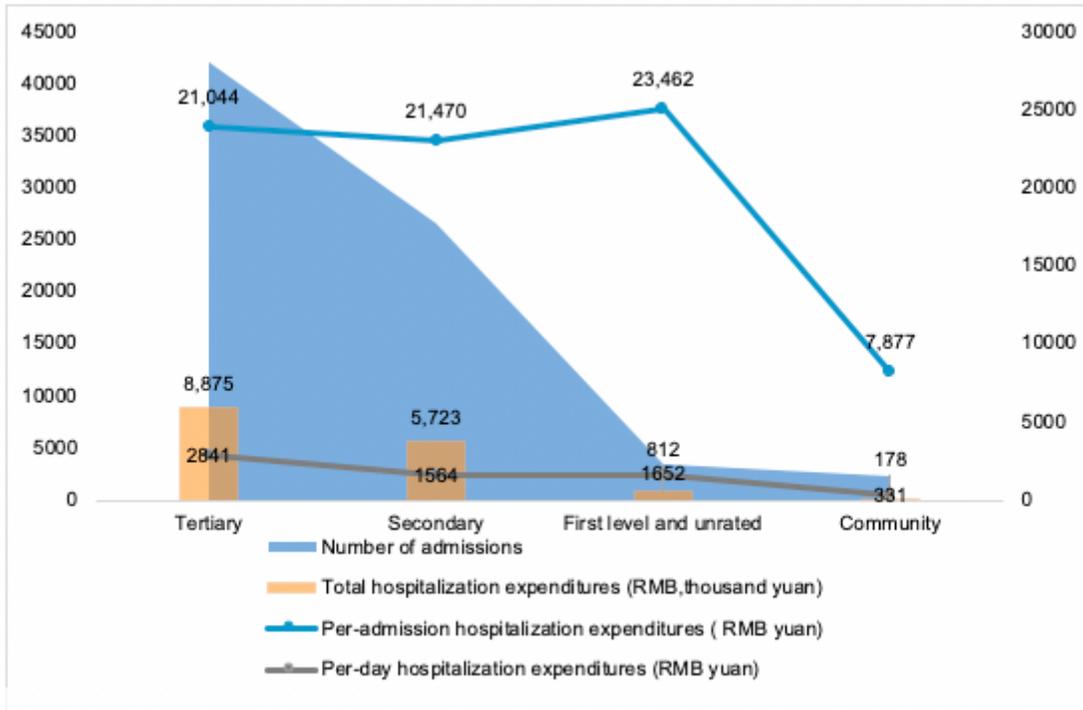


Figure 3

Comparison of terminal malignant tumor patients' hospitalization expenditures in different levels of institutions of Shanghai in 2016

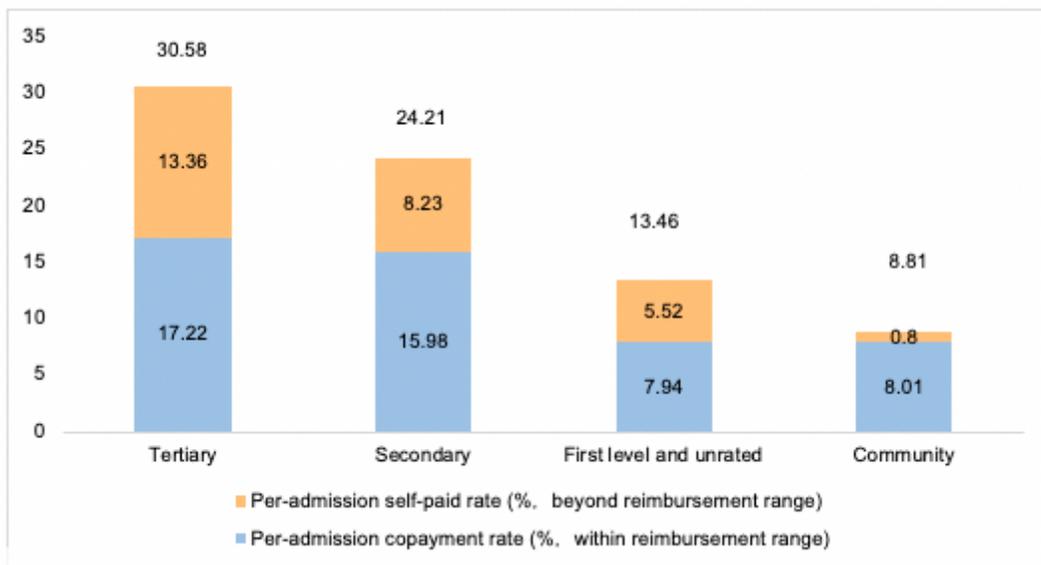


Figure 4

Self-paid structure of terminal malignant patients' hospitalization expenditure in different levels of institutions of Shanghai in 2016 (%)

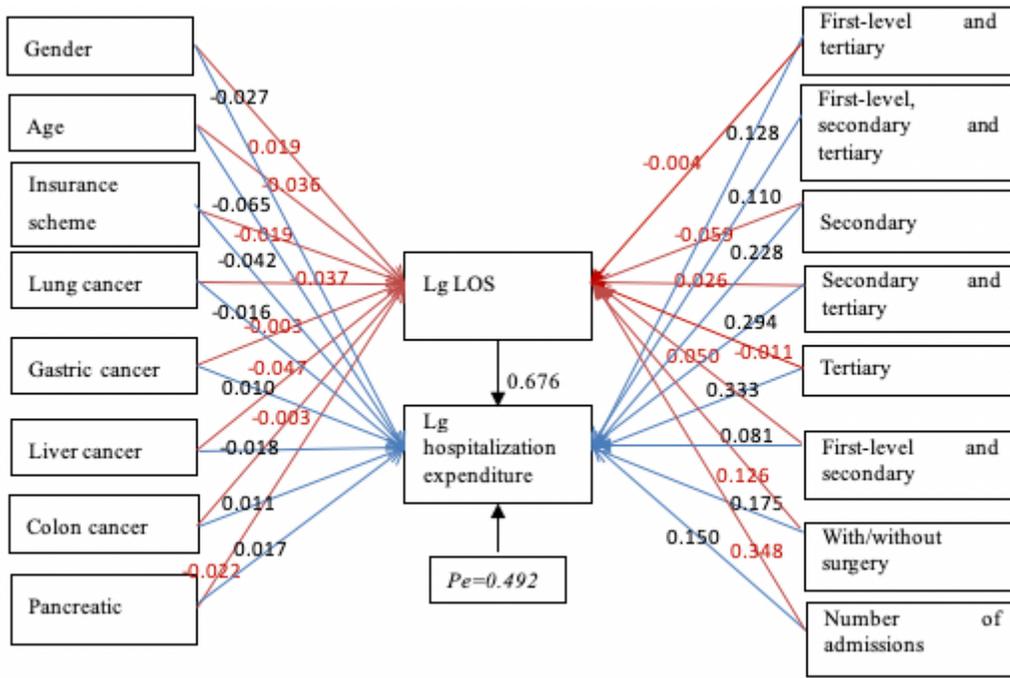


Figure 5

Path figure of terminal malignant tumor patients' hospitalization expenditures in Shanghai in 2016