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Mortality among psychiatric inpatients in China: A national survey

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ABSTRACT

Background: Patients with mental disorders are at increased risk of premature mortality. Psychiatric inpatients are a particularly vulnerable population, yet data on the mortality rate and causes of death among psychiatric inpatients in a national sample are scarce.

Methods: We analyzed data collected from patients who died during psychiatric hospitalization in 2019 and 2020 from 41 psychiatric hospitals in China.

Results: In total, 719 inpatients died over the study period. There were more deaths in 2019 (N = 409, 56.9%) compared to 2020 (N = 310, 43.1%). The mean age was 73.3 ± 16.5 years old, with males significantly younger than females (71.5 ± 16.9 vs. 75.9 ± 15.6, $p < 0.001$). Sudden death accounted for 11.5% of all deaths. The cause was unknown for 31.2% of cases. Among those with known causes of death, respiratory disorders were most common in patients with psychotic disorders (41.9%) and mood disorders (29.8%). Suicide accounted for 17.0% of deaths in patients with mood disorders.

Conclusion: Patients who died during psychiatric hospitalization were overall older (>70 years), and more than one in ten died due to sudden death. While respiratory disorders accounted for the largest proportion of known causes, the causes were unknown in nearly one-third. Death due to suicide, a preventable cause, remained common among patients with mood disorders. Evidence-based interventions should be implemented.

1. Introduction

The mortality rate is an important measure of the overall health status of a given population (Choi et al., 2019), and it is often used as an indicator of the quality of healthcare service and treatment (Diley et al., 2014). Mental disorders in China have garnered more attention from the public and the government in recent years, primarily due to recent studies showing the high rates of mental disorders in the general population (Liu et al., 2015). Furthermore, studies have found that mental disorders, especially severe mental illnesses, are associated with premature death (De Rosa et al., 2017; Plana-Ripoll et al., 2020; Walker et al., 2015). A meta-analysis including 135 studies from 1957 to 2021 showed that all-cause mortality was significantly higher in people with schizophrenia compared to a non-schizophrenia control group (RR=2.52, 95% CI: 2.38–2.68) (Correll et al., 2022). One study showed that among patients admitted to regional public hospitals in Australia between 1996 and 2010, 25.2% of patients with mental disorders died, compared to 17.3% of patients without mental disorders. After adjusting for confounders, patients with mental disorders were more than twice (OR = 2.20) likely to have died during their hospitalization (Karim et al.,

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2019). In another study, based on the National Health Insurance Research Database in Taiwan, the authors identified 285,125 psychiatric patients and 285,125 non-psychiatric peers through 1:1 dual propensity score matching and found that the mortality rate of patients was significantly higher than that of non-psychiatric patients (HR = 1.150, 95% CI = 1.127–1.175, P < 0.0001) (Wang et al., 2020). Among a sample of patients with severe mental illness in Shanghai who participated in the community mental health management system from 2000 to 2018, Tang et al. found the mortality rate of these patients was significantly higher than that of mentally ill patients overall in Shanghai (18 vs. 9.14 per 100,000, $p < 0.01$) (Tang et al., 2020). A study showed that from 2012 to 2016, the average annual mortality rate in Chinese urban and rural residents with mental illness was 2.61 per 100,000 and 2.84 per 100,000, respectively (Wang et al., 2018).

Among patients with mental disorders, inpatients are particularly vulnerable and have higher mortality rates compared to community-dwelling patients. Of the existing studies on mortality among psychiatric inpatients in China, most have been based on analyses of local hospitals. In a study of psychiatric patients admitted to a community mental health center in Beijing from June 2004 to September 2014, 33/3510 died (0.94%; mean age 68.4 ± 10.7), and of those who died, 17 (51.5%) died from medical diseases (Wang et al., 2015). In another study at the Yichun Third People's Hospital, over 32 years from 1975 to 2007, 77/51,231 psychiatric inpatients died (0.15%), and 54.5% of deaths were attributable to medical causes, such as cerebrovascular disorders (23, 29.9%), lung infections (9, 11.7%) and electrolyte abnormalities (3, 3.9%) (Song et al., 2014).

