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Review Article

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Factors Associated with Residents' Place of Death in the Chongwen District of Beijing from 2007 to 2012

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Abstract

Introduction: Developed countries pay more attention to the place at which residents die, but little is known about this topic with respect to China. Given its recent economic development, the distribution and factors associated with place of death in a developed area of China may display unique characteristics. The aim of this study was to determine the current distribution and characteristics of residents' place of death in the Chongwen district of Beijing and to analyze the factors associated with the place of death.

Methods: Data on residents' place of death from 2007 to 2012 in the Chongwen district of Beijing were collected from the Death Cases Reporting System of China. We determined the distributions and trends of place of death and analyzed the factors associated with place of death via univariate and logistic regression analyses.

Results: The average proportion of residents who died at an inpatient hospital ward was 49.2% in the Chongwen district of Beijing and displayed an increased trend from 2006 to 2012 (χ^2=4.240, *P*=0.039). Gender, age, marital status, education level, occupation and cause of death were associated with place of death (*P*<0.001). Being widowed (odds ratio (OR)=1.193), divorced (OR=1.415), having a low education level (middle school: OR=1.381; primary school: OR=1.705; or illiterate: OR=1.923), being unemployed (OR=1.690) and suffering from cardiac disease (OR=2.063) were risk factors for dying outside a hospital ward. Male gender (OR=0.082), being in the 75-84 year age group (OR=0.721) and suffering from cancer (OR=0.374) or respiratory system disease (OR=0.608) were associated with a reduced risk for dying outside a hospital ward.

Conclusions: The proportion of residents who died at a hospital ward in the Chongwen district of Beijing was higher than that of the overall country of China and was similar to that of developed countries. Residents with low education levels, who were unemployed, and who were not married were more likely to die outside the hospital. Policy-makers should focus on effectively assisting low-income residents in obtaining resources for end-of-life medical care. These results emphasize the difficulties with medical and mental care for elderly individuals who live alone.

Keywords: China; place of death; factors; end-of-life care.

Introduction

The place at which residents die can reflect the level of development of national medical and health services, society and the economy [1]. In developed areas such as Europe and America, approximately 60% of residents die in a hospital, and this value has remained at this high level [2-5]. However, in developing countries such as

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Table 1 Distribution of places of death in the Chongwen district of Beijing, 2007-2012

	2007	2008	2009	2010	2011	2012	Total	*P*
Hospital ward, n (%)	1148 (48.3)	1079 (47.9)	1138 (48.8)	1265 (49.5)	1208 (51.1)	1250 (49.7)	7088 (49.2)	0.039
Non-hospital ward, n (%)	1231 (51.7)	1175 (52.1)	1194 (51.2)	1288 (50.5)	1156 (48.9)	1263 (50.3)	7307 (50.8)	

*P*was calculated using theχ^2 tendency test.

China, the proportion of residents who died at a hospital has been less than 30% [6].

In recent years, developed countries have placed additional focus on the care needs and preferences of individual patients. Several studies have shown that most patients prefer to die at home [7], hope to live within the care of family and friends, and enjoy a normal life during the end of their lives [8]. However, for certain reasons, such as cost and quality of medical care, the actual place of death for the majority of residents remains the hospital [9]. To reduce the large discrepancy between patients' preferred and actual place of death and to satisfy the demand for remaining at home during the end of life, developed countries have made substantial reforms to set up and enhance community-based palliative care and nursing services [10]. In several countries, the proportion of patients who die in hospital settings has displayed an increasing trend. This finding reveals that in regions containing good palliative medical services, more people choose to die at home [2-5]. However, in China, for the comparatively small percentage of patients who die in hospitals, the key elements of health policy have been to increase spending on hospital medical services, to advance the levels of clinical treatment, to improve the availability of medical services for residents (especially in underdeveloped areas) and to ensure that residents are able to die in the hospital [11].

To our knowledge, few studies to date have examined the place of death in China. Due to the serious imbalance in economic development in China, the characteristics of place of death have widely varied. Therefore, in the present study performed in the Chongwen District, one of the most developed areas in central Beijing, we described the distribution of residents' place of death using the information collected from the Death Cases Reporting System and analyzed the factors associated with their place of death. This study will provide useful information for establishing healthcare policy.

