Disparities in the utilization of ischemic stroke inpatient services in China: the role of urban basic health insurance

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Abstract

Background As one major disease threatening human health, stroke has placed a heavy financial burden on patients worldwide. This study aims to confirm whether there are disparities and inequity in the utilization of inpatient health services for stroke inpatients covered by different health insurance schemes. **Methods** We conducted statistical analysis based on the data containing urban employee-based basic medical insurance scheme (UEBMI) and urban resident-based basic medical insurance scheme (URBMI) groups, supplied by the China Health Insurance Research Association (CHIRA). Descriptive analysis was the main method to finish this analysis. **Results** Of the 56485 inpatients who had been diagnosed with ischemic stroke, extracted from the CHIRA claimed database, 64.6% (36487) were covered by UEBMI and 35.4% (19998) were covered by URBMI; the mean age of UEBMI subgroup was slightly older than URBMI subgroup (68.64 and 67.45 years old). The annual frequency of hospitalization of UEBMI subgroup was 1.21 times and 1.15 times for URBMI subgroup. The average length of stay of UEBMI subgroup(13.93days) was longer than URBMI subgroup (10.82 days). The UEBMI group had a higher hospitalization costs but fewer out-of-pocket costs: for the UEBMI subgroup, the average hospitalization cost was RMB11187.64(\$1724.02), the average total out-of-pocket costs was RMB2646.42(\$407.81). While for the URBMI subgroup, the average hospitalization cost was RMB6402.27(\$986.59) and the average total out-of-pocket costs was RMB2746.10(\$423.17). All the above differences were significant($P<0.001$). Meanwhile, patients with UEBMI had higher reimbursement rate (82.65% and 63.82%). **Conclusions** We found that there were nonnegligible disparities in the utilization of inpatient health services between UEBMI and URBMI as well as health inequity and financial protection inequity. Thus, our results call for a systemic strategy to improve the fragmented social health insurance system and narrow the gap in health insurance schemes in China.

Background

Expanding health insurance coverage has always been a main approach to strengthen financial protection and improve healthcare accessibility. (1, 2). In 2005, WHO encouraged its members to achieve Universal Health Coverage (UHC) goals(3). Afterward, many countries, such as Mexico(4) and Myanmar(5) had taken effective measures to expand health coverage. In the process of achieving UHC goals, low-level insurance coverage, as well as disparities in social health insurance schemes, were gradually getting severely, which would hinder the equity of health to a great extent(6, 7). Especially health inequity caused by disparities in social health insurances has drawn more and more attention (8-10). Many studies(11, 12) has shown that disparities in health insurance schemes were huge barriers for health equity. Health services utilization has been considered as one of the important elements of health equity, which is also the focus of current studies(13, 14)

Over the past few decades, the health insurance system in China has been improved a lot and the insured rate has been over 95% since 2017. Meanwhile, more than 1.35 billion people have been covered by basic medical insurance in 2018 (15). There are three main health insurance schemes in China: the rural new cooperative medical scheme(NCMS),urban resident-based basic medical insurance scheme(URBMI) and

urban employee-based basic medical insurance scheme(UEBMI) (16). However, wide gaps exist in different health insurance schemes. The main disparities lay in target population, source of funding, funding level ,administration and benefit packages(17, 18).Among the three health insurance schemes, the NCMS is applied to rural residents, UEBMI and URBMI are designed for urban residents which are also the focus of this paper. Table 1 exhibits some details of the disparities between UEBMI and URBMI(16). Some of these would cause inequity in health care utilization(18, 19)posing the heavy financial burden and making people's financial risk protection in an unequal and inadequate situation(20, 21).

Many scholars have studied the disparities in health care utilization under different health insurance schemes from the perspective of one certain disease. A study(22) shows that the UEBMI subgroup had higher statistics in the utilization of mental health inpatient services than the URBMI subgroup.. Another study(23) found that tuberculosis patients who covered by the UEBMI had higher inpatient expenses than patients who were covered by URBMI. Nevertheless, there is seldom research about the utilization of stroke inpatient services under different health insurance schemes in China by now.