The actual causes of death in psychiatric patients have also been a topic of research. People with serious mental illnesses tend to die decades earlier than the general population, and this disparity has been called the mortality gap (Chesney et al., 2014; Erlangsen et al., 2017). Additionally, some excessive deaths among psychiatric inpatients may also be attributable to mental illness, such as death due to suicide (Hunt et al., 2013; Madsen et al., 2012). The age-standardized suicide rate in China in 2019 was 6.7 per 100,000 people (WHO, 2019). Sudden death is a significant contributor to the increased mortality seen in individuals with mental disorders (Ifteni et al., 2014; Koponen et al., 2008). Suicides, accidents, and cardiovascular diseases are considered the main reasons for the excess of premature, sudden deaths in this population (Colton and Manderscheid, 2006; Ruschena et al., 1998). Pulmonary embolism may be a cause of sudden death in this population (Takahashi et al., 2021).

Both first-generation and second-generation antipsychotics have been implicated in increasing the risk of sudden cardiac death (SCD) in patients with schizophrenia. In 2009, Ray et al. published a retrospective cohort study based on data from a large sample on typical and atypical antipsychotics (N > 4000 for each group), and found an increased risk of SCD in patients 30–74 years old treated with antipsychotic drugs, without finding a significant difference between typical and atypical antipsychotics (Ray et al., 2009). In addition, various psychotropics, even newer ones, have been shown to have cardiac toxicity, including the risk of QT prolongation, although the risk differs substantially among the medications (Beach et al., 2014; Chung and Chua, 2011).

Although a few reports have been published on mortality among psychiatric inpatients, few are within the past 10 years, and most reports were based on deaths in one local hospital. No such reports are available after the COVID-19 pandemic started. Therefore, it is important to analyze the mortality rate and causes of death using data collected from a nationwide survey of top-tier psychiatric hospitals to better understand death among psychiatric patients. These findings may help guide quality improvement initiatives on inpatient psychiatric units.

2. Methods

We selected representative psychiatric hospitals in each province. We did not include hospitals within the Ministry of Public Security (forensic psychiatric hospitals) and the Ministry of Social Welfare (safety-net hospitals), as their patient populations are different and often follow different guidelines about staffing and resource allocations. The survey was sponsored by the National Health Commission of China, and 41 psychiatric hospitals in Mainland China were selected. We used a locally developed form to collect data on deaths among psychiatric patients during their hospital stay. Those who died after being transferred to another medical facility were not included. We also collected data on total discharged cases in the same period. The mortality rate was calculated using the following formula: number of deaths / (number of discharged patients + number of people on the last day of the year, i.e. number of beds) × 100%. T-tests were used for the comparison of ages between males and females. Statistical analyses were conducted using GraphPad Prism 6.

3. Results

3.1. Patients characteristics

Table 1 shows the number of deaths in psychiatric inpatients in 2019 (N = 409, 56.9%) and 2020 (N = 310, 43.1%). The cases included 415 males (57.7%) and 304 females (42.3%). The age ranged from 14 to 103 years, with a median of 77. The mean age was 73.3 ± 16.5 years old. Males were significantly younger than females (71.5 ± 16.9 vs. 75.9 ± 15.6, $p < 0.001$). Among all cases, 407 (56.6%) were 75 years or older. The duration of the psychiatric illness also varied, with the vast majority being from 1 year to 10 years ($N = 294$, 40.9%), or more than 10 years (N = 299, 41.6%). Those with a recent onset of psychiatric illness (< 1 year) accounted for 17.5%.

Table 1
Demographic and Clinical Characteristics of 719 deaths in 2019 and 2020 in psychiatric inpatients.

Characteristic	Total (N = 719)	%
Year of death		
2019	409	56.9
2020	310	43.1
Age group, y		
< 17 y	2	0.2
17 y to 64 y	191	26.6
65 y to 74 y	119	16.6
≥ 75 y	407	56.6
Gender		
Female	304	42.3
Male	415	57.7
Duration of illness		
< 1 d	16	2.2
≥ 1 d, < 1 y	110	15.3
≥ 1 y, < 10 y	294	40.9
≥ 10 y	299	41.6
Sudden death		
Yes	83	11.5
No	636	88.5
Autopsy		
Yes	7	1.0
No	712	99.0
Primary Psychiatric Diagnoses		
Psychotic Disorders	272	37.8
Mood Disorders	47	6.5
Others	400	55.6
Psychotropic Treatment		
First Generation Antipsychotics		
Chlorpromazine	7	1.0
Haloperidol	7	1.0
Second Generation Antipsychotics		
Clozapine	50	7.0
Olanzapine	126	17.5
Quetiapine	79	11.0
Risperidone	75	10.4
Aripiprazole	20	2.8

