

Obstetric anesthesia in China: associated challenges and long-term goals

Jing Wu^{1,2}, Shang-Long Yao^{1,2}

¹Department of Anesthesiology, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, Hubei 430022, China;

²Institute of Anesthesia and Critical Care Medicine, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, Hubei 430022, China.

China has recently experienced extraordinary development in medical care and has achieved both Millennium Development Goals 4 and 5. According to the 2012 China Medical and Health Service White Paper, the pregnancy-related mortality rate (pregnancy-related deaths per 100,000 live births; PRMR) in China dropped from 51.3 in 2002 to 26.1 in 2011. A subnational analysis of 2852 Chinese counties between 1996 and 2015 has demonstrated that PRMR has declined from 108.7 in 1996 to 21.8 in 2015, with an annualized rate of decline of 8.5% per year.^[1] According to the 2018 National Medical Service and Quality Safety Report, the PRMR in 2018 was 18.3 per 100,000 live births. In contrast, the PRMR in United States was 17.2 per 100,000 live births between 2011 and 2015.^[2]

Despite ongoing development, provision of obstetric anesthesia in China involves a rather arduous struggle under the universal two-child policy. Obviously, women of childbearing-age in China are numerous. Among the 1.37 billion people in China, about 21% of them are married and may become pregnant. Given that there were approximately 346 million women of childbearing-age in 2018, it is expected that there should have been more than 17 million live births. However, the number of newborns per year has not increased accordingly, despite the incorporation of the universal two-child policy in 2016. According to incomplete statistics, it is estimated that 11 million live births are expected in 2019. Currently, the expected increase of live births under the two-child policy in China has not occurred. Instead, given the number of multiparae of a relatively advanced maternal age (>35 years), the rate of high-risk pregnancies and the incidence of pregnancy-related or delivery-related complications are increasing year by year.

Multiple factors contribute to the increasing risks associated with obstetric anesthesia, one of which is the trend of delayed primiparity on a rise. The age of first birth has increased from 22.8 years in 1970 to 26.6 years in 2007. The planned delay of a second child also explains the trend of advancing maternal age. Frequently, mothers will plan to delay the birth of a second child for 1 to 3 years due to slow physical recovery of the womb, especially following cesarean section. Further, it is worthy of note that China has one of the highest rate of cesarean sections in the world.^[3] At the same time, placenta previa, uterine rupture, postpartum hemorrhage, and other complications related to scarring of the uterus are more troublesome for parturient women. Additionally, the likelihood of a high-risk fetus is increased with multipara. With aging, ovarian function and quality also decrease. The incidence of chromosomal abnormalities and other congenital malformations, including anencephalus, hydrocephalus, and cardiac malformations, is much higher among fetuses of older mothers.^[4,5]

Another urgent concern regarding obstetrical anesthesia in China is that facilities are greatly understaffed. As demonstrated in a cross-sectional study including 2521 hospitals, 81.12% of 678 hospitals lacked neuraxial labor analgesia service due to a shortage of anesthesiologists.^[6] The lacked neuraxial labor analgesia service because of shortage of obstetrical anesthesiologists has been an important factor in the high percentage of cesarean section deliveries. Furthermore, substantial heterogeneity of obstetric anesthesia at the county level is quite obvious, especially between rural, western areas and metropolises. Partly as a result, there is obvious heterogeneity of obstetrical anesthesia in different areas.

Access this article online

Quick Response Code:



Website:
www.cmj.org

DOI:
10.1097/CM9.0000000000000664

Correspondence to: Prof. Shang-Long Yao, Department of Anesthesiology, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, Hubei 430022, China
E-Mail: yaoshanglong@hust.edu.cn

Copyright © 2020 The Chinese Medical Association, produced by Wolters Kluwer, Inc. under the CC-BY-NC-ND license. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

Chinese Medical Journal 2020;133(5)

Received: 01-12-2019 Edited by: Li-Min Chen

The universal two-child policy provides a unique opportunity to understand the importance and risk factors associated with obstetric analgesia and anesthesia and associated clinical issues. Special focus has been placed on treatment for critical pregnancies and enhanced recovery after cesarean delivery (ERAC) and labor analgesia in this new era in China.