Stroke is the second most common cause of death after myocardial infarction worldwide, with the feature of high morbidity, mortality and mutilation rates, as well as heavy financial burden (24, 25). There are 10 million new cases of strokes and 6.5 million people die from stroke every year around the world(26). On average, one-year healthcare and societal costs in Italy amounted to \$13376 and \$22720 per stroke survivor(27), The economic burden caused by ischemic stroke was \$3.658 billion in Korea in 2015, the average economic burden per stroke case was about \$7247(28). The average inpatient expenditure per visit for each ischemic stroke patient in China from 2010 to 2015 was \$1,498(29). Additionally, stroke imposes serious family burden to patients (30, 31).

Although many studies have been done on economic burden of stroke, there is lack of research on disparities in the utilization of medical services due to different insurance coverage. In this study, based on data from the UEBMI and URBMI population in China in 2015, we aim to study the disparities in the utilization of inpatient health services between UEBMI and URBMI. Possible explanations for the disparities in the utilization were provided at last.

Materials And Methods

Data sources

In this study, we extracted data from the UEBMI and URBMI population, a 5% random sample of beneficiaries in China from January 1st, 2015 to December 31st, 2015. We had the medical information for each ischemic stroke inpatient, including age, date of visit, health institute name, primary diagnosis (classified according to International Classification of Diseases, 10th edition (ICD-10)), and the city of residence. Besides, the cost of per inpatient and length of hospital stay (LOS) were also included.

Indicators

In this study, we regarded the annual frequency of hospitalization, the average length of stay (ALOS) and the average hospitalization cost of ischemic stroke patients as indicators to reflect inpatient healthcare services utilization, based on related research (32-34). All costs mentioned in this study were adjusted according annual exchange rate between dollar and RMB in 2015: \$1.0 = RMB6.2284(35).

The total out-of-pocket (OOP) costs were categorized as OOP cost within insurance and OOP cost beyond insurance. The former refers to the medical expenses that patients need to pay after the reimbursement, the latter referred to out-of-pocket cost which couldn't get reimbursed by health insurance.

Statistical analysis

We firstly divided the individuals into different groups according to factors which had an impact on utilization of inpatient health services (36). Descriptive analysis was used to calculate the demographic information of hospitalized patients; afterward. The chi-square test was employed to analyze the differences between UEBMI and URBMI within each subgroup. Secondly, descriptive statistics [mean, standard deviation, percentage, frequency] were calculated for the annual frequency of hospitalization, the average length of stay, the average hospitalization costs, the average out-of-pocket costs and reimbursement rate. Since the frequency of hospitalization, LOS and hospitalization cost data had a skewed distribution, we adopted Mann–Whitney test to identify whether the differences in patients' utilization of inpatient health and OOP costs of two health insurance schemes were statistically significant. A P-value of less than 0.05 was considered statistically significant. All statistical calculations were performed using STATA version 15.0.

Results

Basic information of sample

As shown in Table 2 (see Supplementary Files), a total of 56485 ischemic stroke inpatients were included in our analysis, of whom 64.6% (36487) were covered by UEBMI and 35.4% (19998) were covered by URBMI. The average age of UEBMI subgroup was 68.64 years old, while that of URBMI sub group was slightly younger (67.45 years). Nearly half of the patients (47.68%) choose second-class hospital to have their medical treatment and 32.65% (18443) sought medical advice in tertiary hospitals. Besides, 46.4% (26184) of the patients were in hospital in the midland and 36.91% (20850) the east respectively. Most of the patients (53.97%) received medical treatment in prefecture-level cities.

Utilization of inpatient health services for stroke patients

Table 3-Table 5 (see Supplementary Files) describes the utilization of inpatient health services among UEBMI subgroup and URBMI subgroup. The annual frequency of hospitalization among patients covered by UEBMI (1.21 times) was more than those covered by URBMI (1.15 times) ($P < 0.001$). Furthermore, annual frequency of hospitalization between patients with UEBMI scheme and patients with URBMI

scheme significantly differed according to gender, hospital levels, level of cities, and composition (all $P < 0.001$) (see Table 3).

There was a statistically significant difference in the average length of stay between UEBMI group and URBMI group according to gender, age group, hospital levels, area, administrative level of cities, and composition (all $P < 0.001$) (see Table 4). The average length of stay (ALOS) for ischemic stroke inpatients with the UEBMI (13.92 days) was longer than patients with the URBMI scheme (10.82 days).