Thirteen patients died of suicide, including 7 males (53.8%) and 6 females (46.2%), with an average age of 50.5 ± 17.9 years (median 54 years old). The oldest and youngest ages of patients who died by suicide were 84 and 14 years old, respectively. The methods of suicide included hanging ($N = 5$, 38.5%) and jumping from height ($N = 4$, 30.8%). 83 cases were identified as sudden death among 719 deaths. An autopsy was performed in only 7 of the 719 cases. Patients treated with second-generation antipsychotics olanzapine accounted for the largest proportion, 17.5%.

We calculated the mortality rates based on the provided data. As mentioned above, we used the (number of discharged patients + number of people on the last day of the year, i.e. number of beds) as the denominator for each year and it was 409 in 2019 and 310 in 2020, and the mortality rate was 1.19‰ in 2019–2020 (combined), with 1.12‰ and 1.00‰ in 2019 and 2020, respectively.

3.2. Death by month of the year

We analyzed the monthly pattern of death in psychiatric inpatients. During the full two-year study period (combining data from 2019 and 2020), the month with the lowest and highest number of deaths in our sample was June (37, 5.1%) and January (86, 12.0%), respectively (Fig. 1A). In 2019, the months with the lowest and highest number of deaths were June (20, 4.9%) and December (54, 13.2%), respectively (Fig. 1B). In 2020, the months with the lowest and highest number of deaths were June (17, 5.5%) and January (36, 11.6%), respectively (Fig. 1C).

3.3. Causes of death

Among those with known reported causes, respiratory diseases were the most common, accounting for 52.0% (Fig. 2A-D). With respect to underlying psychiatric diagnosis (ICD-10), patients with psychotic disorders accounted for nearly two-fifths (272, 37.8%) and those with mood disorders accounted for less than 10% (47, 6.5%). Of note, the largest diagnostic category was "other", which included anxiety disorders, substance use disorders, and others (data was not available to further categorize). Twenty-seven cases died from cancer or neoplasm, accounting for 3.8%. Among cases of sudden death, patients with psychotic disorders accounted for the largest proportion (43, 51.8%). Unexplained causes of death accounted for 41.9% (Fig. 2A-D). The proportion of suicide in mood disorders (8, 17.0%) was higher than in psychotic disorders (2, 0.7%) (Fig. 2B-C).

4. Discussion

Our study was the first nationwide survey to investigate the clinical characteristics of psychiatric patients who died during psychiatric hospitalization in China. We identified 719 psychiatric inpatients who died in 2019 and 2020. The number of deaths in China's mental hospitals did not significantly fluctuate when comparing 2019–2020, which was interesting given the onset of the COVID-19 pandemic in early 2020.

The overall mortality rate was 1.19‰ in our sample. This is similar to the mortality rate reported by a hospital in China from 2004 to 2010 (1.01‰) and much lower than the 9.00‰ mortality rate from 1958 to 1997 in the Shanghai Mental Health Center, China (Wang et al., 2001;

