

Current Census of Oncology Critical Care Medicine in China

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Abstract

Objective The purposes of this survey were to show the current situation of oncology critical care medicine in China, to understand the resource distribution of oncology critical care medicine, and to analyze and evaluate the existing resources and reserve capacity of oncology critical care medicine.

Methods A general survey was conducted at the 36 member units of the Oncology Critical Care Medicine Committee of the Chinese Anti-cancer Association through e-mailed questionnaires. The census takers filled out the questionnaires with feedback. The survey covered 8 items: basic information on the hospital, basic profile of the ICU, personnel allocation, management status, technical skills, patient sources, equipment configuration and tumor-related treatment technology.

Results The survey results involved information from 28 member units, all of which are tertiary hospitals, distributed in 20 provinces and 4 direct-controlled municipalities. The results are as follows. (1) The total ratio of ICU beds to hospital beds was 1.06%, and the average number of ICU beds was 16.36. (2) The ratio of ICU physicians to beds was approximately 0.62:1, and the ratio of nurses to beds was approximately 1.98:1. (3) According to the census of the population and GDP of different regions conducted by the State Statistics Bureau in 2017, the ratio of ICU beds for tumor patients to population was 4.55 beds per 10 million people, and the ratio of ICU beds to GDP was 8.00 beds per RMB 100 billion, on average. (4) The equipment configuration is relatively perfect, while the technical skills need to be improved.

Conclusion The development of oncology critical care is becoming better, but there is still a certain gap compared with the ICU standards in China and the average level of the national ICU. It is urgent to develop oncology critical care medicine.

Introduction

Critical care initially emerged for surgical patients that needed special management that was different from that of patients in general wards, and special room care was given to improve the survival rate of patients after surgery [1]. China established its first modern department of critical care medicine (ICU ward) in the 1980s [2–5]. After decades of rapid development, China has gradually set up a professional system of critical care medicine, drawing on foreign experience, combining the characteristics of domestic medicine and focusing on discipline development. In recent years, the rate of incidence and mortality of cancer remain high [6]. According to the data, malignant tumors causing death ranked first among urban residents in some regions of China in 2017, with a mortality rate of 160.72 per 100,000. In the past, tumor patients, especially patients with advanced cancer, were one of the groups considered not suitable for critical care. With the increase in tumor patients, improvement in cancer diagnosis and treatment technologies and the decrease in mortality of some tumor patients, as well as changes in people's attitudes towards cancer, tumor patients and their families are eager to extend the life of the patients by means of organ function support with critical care medicine, to pass through a stage in which

the vital signs are seriously unstable or there are potentially life-threatening factors, achieving the survival of tumor patients. Based on the above reasons, the demand of tumor patients for critical care has increased rapidly, and tumor hospitals have gradually realized the importance of oncology critical care medicine [7–9]. Oncology critical care medicine is also a multidisciplinary comprehensive specialty. Compared with most critical care patients of general hospitals, tumor patients have their own characteristics in immune function, nutritional status, radiotherapy and chemotherapy. Under the initiative of Professor Kaijiang Yu, the Professional Committee of Oncology Critical Care Medicine of the Chinese Anti-cancer Association (hereafter referred to as the special committee) was formally established in 2017, aiming to standardize the discipline development of oncology critical care medicine and provide a good platform for the professional development of oncology critical care medicine.(the Committee of Cancer Critical Care Medicine CACA)

There have been several surveys on the current condition of critical care medicine in China [10]. However, research on current situation of critical care medicine at home and abroad still needs to be continued, or the standardized construction and development of the discipline may be hindered. Therefore, in the same year of the establishment of the special committee, the project First National Survey of Oncology Critical Care in China was officially launched to investigate the resources of critical care medicine in the member units of the special committee, which covers basic information on the discipline, management status, personnel configuration and development of tumor-related treatment technologies. The purpose of this survey is to comprehensively show the current condition of oncology critical care medicine in China, preliminarily understand the resource distribution of oncology critical care, and play a certain role in the rational application and sharing of resources of oncology critical care medicine to promote the standardized discipline construction and development, facilitating the treatment of severely ill tumor patients and further improving the survival rate and quality of life of the patients.

Materials And Methods

1. Census Object

This survey uses an e-questionnaire via a network. After the proposal of a census plan, it was submitted to the special committee for approval, and a census group was established to guide and supervise the census process. Each member unit assigned an investigator to truthfully fill in the survey within the prescribed time limit and submit all the contents to the head of the department for verification after completion. The census team made a return visit for confirmation to ensure the authenticity and reliability of the data. This survey focused on the information of critical care medicine, with a basic understanding of information on intensive care units or resuscitation units. An ICU affiliated to the department was not included (for example, the extrathoracic/intracardiac/emergency/respiratory ICU belongs to intensive care unit). There are 36 member units of the special committee, among which the tumor hospitals were regarded as the research objects that met the requirements of this survey, with general hospitals and hospitals with a department of oncology excluded.