The inpatient hospital costs between the UEBMI group and URBMI group were found significantly differed according to gender, age group, hospital levels, area, administrative level of cities, and composition (all $P < 0.001$) (see Table 5). Overall, the mean total hospitalization costs in the UEBMI subgroup (¥11187.64/\$1724.02) was higher than URBMI subgroup (¥6402.27/\$986.59).

Composition of average total hospitalization costs

Table 6 (see Supplementary Files) describes the composition of average total hospitalization costs per patient of each insurance type. We found that patients with UEBMI (¥2646.42/\$407.81) had lower average total OOP cost than those with URBMI (¥2746.10/\$423.17), although patients with UEBMI (¥11187.64/\$1724.02) had much higher average total hospitalization costs than those with URBMI (¥6402.37/\$986.61). The reimbursement rates of hospitalization costs were 82.65% and 63.82% for UEBMI and URBMI. Obviously, the average reimbursement rate of UEBMI was higher than that of URBMI. That's because patients covered by different insurance schemes enjoyed different benefit as indicated in Table 1. Patients with UEBMI scheme had fewer OOP costs within insurance (¥1793.35/\$276.36) than patients with URBMI scheme (¥2072.85/\$319.43), while the OOP costs beyond health insurance of UEBMI subgroup (¥853.06) was higher than URBMI subgroup (¥673.24/\$103.75). There was a statistically significant difference in the OOP cost between UEBMI and URBMI ($P < 0.001$).

Discussion

Stroke patients in China are increasing at a rate of nearly 9% per year, with a high proportion of high-risk groups existing at the same time(37, 38). Ischemic stroke (IS), primary intracerebral hemorrhage (ICH), and subarachnoid hemorrhage (SAH) are major pathological types of stroke. Among them, IS has the highest number of cases (39). There is a gap in the utilization of health services among stroke patients covered by different health insurance schemes (40).

Our study provides clear empirical evidence that there are remarkable disparities between UEBMI and URBMI on the utilization of ischemic stroke inpatient health service in China. Health inequity and financial protection inequity exist between the two schemes at the same time. Compared with ischemic stroke inpatients covered by UEBMI, those who covered by URBMI have gotten less inpatient health care but have more OOP cost. The disparity on reimbursement rate may be the main possible explanation (41). The source and level of financing for UEBMI and URBMI are different, which affects the amount of funds available for patients and then results in different reimbursement levels and anti-risk capacity (23, 42,

43). Reimbursement rate can exert an impact on patients' psychological states. As reimbursement rate increasing and out-of-pocket costs decreasing, patients tend to use more and better health services(42, 44).

Meanwhile, the OOP cost beyond insurance of UEBMI group was higher than that of URBMI group. Patients covered by UEBMI generally have stable jobs and higher income, and this endow them greater capacity and willingness to pay for health services (14). A study indicates that compared with inpatients covered by URBMI, those with UEBMI tend to visit higher level of medical institutions and are more likely to prescribe expensive medicines(19).

The annual frequency of hospitalization of UEBMI subgroup was higher than that of URBMI subgroup. This might associate with income and other factors. Patients with UEBMI are more likely to use inpatient services, while patients with URBMI used more outpatient services(45). Patients covered by UEBMI possibly have higher degree of education, as well as more attention to personal health(46). In that case, patients with UEBMI scheme go to the hospital more often. Meanwhile, socioeconomic status and education level are also considered as an important influential factor in pre-hospital delay, which will affect the LOS for ischemic stroke inpatients(47).

Government policies and incentives are the leading influencing factors(48) of average length of stay(ALOS) , which is also affected by immediate causes such as stroke type as well as stroke severity (49). A study (40)in the US shows that the ALOS was significantly longer for stroke patients with Medicaid than those with private insurance by more than 2 days, which demonstrates that the effect of different health insurances on the ALOS could not be ignored. Inpatients with UEBMI had longer ALOS than inpatients with URBMI in this study(12). This might be caused by higher financial protection of UEBMI. Under the protection of health insurance, cerebral infarction inpatients with higher financial supports tend to lengthen their LOS, although there is no need for more treatments (50).