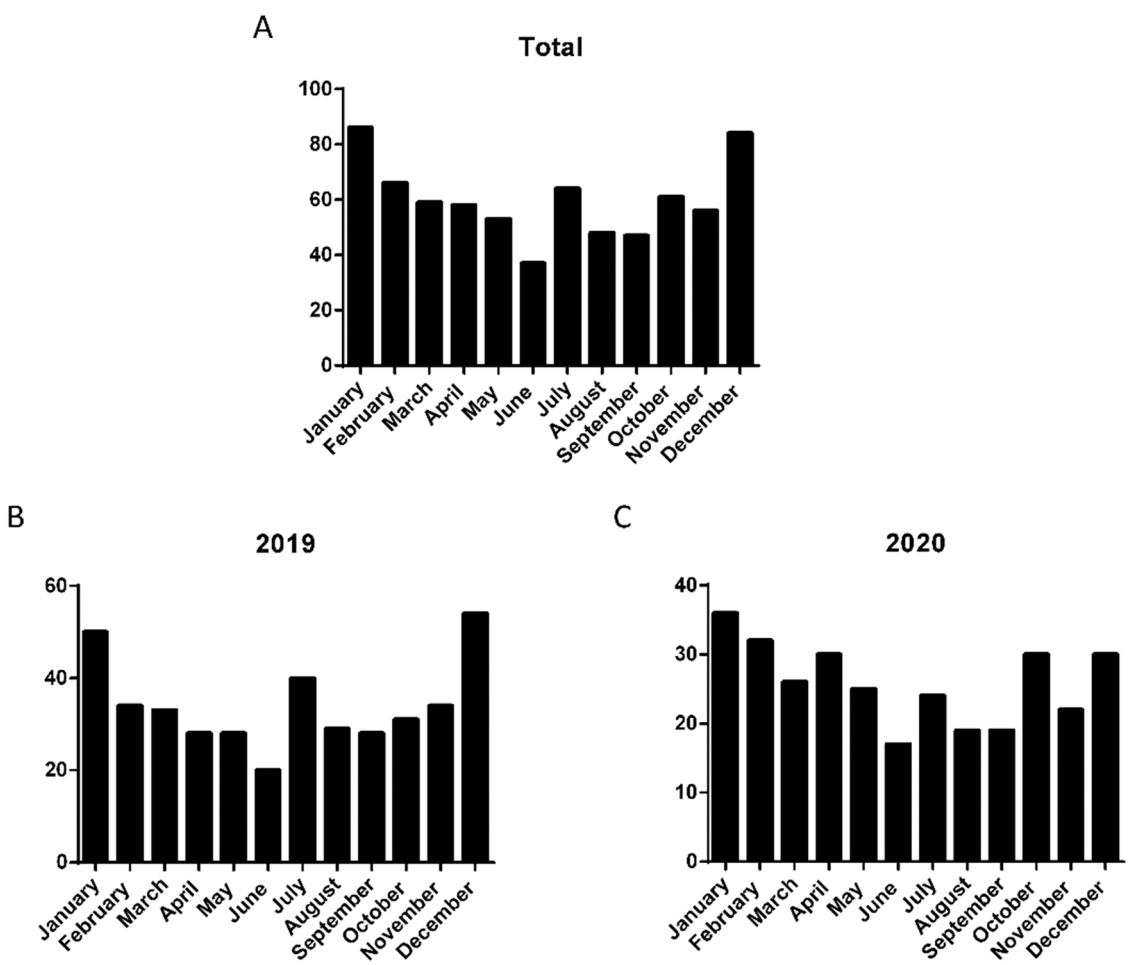

Fig. 1. Monthly distribution of death cases. A = Total; B = 2019; C = 2020.