2. Data Analysis (accurate to two decimal places)

The enumerated data included counts, rates, constituent ratios and averages. Microsoft Excel or the SPSS19.0 software package was used for statistical analysis. Based on the regional GDP and population data issued by the State Statistics Bureau (<http://data.stats.gov.cn>) in 2017, the population proportion of ICU beds and GDP proportion of ICU beds in the included regions were calculated.

Results

There are 36 members of the special committee, among which 32 hospitals reported complete data within the prescribed time limit. The number of hospitals that met the investigation scope of oncology critical care medicine was 28, distributed in 20 provinces and 4 direct-controlled municipalities. Hospitals were divided into teaching hospitals affiliated with medical colleges, teaching hospitals affiliated with nonmedical colleges and hospitals affiliated with provinces, cities and counties. There were no private hospitals. The 28 units were all tertiary hospitals, including 3 comprehensive grade 3A hospitals, 1 comprehensive grade 3B hospitals, 23 specialist grade 3A hospitals and 1 specialist grade 3B hospitals.

From basic information on hospitals, the average number of ICU beds was 16.36 in terms of the basic profile of ICU and personnel allocation. At present, with the rapid development of critical care medicine in China, the ratio of comprehensive ICU beds in tertiary hospitals is considered to be a very important indicator in hospital evaluation. In this survey, the ratio of ICU beds to hospital beds was 1.06%, the ratio of ICU physicians to beds was approximately 0.62:1, and the ratio of nurses to beds was approximately 1.98:1, which fail to meet the national standards. In addition, the average numbers of single rooms, double rooms and triple as well as four-person and six-person rooms were 3.38, 0.75 and 0.83, respectively. Of the 28 hospitals, 15 were equipped with negative pressure beds, with an average number of 1.29.

According to the census of the population and GDP of different regions conducted by the State Statistics Bureau in 2017, the ratio of ICU beds for tumor patients to population was 4.55 beds per 10 million people. However, based on the national census data in 2015, the average number of ICU beds per 100 thousand people in China was 3.19. Furthermore, the ratio of ICU beds to GDP was 8.00 beds per RMB 100 billion, on average, according to the GDP of different regions in 2017. However, in 2015, the census data showed that the ratio of ICU beds to GDP in the six geographical regions of China averaged 7.36 beds per RMB 10 billion.

Regarding years of working in an ICU for the critical care medicine directors and head nurses, the average years of working for directors and head nurses in the ICU were 13.18 and 12.39, respectively, while the longest years of working for directors and head nurses in the ICU were 27 and 31, respectively. Regarding professional and technical titles, chief physicians, deputy chief physicians, attending physicians and resident physicians accounted for 9.89%, 13.43%, 37.10% and 39.58%, respectively. The highest degree compositions of physicians, doctorate, master's degree, bachelor's degree and college degree were 12.01%, 69.97%, 17.67% and 0.35%, respectively.

Regarding management, ICU management mode could be divided into closed management, semiclosed management and open management. Closed management mode was defined as ICU doctors and nurses with critical care medicine qualifications to manage patients. Semiclosed management mode was defined as the management of patients by ICU doctors, nurses and physicians. Open management mode was defined as patient management by ICU nurses and treatment by physicians. Among the respondents, 17 hospitals applied the closed management mode, 11 applied a semiclosed management mode, and none applied an open management mode. Regarding quality control of medical infection, all 28 hospitals had infection-control doctors and nurses, as well as corresponding isolation measures after the presentation of patients with drug-resistant bacteria, and were equipped with dry papers or hand dryers and automatic hand-washing switches.

Regarding technical skills and equipment configuration, the survey showed that the ICU could handle central venipuncture, tracheal intubation, tracheotomy, bronchoscopy treatment, hemodynamic monitoring, continuous blood purification, bedside ultrasound and other core technologies in critical care medicine, and continuous blood purification technology, bronchoscopy treatment, bedside ultrasound and other operations were gradually performed independently by ICU doctors. Among the 28 units included in the survey, only 1 hospital performed ECMO, but other hospitals had not performed ECMO, which may be due to the particularity of tumor patients' diseases. The census collected the condition of patients admitted in 2016. From January 1, 2016 to December 31, 2016, a total of 44,023 patients were admitted in the 28 hospitals, mainly from thoracic surgery, general surgery, emergency department and postoperative observation room (the top four). The relevant ICU technologies for tumor treatment included intravenous infusion port implantation, radiotherapy and chemotherapy under monitoring, continuous blood purification technology for tumors with renal insufficiency, and individualized nutritional support for patients with various stages of malignant tumors and so on.

