

# Chinese doctors are under a high risk of sudden death

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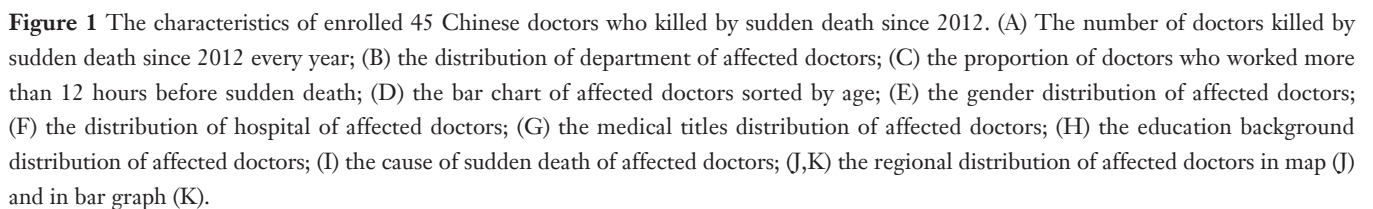
Since 2015, the Chinese health-care system reforms have been emphasizing the importance of constructing hierarchical medical system. Hierarchical medical system policy was aimed to enhance the development of primary medical care and redistribute medical resources more rationally. At present, most of patients prefer to go to tertiary hospitals, which increases the working load on doctors there.

Although these extra burdens on doctors have been realized, no corresponding action has been taken. At the same time, it has been noticed that the rate of sudden death of doctors has been increasing in the past five years (*Figure 1*). On 26<sup>th</sup> July, 2017, a 30-year-old anesthetist died suddenly on his night shift in a tertiary hospital in China. He was the 14<sup>th</sup> doctors who had sudden death in 2017 (*Table 1*). According to systematic search of public reports on local media, medical websites and official documents, 45 doctors are found to be killed by sudden death since 2012. The majority of the doctors worked in tertiary hospitals. Most of them are surgeons or anesthetists (*Table 1, Figure 1*). Filled with tension and pressure, Chinese doctors are under a high risk of sudden death.

This phenomenon may be largely due to lack of enough medical resources and its uneven distribution. China is a big country with 22% of world's total population while it occupies only 2% of world's medical resources (1). China only owns less than half of medical resources per capita

(1.2 physicians/1,000 population *vs.* 2.8 physicians/1,000 population) compared with developed countries (1). All these factors contribute to the increasing burden on Chinese doctors in general. Moreover, since the access for a physician is not as strict as in western countries, patients are tended to tertiary hospitals for seeking better medical care (2). Including the large number of patients transferred from community hospitals, doctors in tertiary hospitals faced an extremely heavy burden in both outpatients and inpatients. Among the 45 doctors who had sudden death since 2012, 86% of them were from tertiary hospitals and 49% of them had been worked more than 12 hours before sudden death (*Figure 1*). In 2015, 2,402 doctors were enrolled in a survey which was conducted by Ding Xiang Yuan (the most popular biomedical website in China) (3). The survey showed that only 3% of doctors had less than 40 hours of working time every week while 37% of doctors had more than 60 hours to work every week (*Figure 2*). In addition, 47% of doctors had less than 1 day for rest every week (*Figure 2*) and 75% of them never had time for paid leave (*Figure 2*).

Getting promotion is another big challenge for Chinese doctors, especially in tertiary hospitals. Having National Natural Science Foundation and published paper listed in the Science Citation Index (SCI) are the criteria for candidates (4). As a result, doctors had to spend extra time on researches. As showed in Ding Xiang Yuan survey (3),