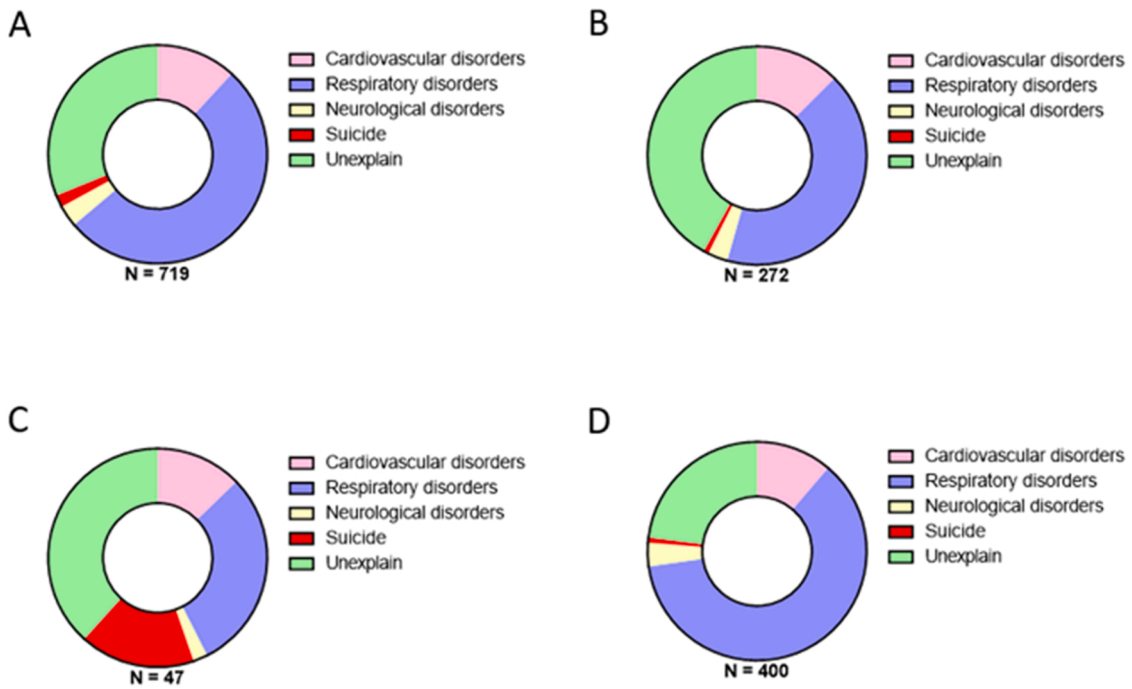

Fig. 2. Causes of death in psychiatric patients, by diagnosis. A = Total; B = Psychotic disorders; C = Mood disorders; D = Unknown.

Yang et al., 2012). One reason for the lower mortality rates over time may be related to recent efforts to improve conditions in inpatient units in China. In comparison to other countries, the mortality rates among psychiatric inpatients in Romania and India were 5.13‰ and 3.23‰, respectively (Fulga et al., 2021; Shinde et al., 2014). A report from a psychiatric center in Singapore showed mortality in mentally ill patients was about 2.79 times that of the general population in the years 1985–1986 (Lim et al., 1991).

The results showed that the average age of females at death was older than males in the study. Similar findings have been reported in other countries. For example, an Indian study on mortality among psychiatric inpatients showed that most of the patients who died (67%) were males (Shinde et al., 2014). The overall average life expectancy of the Chinese population is 77.4 years, 80.5 years for females, and 74.7 years for males, respectively (WHO, 2021). The mean age at death of our whole sample, in male and female inpatients, was significantly lower than that in the general population in China, suggesting a mortality gap between psychiatric inpatients and the general population. Slightly over half of cases (52%) had a defined cause of death, with respiratory disorders being most common. In a Canadian study in a forensic psychiatric hospital, respiratory diseases were a leading cause of death (44.4%) (Adelugba et al., 2019). A chart review of 333 cases for 26 years in an Indian hospital showed that the leading cause of psychiatric inpatients' death was cardiovascular system disorders (43.6%), followed by respiratory disorders (14.9%), and nervous system disorders (9.9%), and infections (10.1%) (Shinde et al., 2014). Additionally, we found that 3.8% of our sample died of neoplastic disorder, consistent with the finding in the literature that neoplastic diseases were associated with increased risk of death in psychiatric inpatients (Myślicka et al., 2021).

Our results showed a wide monthly variation in the number of deaths. The number of deaths in December and January was more than two times higher than in June. The possible reason is that respiratory disorders and cardiovascular disorders are often related to temperature changes and air pressure, and cold air stimulates the progression of chronic diseases. Similar findings were reported in Beijing, from 2010 to 2019, the seasonal distribution of deaths of inpatients was the highest in winter (26, 69%) (Liu et al., 2021). In another autopsy study of 363 cases of sudden death in Yunan province (located in a temperate zone), the authors found nearly one-third of cases of sudden death (114, 31.4%) occurred in spring (Sun et al., 2018). A case-crossover study including 3614 autopsy-confirmed SCD cases in the Oulu province of Finnish from 1998 to 2011 suggested that the risk of SCD was correlated with the cold spell (OR 1.33; 95% CI 1.00, 1.78) (Ryti, 2017). This suggests that medical staff and hospital administrators need to consider seasonal and weather factors when developing interventions to reduce inpatient mortality.