Discussion

The member units included in this survey are all tertiary hospitals, which are distributed in 20 provinces and 4 direct-controlled municipalities, and basically cover local centralized hospitals for tumor patients, which makes this survey representative. Considering the fact that the state has not yet issued guidelines on the establishment of critical care medicine in specialized hospitals, the survey results were compared and analyzed with reference to the Guide on the Construction and Management of Critical Care Medicine (Trial) issued by the general office of the Ministry of Health in 2009 (hereafter referred to as the Guide). The survey describes the current condition of departments of oncology and critical care medicine in China in detail, and there is still a gap between the survey and the Guide. The Guide points out that "the number of beds in critical care medicine is 2–8% of the total number of hospital beds in a comprehensive tertiary hospital", and "every room is equipped with at least one single ward for isolating the patient", but the ratio of the number of ICU beds to the total number of hospital beds does not reach the minimum standard of 2% required by the state, indicating that the number of hospital beds has increased rapidly while the ICU beds are obviously insufficient. The number of patients should be taken into consideration, and an individualized design should be implemented for tumor patients when considering the proportion

of ICU beds and the form of room settings. There is immunosuppression in tumor patients admitted in critical care medicine after radiotherapy and chemotherapy. According to the actual situation of each hospital, while increasing the number of ICU beds or expanding ICU wards, factors such as a positive pressure ward and negative pressure ward should be fully considered in the form of room setting to fully guarantee the treatment of patients with severe tumors.

For personnel allocation, the Guide requires that “the ratio of the number of physicians in critical care medicine to the number of beds shall be more than 0.8:1, and the ratio of nurses to the number of beds shall be more than 3:1; the appropriate number of paramedics can be deployed as needed.” The survey indicates that the proportions of doctors and beds and of nurses and beds do not meet the national requirements, and there is a shortage of establishment for doctors and nurses. Only 3 units (4 people) have set the respiratory therapists post, insufficient medical staff has led the work overload, and in some hospitals, each nurse cares for more than 2 patients with severe cancer, which poses a great test to the safety of medical work. The director and head nurse have been engaged in the ICU for more than 10 years on average, and they have rich clinical experience and management ability, which plays an important role in the construction and development of oncology critical care medicine. Regarding the title and education of ICU doctors, the survey results show that attending physicians and resident physicians are the main force in the physician team of critical care medicine, while more than 80% of the physicians of critical care medicine have a master’s degree or above, indicating that physicians may be highly educated and young and have advantages in learning and applying new approaches and knowledge. For the qualifications of doctors and nurses, the level of the medical staff in the department of critical care medicine can be improved by standardized training and assessment and specialized qualification certification to accumulate working experience and improve working ability. The data show that the average number of participants from the 28 units in the critical care medicine training held by the Chinese Medical Association is 5.4 per unit.

On this basis, combined with the 2017 data on regional population and GDP from the National Bureau of Statistics, the ratio of ICU beds to population in each region is 4.55 ICU beds per 10 million people, and the ratio of ICU beds to GDP is 8 ICU beds per 100 billion yuan on average, which is an order of magnitude larger than that in the 2015 national census. In addition, the survey results show that there is no consistent relationship between GDP, population and the number of ICU beds, indicating that there may be insufficient attention paid to the development of oncology critical care medicine in economically developed areas and densely populated areas in China. The Guide indicates that “there must be necessary monitoring and treatment equipment to ensure the care of critically ill patients in critical care medicine. The relevant departments of the hospital shall have sufficient technical support capacity to provide bedside B-ultrasound, blood purification apparatus, X-ray imaging and biochemical and bacteriological laboratory examinations to critical care medicine at any time”. The survey results show that the existing equipment configuration in ICUs has greatly improved. For example, the bedside monitor configuration can reach at least 1 unit per bed, but there are still deficiencies in the use of equipment and technology application to varying degrees, which limit the treatment ability of ICUs, and there is still a large room for improvement in the mastery of relevant core technologies. Under the background of

“Internet +”, it is advocated to make full use of the advantages of the network to give full benefit to the great function of the remote consultation system in ICU wards, but there is still a long way to go. The teaching and research of oncology critical care medicine in China and relevant contents not involved in the survey will be considered in future surveys.