We found that patients with UEBMI had higher hospitalization costs, which is consistent with existing researches (51, 52). This might be explained from doctors' behavior. Depending on a patient's health insurance status, different therapeutic schedules would be considered by doctors, which could result in the differences in the effectiveness of stroke treatment (53, 54). Additionally, supply-induced demand may be another involved behavior of doctors. A study (55)has shown that under the influence of supply-induced demand, a higher benefit level for a health insurance scheme was associated with a stronger impact on total medical expenses. Secondly, inpatients with URBMI had obviously lower hospitalization cost. The possible explanation is that URBMI seems to haven't offered strong financial protection. Inpatients with URBMI are unable to afford high hospitalization cost if they want to get equal health services to those with UEBMI(56). Worrying about that catastrophic health expenditure would happen, they had reduced the use of health services. Partly due to the high economic burden of treatment, some stroke patients without health insurance and have a low family-income had given up visiting hospitals(57). Last but not least, higher hospitalization costs for UEBMI subgroup may be associated with longer length of stay(58, 59).

In order to improve fragmented social health insurance system and narrow the gap in health insurance schemes in China, the government officially launched the medical security system for urban and rural residents, covering people used to be covered by URBMI and NCMS in 2016(60). A gap between urban and rural residents in terms of contribution levels, financial subsidies and treatment had been narrowed(61). Nevertheless, the disparities between urban-rural resident medical insurance and UEBMI still exists. Consequently, to consolidate the social health insurance schemes gradually may be a long-term work. The key point is to unite the funding levels ,cost-sharing methods, standards of payment systems and service provisions of different schemes (16). All of these can play a positive role in improving health equity. However, to achieve UHC and improve the financial protection ability of health insurances, more systemic and effective strategies are in need.

Limitations

Limitation of this analysis is that we have only compared disparities in the utilization of ischemic stroke inpatient services between UEBMI and URBMI, which are also called the urban basic health insurance. Consequently, this analysis does not account for the disparities among all health insurance schemes in China. In order to have a more comprehensive compare in disparities in the utilization of ischemic stroke inpatient services between health insurance schemes in China, the NCMS should be taken account of in the future.

Conclusion

Large disparities exist between UEBMI and URBMI in the utilization of ischemic stroke inpatient health services in China, which has caused health and financial protection inequity. Financial support has been a major factor influencing ischemic stroke patients to seek more inpatient health care. The reimbursement ratio of health insurance can be a crucial policy tool to improve inequality.

Our findings have important implications for policy-making, especially in consolidating the social health insurance schemes, reducing the economic burden caused by stroke and improving health equity. Meanwhile, this implication has an international significance: stroke has always been a global disease, and effective measures are in need to control it. This study has proved that health insurance was an important factor in stroke treatment, which provides direction for it. Furthermore, the UHC is also a significant global action—this study provides a valuable reference for it—especially in countries where the health insurance system is fragmented. It's worth improving health equity and strengthening the financial protection of vulnerable groups covered by health insurance by narrowing the gap between different health insurance schemes in China.

Abbreviations

UEBMI: Urban Employee's Basic Medical Insurance;

URBMI: Urban Resident Basic Medical Insurance;

UHC: universal health coverage

Declarations

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Availability of data and materials

The dataset analyzed during this study can be available by the authors with permission from the China Health Insurance Research Association as we do not have permission to make data containing medical information of ischemic stroke inpatients publicly available.

Authors' Contributions

While conducting this study, Y.Y. played a role in putting forward the idea as well as analyzing these data and writing the manuscript. X.W.M. played a large role in analyzing these data and editing the manuscript. S.L., Q.B., X.W., L.Y.H. and Y.W.G. played an important role in developing the idea as well as interpreting the data analysis. P.W.Z. and Y.M. played role in overseeing data collection. X.F.S. played a large role in collecting these data, developing the idea and editing the manuscript.

Ethics approval and consent to participate

The study was considered as exempt from ethical approval by the institutional review board of the authors' institute for we had taken advantage of deidentified aggregated data instead of individual data. Consequently, the requirement of informed consent was waived.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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Tables

Due to technical limitations, tables 1 - 6 are only available as a download in the supplemental files section.

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