**Table 1** General characteristics of enrolled doctors

ID	Time of sudden death	Age (years)	Gender	Province	Levels of hospital	Department	Medical title	Education background	Cause of sudden death	Brief description before sudden death
P01	2012/11/23	35	M	Anhui	Tertiary	Orthopaedics	Attending	Doctoral Degree	Heart attack	He only had 3-4 hours for sleep every day and need to do research after works. He had a 24-hour shift before sudden death
P02	2013/07/05	50	F	Jiangsu	Tertiary	Gastroenterology	Associate of Chief	Master's Degree	Undiagnosed	She had more than 100 outpatients to receive every day
P03	2013/12/01	49	M	Beijing	Tertiary	Cardiac Surgery	Chief	Doctoral Degree	Cerebral hemorrhage	The annual number of surgery is more than 300 for the last 5 years. Have the history of hypertension and hydrops artculi. He was giving emergency treatment to patient before sudden death
P04	2014/11/18	32	M	Anhui	Tertiary	Anesthesiology	Attending	Doctoral Degree	Undiagnosed	He worked 6 days a week and more 12 hours every day. He did overtime work before sudden death.
P05	2014/09/20	48	M	Beijing	Tertiary	Neurology	Unavailable	Unavailable	Undiagnosed	He was attending meeting before sudden death
P06	2014/10/12	55	M	Beijing	Tertiary	Burns Surgery	Chief	Doctoral Degree	Heart attack	He had night shift in ICU before sudden death
P07	2014/10/25	48	M	Beijing	Tertiary	Orthopaedics	Associate of Chief	Doctoral Degree	Heart attack	He was the specialist in bone tumor as well as the vice director of education department in hospital. He was attending an International Meeting in Thailand before sudden death
P08	2014/11/22	53	M	Beijing	Tertiary	Orthopaedics	Chief	Doctoral Degree	Undiagnosed	He was the specialist in minimally invasive techniques for spinal surgery and worked over 8 hours every day. He was organizing a Conference before sudden death
P09	2014/12/02	42	M	Beijing	Tertiary	Anesthesiology	Associate of Chief	Doctoral Degree	Brainstem hemorrhage	He was performing an operation before sudden death
P10	2015/01/11	47	M	Guangdong	Tertiary	Orthopaedics	Chief	Doctoral Degree	Cerebral hemorrhage	The annual number of surgery is more than 300. He was on the way to surgery when sudden death happened
P11	2015/03/01	26	F	Zhejiang	Tertiary	Anesthesiology	Intern	Bachelor Degree	Undiagnosed	She had a night shift before sudden death
P12	2015/03/02	28	M	Shanxi	Tertiary	Psychiatry	Resident	Master's Degree	Undiagnosed	He had medical history of depression and had a night shift when sudden death happened
P13	2015/04/01	32	F	Hunan	Tertiary	Anesthesiology	Attending	Bachelor Degree	Undiagnosed	She worked more 12 hours every day. He had a night shift when sudden death happened

**Table 1** (continued)

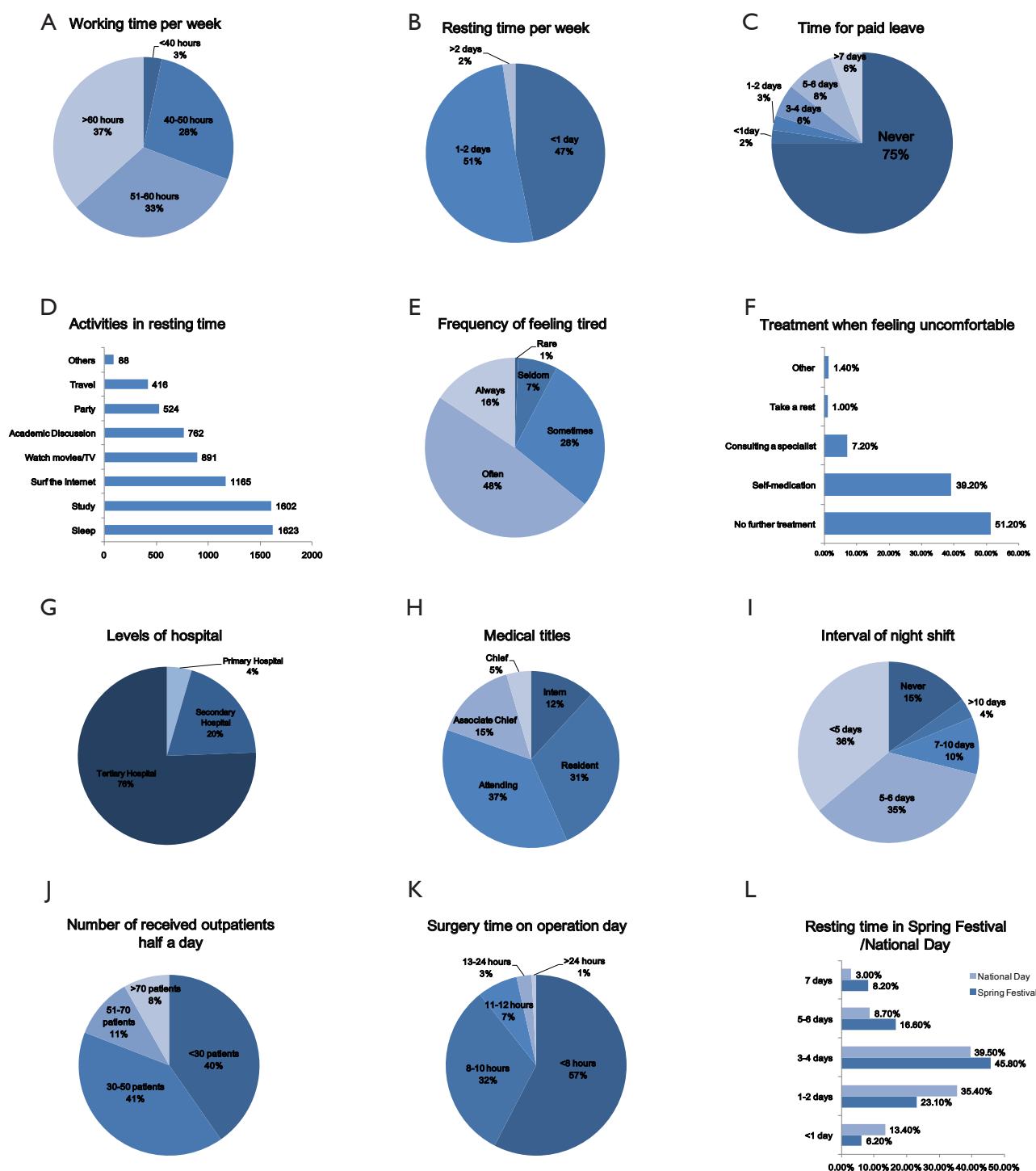
Table 1 (continued)