Conclusion

The paper provides data support for further strengthening the discipline development through the current census of oncology critical care medicine in China and the analysis and evaluation of the reserve capacity of oncology critical care medicine. In the process of rapid development of the specialty of oncology critical care medicine, it is urgent to have a systematic and standardized orientation, so that the development of the specialty of oncology critical care medicine in China will enter a scientific, standardized and intelligent development path. The construction of oncology critical care medicine is increasingly improved, but there is a certain gap between it and the national standard and between the average level of the national ICU and the international level, so it is urgent to strengthen the development of oncology critical care medicine.

Declarations

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Authors' contributions

All authors provided intellectual contributions and read and approved the final version of the manuscript.

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests

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Figures

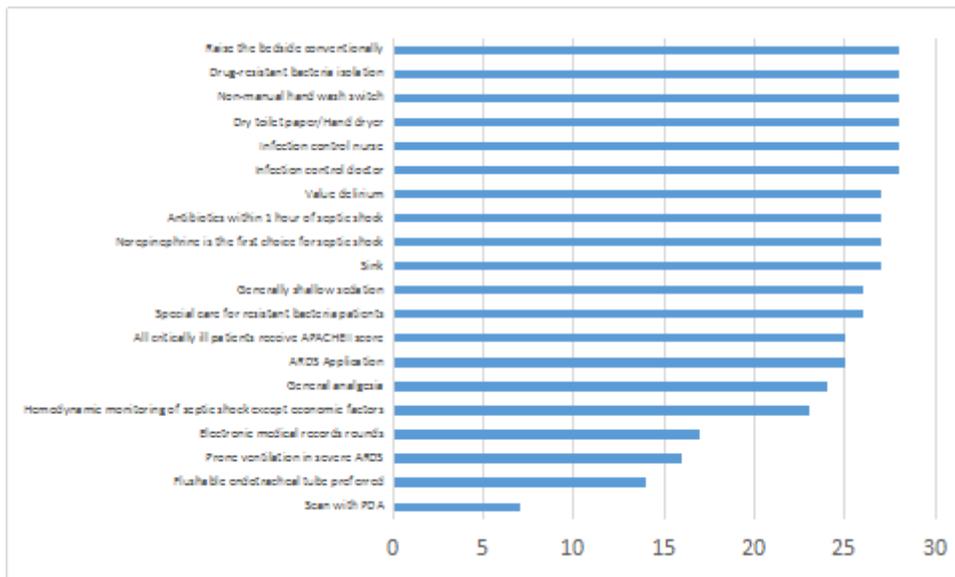


Figure 3

ICU Medical Quality Control Index

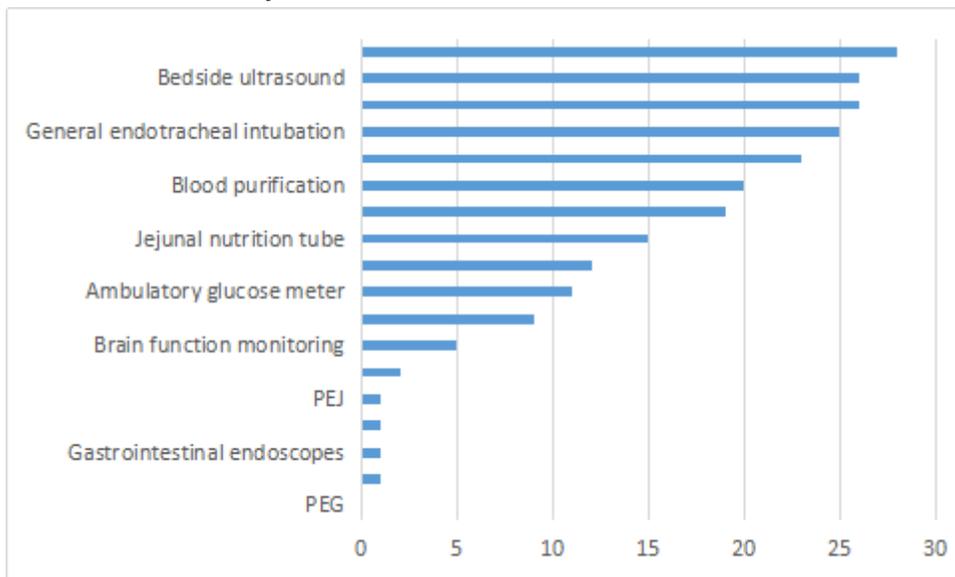


Figure 4

ICU technical skills