COMMUNICATION

History of pediatric critical care medicine in the mainland of China

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Overview of critical care medicine

The history of critical care medicine (CCM) dates back more than a century. The predecessor of the intensive care unit (ICU) was a “special ward” where doctors and nurses used integrated equipment to effectively treat a large number of patients suffering from the same disease. In the early 20th century, only a few hospitals in Western countries had established special pediatric wards, and these were mainly for the centralized treatment of premature babies. In 1952, Copenhagen, the capital city of Denmark, was struck by a severe poliomyelitis epidemic. During this epidemic, a number of techniques were applied to treat critically ill patients, marking the beginning of a new era for ICUs. In 1956, the first pediatric ICU (PICU) was established in Fort Gordon, Sweden; however, PICUs were not widely founded around the world until the 1970s and 1980s. In 1970, the American Society of Critical Care Medicine (SCCM) was established as an independently academic society, and the European Society of Intensive Care Medicine (ESICM) was established in 1982. Since that time, the new discipline of CCM and ICUs as a major venue for the practice of CCM have matured and achieved a consolidated academic position.

The beginning of pediatric critical care medicine in China

In the mainland of China, pediatric CCM (PCCM) originated from the treatment of childhood infectious diseases, such as toxic bacillary dysentery, fulminant meningitis, etc. in the 1950s. In the 1970s, Professor Xiangwen Zhao of Hunan Children’s Hospital organized a National Collaborative Group on Septic Shock in Changsha. He organized two symposiums and formulated the Diagnosis and Treatment Criteria for Septic Shock in Children. The development of pediatric critical medicine in China benefited from the United Nations International Children’s Emergency Fund (UNICEF) project. From 1982 to 1984, the Ministry of Health of the People’s Republic of China and UNICEF joined forces to establish the “Pediatric Intensive Care Training Project”. The project chose 11 Chinese hospitals, including four key hospitals (Beijing Children’s Hospital of Capital Medical University, Shengjing Hospital of China Medical University, Children’s Hospital of Chongqing Medical University, and Shanghai Children’s Hospital). The Ministry of Health also organized two delegations to visit the United States and Canada to learn from these countries’ advanced experience.
with PCCM, and selected medical staff to study abroad. From 1983 to 1985, UNICEF sent experts to China to organize courses for CCM staff members working in the fields of cardiology, respiratory medicine, neonatology, and neurology. In 1983, with the support of the World Health Organization, Professor Xunmei Fan of Beijing Children’s Hospital, the pioneer and founder of PCCM in China, set up the first PICU in China, starting with a ventilator and six beds. The 11 pilot hospitals involved in the “Pediatric Intensive Care Training Project” established a variety of ICUs or emergency centers, including PICUs, neonatal ICUs (NICU), and surgical ICUs (SICU) for children and so on, paving the way for the development of modern PCCM in China.

**Development of discipline and establishment of relevant academic organizations**

In the late 1980s and 1990s, ICUs were established in children’s hospitals of different sizes and even in departments of pediatrics in general hospitals across China. In the late 1980s, we began to recruit postgraduates of pediatric critical care subspecialty. In the 1990s, we began to recruit PhD postgraduates in Beijing, Shanghai, Chongqing, Shenyang, and other major cities. Many young and mid-aged doctors and nurses received additional training abroad in developed countries. These professional training promoted the rapid development of PCCM in China in the 21st century.

In 1988, the Pediatrics Group of the Society of Emergency Medicine of the Chinese Medical Association was established. Professor Xiangwen Zhao served as the head of the group, and Professor Xunmei Fan was the deputy head. In 1989, the first National Pediatric Critical Care Conference was held in Dandong, Liaoning Province. Since then, it has been held every two years, serving as an important academic exchange platform for Chinese medical personnel involved in PCCM and emergency medicine. In 1993, under the leadership of Professors Xiangwen Zhao and Xunmei Fan, the Emergency Group of the Chinese Society of Pediatrics was established. The Emergency Group of the Chinese Society of Pediatrics and the Pediatrics Group of the Emergency Medicine Society of the Chinese Medical Association jointly organized the “National Pediatric Critical Care Conference” every two years. The two groups have organized 15 national conferences and various seminars of pediatric critical care medicine. In 2006, the “National Pediatric Critical Care Conference” established a national training base and “continuous blood purification treatment”. These professional groups have also organized training programs on topics such as “pediatric advanced life support training”, “pediatric basic life support training”, “clinical application training of pediatric mechanical ventilation” and “continuous blood purification treatment”. These efforts have effectively promoted the popularization and standardization of pediatric critical care techniques in China.