ID	Time of sudden death	Age (years)	Gender	Province	Levels of hospital	Department	Medical title	Education background	Cause of sudden death	Brief description before sudden death
P14	2015/04/13	48	M	Beijing	Tertiary	Cardiac Surgery	Associate of Chief	Bachelor Degree	Undiagnosed	He had medical history of diabetes and hypertension. He worked continuously for several days before sudden death
P15	2015/04/14	51	M	Fujian	Tertiary	Pediatrics	Chief	Doctoral Degree	Cerebral hemorrhage	He had a 24-hour shift every 3 days and only had 1 day off every 3 weeks
P16	2015/06/29	43	M	Guangdong	Tertiary	Emergency	Chief	Doctoral Degree	Cardiac rupture	He had a 48-hour shift in the latest holiday. He had another 24-hour shift before sudden death
P17	2015/07/09	31	M	Beijing	Tertiary	ICU	Resident	Doctoral Degree	Heart attack	He had only 3–4 hours for sleep every day and the rest time was always working
P18	2015/08/01	53	M	Henan	Tertiary	Neurology	Chief	Master's Degree	Myocardial infarction	Unavailable
P19	2015/08/01	45	M	Hubei	Secondary	Orthopaedics	Associate of Chief	Master's Degree	Brainstem hemorrhage	He had a 24-hour shift before sudden death
P20	2015/08/16	51	M	Beijing	Tertiary	Orthopaedics	Associate of Chief	Doctoral Degree	Heart attack	He was a specialist in spine surgery and held several academic posts. He was in an academic conference when the sudden death happened
P21	2015/10/05	48	F	Zhejiang	Tertiary	Stomatology	Chief	Doctoral Degree	Cerebral hemorrhage	Unavailable
P22	2015/10/11	37	M	Henan	Tertiary	Neurosurgery	Intern	Bachelor Degree	Undiagnosed	Unavailable
P23	2016/01/02	45	F	Liaoning	Tertiary	Pathology	Associate of Chief	Master's Degree	Heart attack	She was doing extra work in weekend when the sudden death happened
P24	2016/03/09	34	M	Beijing	Tertiary	Anesthesiology	Intern	Bachelor Degree	Undiagnosed	He was in a night shift when the sudden death happened
P25	2016/04/21	35	M	Anhui	Secondary	Orthopaedics	Attending	Bachelor Degree	Undiagnosed	He was on the way to an emergency operation before sudden death
P26	2016/05/15	25	M	Fujian	Tertiary	Surgery	Resident	Bachelor Degree	Undiagnosed	Unavailable
P27	2016/06/30	45	M	Guangdong	Tertiary	Orthopaedics	Chief	Doctoral Degree	Undiagnosed	He performed operation late into midnight two days before sudden death
P28	2016/08/16	49	M	Shanghai	Tertiary	Traditional Chinese medicine	Chief	Doctoral Degree	Undiagnosed	He was a specialist in massage and held several academic posts. He kept receiving outpatients when he felt ill

Table 1 (continued)