Methods

Data extraction

In this study, we collected the death information for all individuals who possessed a formal residential household registration in the Chongwen district and who died between 2007 and 2012. Data were extracted from the Death Cases Reporting System, a subsystem of the China Information System for Diseases Control and Prevention by the Chongwen District Center for Disease Control and Prevention (CDC). In accordance with the objective of this study, we extracted related variables including gender, age, marital status, educational level, occupation, cause of death and place of death from the information system.

Variable categorization

In this study, the outcome variable, place of death, was classified into the following two categories: hospital ward and non-hospital ward (including home, emergency room and all other places not in hospital wards). The factors of interest included gender, age, marital status, education level, occupation and cause of death. Occupation was classified into six categories as follows: manager, technician, merchant and service staff, worker, jobless and other. All causes of death were classified according to the 10th Edition of the International Classification of

Table 2 Distribution of the factors associated with residents' place of death in theChongwen district of Beijing, 2007-2012

Factor	Hospitalward (%)	Non-hospital ward (%)	χ^2	*P*
Gender				
Male	3892 (50.2)	3860 (49.8)	6.286	0.012
Female	3196 (48.1)	3447 (51.9)		
Age group			(Z)	
0-44	164 (47.1)	184 (52.9)	-8.961	<0.001
45-64	1294 (54.0)	1102 (46.0)		
65-74	1311 (51.7)	1224 (48.3)		
75-84	2952 (50.7)	2866 (49.3)		
85+	1367 (41.4)	1931 (58.6)		
Marital status				
Married	4808 (53.2)	4224 (46.8)	169.955	<0.001
Unmarried	135 (43.1)	178 (56.9)		
Widowed	1974 (42.4)	2679 (57.6)		
Divorced	122 (38.2)	197 (61.8)		
Unknown	49 (62.8)	29 (37.2)		
Education level				
University or above	767 (60.7)	496 (39.3)	586.475	<0.001
Middle school	2466 (50.8)	2386 (49.2)		
Primary school	2033 (45.4)	2448 (54.6)		
Illiterate	1153 (38.6)	1832 (61.4)		
Unknown	669 (82.2)	145 (17.8)		
Occupation				
Manager	1134 (57.2)	847 (42.8)	233.554	<0.001
Technician	840 (55.3)	679 (44.7)		
Merchant and services staff	842 (53.2)	741 (46.8)		
Worker	2684 (50.0)	2688 (50.0)		
Unemployed	1043 (37.8)	1718 (62.2)		
Other	545 (46.2)	634 (53.8)		
Cause of death				
Cancer	2729 (71.0)	1116 (29.0)	1414.757	<0.001
Cardiac disease	1003 (28.6)	2510 (71.4)		
Cerebrovascular disease	1137 (43.5)	1474 (56.5)		
Respiratory system disease	1050 (56.3)	815 (43.7)		
Injury	153 (49.5)	156 (50.5)		
Other	1016 (45.1)	1236 (54.9)		

For analysis, the factors were examined using the χ^2 test, except for age, for which the rank sum test was used. *P* was calculated using the χ^2 test, except for age, which was assessed using the rank sum test.

Diseases (ICD-10), and in this study, the cause of death was classified as cancer (ICD-10, C00-C97), cardiac disease (ICD-10, I05-I09, I11, I20-I27, I30-I52), cerebrovascular disease (ICD-10, I60-I69), respiratory system disease (ICD-10, J00-J99), injuries (ICD-10, V01-Y89), other cause of death.

Statistical analysis

Table 3 Logistic regression analysis of the risk of a non-hospital ward deathin the Chongwen district of Beijing,2007-2012

	P	OR	95%CI	
			Lower	Upper
Gender	<0.001			
Male		1		
Female		0.820	0.756	0.889
Age group	<0.001			
0-44		1		
45-64	0.300	0.871	0.671	1.130
65-74	0.283	0.865	0.663	1.128
75-84	0.014	0.721	0.555	0.937
85+	0.309	0.870	0.665	1.138
Marital status	<0.001			
Married		1		
Unmarried	0.814	1.032	0.793	1.344
Widowed	0.000	1.193	1.095	1.299
Divorced	0.006	1.415	1.104	1.815
Unknown	0.035	1.766	1.042	2.994
Education level	<0.001			
University or above		1		
Middle school	0.000	1.381	1.199	1.590
Primary school	0.000	1.705	1.464	1.985
Illiterate	0.000	1.923	1.622	2.281
Unknown	0.000	0.304	0.240	0.383
Occupation	<0.001			
Manager		1		
Technician	0.037	1.168	1.009	1.352
Merchant and services staff	0.420	1.062	0.918	1.228
Worker	0.082	1.109	0.987	1.246
Unemployed	0.000	1.690	1.475	1.936
Others	0.000	1.468	1.249	1.726
Cause of death	<0.001			
Other		1		
Cancer	0.000	0.374	0.335	0.419
Cardiac disease	0.000	2.063	1.840	2.313
Cerebrovascular disease	0.392	1.052	0.936	1.183
Respiratory system disease	0.000	0.608	0.535	0.692
Injury	0.095	0.811	0.634	1.037