In our sample, we found that suicide remained a common cause of death in patients with mood disorders. As suicide in hospitals is preventable, action needs to be taken to address this. Specifically, staff needs better training, including using validated assessment tools such as the Ask Suicide-Screening Questions (Horowitz et al., 2020) to identify and address acute suicide risk. In the meantime, a more comprehensive review of environmental factors to minimize the means of suicide (e.g. reducing access to ligature points) should be prioritized.

The relationship between antipsychotic medication and mortality is complex. For example, in a Finnish registry study over 20 years (FIN20), long-term antipsychotic use for individuals with schizophrenia, particularly clozapine, was associated with a decrease in mortality (Taipale et al., 2020). In our study, among the 719 cases, the antipsychotics prescribed at the time of death included the following: 7 (1.0%) with chlorpromazine, 7 (1.0%) with haloperidol; 50 (7.0%) with clozapine, 126 (17.5%) with olanzapine, 79 (11.0%) with quetiapine, 75 (10.4%) with risperidone, and 20 (2.8%) with aripiprazole. Ample autopsy data indicate that active coronary lesions are observed in up to 80% of those with SCD (Priori et al., 2001). As shown in the study comparing users to nonusers of antipsychotic drugs, the incidence-rate ratio of SCD was 1.88 for quetiapine, 2.04 for olanzapine, and 2.91 for risperidone, and 3.67 for clozapine (Ray et al., 2009). The findings provide preliminary evidence that unexplained sudden deaths of psychiatric patients are likely due to coronary events (Manu et al., 2011). However, additional research is needed to reach definitive results.

This study found that a very small percentage (1.0%) of deaths underwent an autopsy, which may be explained by traditional Chinese practices and preferences. An autopsy is a crucial method for identifying the cause of death of patients, and the lack of autopsies often leads to unclear or unexplainable causes of death in many patients. Among the

224 inpatient deaths with unexplained causes, we cannot exclude negligence or lack of vigilance to medical issues given the few autopsies that were conducted. This finding should raise awareness that inpatient teams should consider autopsies more frequently, especially when the cause of death is unknown. Accidental death (suicide, sudden death, etc.) accounts for a part of the causes of death in psychiatrically hospitalized patients in China, and this requires the attention of hospital management.

Our study presents new, comprehensive information on variables including gender, disease onset, diagnosis, and age in a relatively large sample of psychiatric inpatients. However, a few limitations need to be acknowledged. First, we did not have data on some potentially important factors that may be associated with death, such as BMI, physical comorbidities, substance use disorders (alcohol and tobacco use), the duration of hospitalization, and the dose of medication at the time of death. These variables should be considered for future studies. Second, the rate of autopsy in these patients was extremely low: it was performed in only 7 of the 719 cases. Third, we were unable to objectively evaluate the quality of medical care received by these psychiatric patients, therefore the interpretation of our findings is limited.

5. Conclusion

We found the overall mortality rate among psychiatric inpatients in China was 1.19‰ in 41 psychiatric hospitals. Patients who died during a psychiatric hospitalization were older (>70 years) and more than half were 75 years or older. More than one in ten died from sudden death. While respiratory disorders accounted for the largest proportion of known causes, nearly one-third of death cases in our sample were due to unknown causes. Death due to suicide, a preventable cause, remained common, especially among patients with mood disorders, and this suggests the urgent need to identify and mitigate risks related to suicide among inpatients. For clinical and medicolegal consideration, an autopsy should be encouraged to identify causes of death when the causes are unknown or unclear. The role of antipsychotics as risk factors for death in psychiatric inpatients requires careful longitudinal studies. A decrease in the prevalence of suicide in psychiatric hospitals can be obtained through programs to strengthen the supervision and care of the patients.

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CRediT authorship contribution statement

HL, YLT, and FJ conceived this work. XW, LX, and YY completed data acquisition and data analysis. LZ, ML, TL, YL, RC, and YLT provided critical comments related to the interpretation of the study findings. XW led on drafting the manuscript with subsequent iterations refined by RC and YLT. All authors have approved the final version for publication.

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Conflicts of Interest

Dr. Yi-lang Tang receives research funding from the U.S. Department of Veterans Administration for a medication clinical trial. The authors declare that there are no conflicts involved in the article.

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