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ID	Time of sudden death	Age (years)	Gender	Province	Levels of hospital	Department	Medical title	Education background	Cause of sudden death	Brief description before sudden death
P29	2016/09/21	45	M	Anhui	Tertiary	Oncological Surgery	Associate of Chief	Master's Degree	Heart attack	He operated for 24 hours before sudden death
P30	2016/12/07	43	M	Fujian	Tertiary	Hematology	Associate of Chief	Master's Degree	Aortic dissection	Unavailable
P31	2016/12/08	40	M	Fujian	Tertiary	Pneumology	Chief	Doctoral Degree	Heart attack	Unavailable
P32	2017/01/09	27	M	Xinjiang	Secondary	Anesthesiology	Unavailable	Unavailable	Undiagnosed	He had a 48-hour shift before sudden death
P33	2017/02/10	39	M	Hebei	Secondary	Unavailable	Unavailable	Unavailable	Undiagnosed	He had a 24-hour shift before sudden death
P34	2017/03/27	25	M	Jiangsu	Secondary	Anesthesiology	Intern	Unavailable	Undiagnosed	Unavailable
P35	2017/04/05	37	M	Guangxi	Tertiary	Hepatic Surgery	Attending	Doctoral Degree	Heart attack	He needed to perform operation in working time and do academic research after work
P36	2017/04/16	30	M	Guangxi	Tertiary	Traditional Chinese medicine	Intern	Unavailable	Undiagnosed	Unavailable
P37	2017/05/06	34	F	Guangdong	Tertiary	Gastroenterology	Attending	Doctoral Degree	Undiagnosed	Unavailable
P38	2017/05/10	37	M	Shandong	Tertiary	Surgery	Associate of Chief	Master's Degree	Undiagnosed	He had to work even if he was ill. He performed 5 operations before sudden death
P39	2017/06/10	44	M	Zhejiang	Tertiary	Orthopaedics	Associate of Chief	Doctoral Degree	Heart attack	He had a 24-hour shift every 3 days and only had 1 day off every 3 weeks
P40	2017/06/28	26	M	Zhejiang	Tertiary	Anesthesiology	Intern	Bachelor Degree	Undiagnosed	He had a 24-hour shift before sudden death
P41	2017/07/09	32	M	Jiangxi	Tertiary	Orthopaedics	Attending	Doctoral Degree	Heart attack	He had a 24-hour shift before sudden death
P42	2017/07/09	44	M	Sichuan	Tertiary	Pneumology	Chief	Doctoral Degree	Undiagnosed	He worked more than 10 hours every day and had a night shift before sudden death
P43	2017/07/18	36	M	Henan	Secondary	Urinary Surgery	Attending	Unavailable	Undiagnosed	He had a night shift and continued to perform two operations before sudden death
P44	2017/07/20	41	M	Tibet	Tertiary	Oncology	Associate of Chief	Unavailable	Undiagnosed	Unavailable
P45	2017/7/26	30	M	Sichuan	Tertiary	Anesthesiology	Attending	Unavailable	Undiagnosed	He was in a night shift when the sudden death happened



**Figure 2** The survey on working status of Chinese doctors conducted by Ding Xiang Yuan in 2015 (n=2,402). (A) The distribution of working time per week. (B) the distribution of rest time per week; (C) the time for paid leave; (D) the distribution of activities in the rest time; (E) the frequency of feeling tired; (F) the distribution of treatment when feeling uncomfortable; (G) the distribution of hospital of enrolled interviewee; (H) the medical titles of enrolled interviewee; (I) the frequency of interval for night shift; (J) the number of patients received in outpatients half a day; (K) the surgery time of surgery on operation day; (L) the distribution of rest time in Spring Festival and National Day.

study occupies almost all their time after work (*Figure 2*). Living in such conditions, half of doctors feel overwhelmed (*Figure 2*), but half of them would do no treatment when they felt uncomfortable (*Figure 2*).

The hierarchical medical system is an ideal method which is supposed to solve the problems above. However, it failed to cover the problems as follows: First, more medical resources should be created to relieve the extreme lack of total medical resources in China. Second, the quality of medical service in primary hospitals should be improved and the communication network among primary, secondary and tertiary hospitals should be well-rounded and timely, to ensure that patients could receive equal medical care. Third, the financial support from the government should be strengthened, especially for tertiary hospitals. It can relieve the pressure for hospitals to generate income as well as to reduce the competition among primary, secondary and tertiary hospitals (5). If only taken all these into consideration, would the current situation be changed.

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