*P*was calculated from a logistic regress.

In this study, we examined the distributions and trends of residents' place of death in the Chongwen district of Beijing from 2007 to 2012 using a χ^2 tendency test. To assess whether the factors were distributed differently between people who died at a hospital ward and outside a hospital ward, the χ^2 test was employed for all factors except for age, for which a rank sum test was used. All factors associated with place of death based on univariate analysis were

subsequently entered into multiple logistic regression analyses to ultimately determine their association with place of death, the dependent variable. For each variable, the risk was expressed as an odds ratio (OR) with a corresponding 95% confidence interval (CI). *P*-values of less than 0.05 were considered to be significant. All data were analyzed using SPSS version 17.0 software (SPSS, Inc., Chicago, IL, USA).

Result

From 2007 to 2012, the total number of deaths in the Chongwen District was 14395, of which 7088 (49.2%) died at a hospital ward and 7307 (50.8%) died outside a hospital ward. During this period, the proportion of residents who died at a hospital ward displayed an increasing trend (χ^2=4.240, *P*=0.039) (Table 1).

Although the proportion of males who died outside a hospital ward was 2.1% lower than that of females (49.8% vs. 51.9%), after adjustment for potential confounding factors, females exhibited a lower risk of dying outside a hospital ward than males (OR=0.820, 95% CI=0.756-0.889). The proportion of residents older than 45 years who died outside a hospital ward increased with age. After adjusting for other factors, compared with those 0-44 years of age, the lowest risk for dying outside a hospital ward was found among those aged 74-85 years (OR=0.721, 95% CI=0.555-0.931); the other age groups did not display any clear differences. The proportion of married residents who died at a hospital ward (53.2%) was higher than that of unmarried (43.1%), widowed (42.4%) and divorced residents (38.2%). The risk of dying outside a hospital ward for divorced and widowed residents was 1.415 (1.104-1.815)- and 1.193 (1.095-1.299)-fold higher than that of married residents, respectively. The risk of dying outside a hospital ward showed a decreasing trend as the education level decreased. The risk of dying outside a hospital ward for residents with an education level of middle school, primary school and illiteracy was 1.381 (1.199-1.590)-, 1.705 (1.464-1.985)- and 1.923 (1.622-2.281)-fold higher than that for those with a university level of education, respectively. The residents who held an occupation as a manager exhibited the highest rate of dying at a hospital ward (57.2%), and jobless residents exhibited the lowest rate of dying at a hospital ward (37.8%). Unemployed individuals and technicians exhibited a risk of dying outside a hospital ward that was 1.690 (1.475-1.936)- and 1.168 (1.009-1.352)-fold higher than that of managers, respectively. Significant differences were not detected for the other occupation categories. Of those who died of cancer, 71.0% died at a hospital ward; in contrast, 71.4 percent of residents who died of a cardiac disease died outside a hospital ward. The risk of dying outside a hospital ward for patients with cancer or respiratory system disease was 0.374 (0.335-0.419) and 0.608 (0.535-0.692)-fold that for those with other diseases, whereas that for those with a cardiac disease was 2.063 (1.840-2.313)-fold higher than that for those with other diseases. (Table 2).

Discussion

In this study, we analyzed the distributions of place of death and found that the average proportion of residents who died as an inpatient at a hospital ward is 49.2% in the Chongwen district of Beijing and detected an increasing trend in this rate from 2007 to 2012. Further investigation of the factors associated with (influencing) the place of death, we found that gender, age, marital status, education level, occupation and cause of death were associated with the place of death. Being male, divorced, or widowed, having a low education level, being unemployed and dying due to cardiac disease increased the risk of dying outside a hospital ward. Alternatively, residents who were 75-84 years of age or who died due to cancer or respiratory system disease were more likely to die at a hospital (Table 3).