During the same period, several monographs and journals on PCCM were published. China’s first monograph on pediatric emergency medicine, *Practical Pediatric Emergency Medicine*, was published in 1992, followed by the release of several other books, including *Pediatric Emergency Medicine* and *Practical Pediatric Critical Care Medicine*. In 2018, *Critical Care Medicine* section, which was used as a textbook for training resident pediatricians, was published, which gradually standardized the training of PICU specialists in China. In 1994, a peer-reviewed journal, *Pediatric Emergency Medicine*, was founded. This journal was renamed *Chinese Pediatric Emergency Medicine* in 2006.

Over the past decade, with the further deepening of the reform and opening up of the country, the PCCM in China has led to a surge in the field. The number of physicians and nurses practicing PCCM is increasing annually, as are the numbers and size of PICUs and pediatric emergency departments across the country. To standardize the diagnosis and treatment protocols for pediatric critical diseases, provide guidance for operation technology, and optimize the management of critically ill children, professional groups have developed a series of guiding documents, including *Pediatric Critical Illness Score (primary edition)*, *Recommended Protocol for Diagnosis and Treatment of Septic Shock in Children*, *The Experts’ Consensus on Continuous Blood Purification treatment of severe sepsis in Children*, *Experts’ Consensus on Sedation and Analgesia in Pediatric Intensive Care Units (2013)*, *Criteria and Practical Guidance for Determination of Brain Death in Children (BQCC version)*, and *Guidelines for the Provision and Assessment of Nutritional Supportive Therapy in Critically Ill Children (2018, China)*. Professional groups have also organized training programs on topics such as “pediatric advanced life support training”, “pediatric basic life support training”, “clinical application training of pediatric mechanical ventilation” and “continuous blood purification treatment”. These efforts have effectively promoted the popularization and standardization of pediatric critical care techniques in China.

**Role of pediatric critical care medicine in public health emergencies**

With the development of PCCM in China, its role in public health emergencies has become increasingly recognized. The outbreak of severe acute respiratory syndrome (SARS) in China in 2003 brought PICUs into public notice. In the early stage of a large outbreak of hand, foot and mouth disease (HFMD) in China from 2008 to 2009, PICU experts traveled to the epidemic areas to provide guidance on treatment and to urgently establish PICUs in many affected prefecture- and county-level cities across China to reduce mortality from the disease. The overall mortality rate of HFMD and mortality rate of severe HFMD in China decreased, respectively, from 0.26% and 11.5% in
the early outbreak of 2008 to 0.08‰ and 1.3% in 2016. In 2008 and 2010, PCCM professionals also played key roles in the disaster relief following the Wenchuan and Yushu earthquakes, the prevention of an H1N1 influenza epidemic, and other public health events, increasing recognition of the value of PICUs by both the Chinese government and the public.

**Discipline management system for pediatric critical care medicine**

CCM was officially incorporated into the National Medical Discipline Management System on July 4, 2008, thus became an independent second-level discipline on the same level as internal medicine and surgery. The Ministry of Health has explicitly required all tertiary-level and some well-equipped secondary-level hospitals to have an ICU, and establishment of ICU is now recognized as an important measurement in hospital evaluation. At present, PICUs have been established in over 100 hospitals in China, and PCCM has become a complete and independent modern medical discipline. Pediatricians and nurses working at PICUs are fixed professional medical staff. In most regions, especially in economically developed provinces and municipalities, talent pyramids with reasonable structures have been formed in many PICUs. In 2010, PCCM was included in the first set of national key clinical specialties, marking the beginning of a new stage in the development of PCCM in China.

**Problems and prospects**

In future, PCCM in China will experience a transition of developmental direction, moving from a rapid increase in the number of PICUs and beds toward standardized disease management and improved quality control, including the optimization of equipment and facilities and the development of new technologies. Building effective critical care teams in PICUs is another priority. For example, most PICU teams in China do not meet the minimum requirements for ICU staffing, and there is a general lack of pharmacists, dieticians, respiratory therapists, and rehabilitation therapists. Fortunately, PCCM in China has moved beyond the beginning stages and is positioned to revolutionize its skills training and long-term planning. An overall enhancement of clinical practice, teaching, and scientific research can be expected in the coming years.

**CONFLICT OF INTEREST**

We have no conflicts of interest to declare.

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