The percentage of residents of the Chongwen district who died at a hospital ward was lower than that of China overall. Studies of China have shown that the proportion of residents who died at a hospital has been only 20% [6,12], whereas

several studies have shown that the proportion of residents who died at a hospital has been higher than 50% in developed countries [2-5]. In this study, the proportion of patients who died at a hospital in the Chongwen district of Beijing was approximately 50% and displayed an increasing trend since 2007. This proportion was significantly higher than that of the overall country and was similar to that of developed countries. This result partially reflects that the present developmental level of society, the economy, and health services in some developed regions of China has enabled residents to obtain good medical treatment and end-of-life services.

Studies of the factors that influence residents' place of death have been minimally explored in China. This study aimed to examine the sociodemographic and disease-related factors associated with place of death, and these results were similar to those of previous studies [11-13]. Residents with a low education level or who were unemployed more frequently died outside a hospital ward, which suggests that the distribution of the place of death displays a close relationship with social status, family income and health status even though a higher percentage of deaths occur at a hospital in this area. Regional health policies should continue to focus on the effective assistance of low-income residents in obtaining end-of-life medical service resources. Moreover, we did not detect any significant differences between any type of occupation, except for being unemployed, on residents' place of death. Due to the development of the societal economy, the promotion of residents' income level and the improvement of medical insurance for urban employees in the developed areas of China, these residents appear to more generally enjoy medical services than those in less developed areas.

Based on the analysis of marriage status, we found that residents without a spouse more frequently died outside a hospital. As the age of the population increases, the number of elderly individuals who live alone will also continue to increase. Thus, the difficulties with medical and mental care for these residents should be emphasized. The analysis of disease status revealed that the proportion of cancer patients who died at a hospital ward was significantly higher than that of those who died due to other causes. However, diseases such as cancer exhibit a longer course, no clear therapeutic strategy is available during their end-stage. Therefore, these patients would prefer to die at home with the care of family and friends [14]. Recently, developed countries have explored and developed their own model of hospice service, which has been continuously improved based on a large body of research and has gradually become a perfect and suitable hospice care system [15]. In China, community-based health services and hospice care services have been developed relatively recently. In developed areas of cities, the health department should attend to and gradually strengthen the hospice care service system. Using the developed countries' model as a reference and by combining this model with the unique characteristics of China, the development of professionals and institutions specializing in end-of-life care services and elderly nursing care can be improved to meet the subjective demands of residents at the end-of-life stage. These demands of elderly individuals who live alone at the late stages of life are to live, to receive care and die at home, and to obtain medical, mental and emotional care.

This study has certain limitations. There are several "unknown" factors related to marital status, education level and occupation in the death registration data. This lack of information partially influences the accuracy of the conclusions of this study. In addition, the factors influencing place of death include three types of factors, individual, disease, and environmental [16], and patients' subjective intentions exert a large impact on the selection of place of death. In this study, only analyzing sociodemographic and disease factors may bias the accuracy of the conclusions. Despite this potential bias, this study provides a scientific comprehensive analysis of the distributions of and the factors influencing place of death. These results enhance our

understanding of the distributions and trends associated with these characteristics in the place of death in developed areas in China. Furthermore, this analysis reveals several factors influencing place of death and provides scientific evidence for policy-making related to the development of hospice care services and the utilization and adjustment of medical and health resources.

Conclusion

The proportion of residents who died at a hospital ward in the Chongwen district of Beijing - a developed area in China - was higher than that of the overall country of China and was similar to that of developed countries. Most residents in some developed regions of China enabled to obtain good medical treatment and end-of-life services. In addition, residents with low education levels, who were unemployed, and who were not married were more likely to die outside the hospital should bring policymakers' attention to the need to effectively assist low-income residents in obtaining end-of-life medical care resources and emphasize the difficulties with medical and mental care for elderly individuals who live alone.

Competing interests

The authors declare that they have no competing interests.

Author's contribution

XH, YZ, DH, LJW and YH conceived the study. XH drafted the manuscript. YZ and LJW collected the data. YXY, FL, XXP, YXL, LZ and JZ participated in the study design and critically revised the manuscript. XH and DH performed the statistical analysis, and YCY, RYK, GXL and RZ helped in data reduction and analysis. All authors read and approved the final manuscript

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Ethical considerations

The study was approved by the Institute Ethics Committee.

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