According to the findings of the pregnancy mortality surveillance system of the United States, the leading causes of pregnancy-related deaths varied with the timing of death.^[2] Acute obstetric emergencies such as hemorrhage and amniotic fluid embolism (AFE) most commonly occurred on the day of delivery, whereas deaths caused by hypertensive disorders of pregnancy and thrombotic pulmonary embolism were more likely occur at any stage of the perinatal period. In this case, coordination between the anesthesiologist and the obstetrician is critical. This also further raises the following question: to what aspects should general hospitals pay special attention when dealing with crisis situations?

Pregnancy-induced hypertension (PIH), obstetric bleeding, scarred uterus-related complications and AFE are the most common crises in obstetric anesthesia in China. PIH, including preeclampsia and eclampsia, affects nearly 3% to 5% of pregnancies and is one of the leading causes of maternal and perinatal mortality and morbidity.^[7] Advanced maternal age is associated with a higher risk of PIH due to myometrial vascular atherosclerosis and local ischemia of the placenta.^[8] Multiparae of advanced maternal age, particularly those who have experienced multiple abortions, may have various degrees of uterine trauma. Complications such as AFE, uterine rupture, and soft birth canal injury are likely to occur among these women. The incidence of uterine rupture during pregnancy in the US is 0.04% to 0.10%, whereas in China, it jumps to 0.10% to 0.55%. The domestic death rate of women with uterine rupture is 12%, with a 90% mortality rate of perinatal infants. Uterine rupture accounts for 6.4% of maternal deaths, according to a recent report.^[9]

Another significant complication is AFE. As shown in a retrospective population-based study from the National Maternal Mortality Surveillance System between 1996 and 2013, maternal mortality rate for AFE decreased from 4.4 per 100,000 births to 1.9 per 100,000 births.^[10] Although the incidence of AFE is rare, it has an extremely high death rate. The pathophysiology of AFE includes anaphylactic shock, acute respiratory and circulatory failure, and acute disseminated intravascular coagulation (DIC). Treatment should be focused on the correction of hypoxemia and respiratory and circulatory failure, which result from the allergic reaction and acute pulmonary hypertension, and the prevention of DIC and kidney failure.

Fortunately, early intervention and treatment of critical obstetric situations associated with scarred uterus can allow for improved prognosis of the previously mentioned crises. According to another epidemiological report, hemorrhage and pre-eclampsia constitute the leading causes of intensive care unit admissions during births but have relatively low

mortality rates, perhaps demonstrating the impact of informed care in managing obstetric crises.^[11] However, obstetric sepsis, heart disease, and anesthesia complications might be the focus of future research.^[11]

Although the probability of these crises is low, they are serious events that require intense coordination between anesthesiologists and obstetricians. In case of such emergencies, the obstetrician decides whether to start the immediate cesarean section process. On receiving the obstetrician's crisis signal, the emergency plan should be immediately implemented by the whole team. General anesthesia is the optimal procedure, while it is also suitable to incorporate epidural administration if intra-spinal analgesia was previously carried out during labor analgesia. Close monitoring of high-risk patients is necessary, including hemodynamic monitoring for preload and afterload of the heart, cardiac pump function, and coagulation function tests. The ability to resuscitate the mother and the newborn is also essential.

An emergent cesarean section requires hardware, personnel, technology, equipment, and a trained emergency team to respond to obstetric emergencies expediently. Simulation exercises are the gold standard for general and specialized hospitals. Thus, guidelines that provide standardized approaches are ideal.

In 1997, enhanced recovery after surgery (ERAS) was introduced by Henrik Kehlet to reduce the length of hospital stays. In China, the first ERAS Congress was held in 2015, and the publication of a series of Chinese Experts Consensuses soon followed. Unfortunately, ERAS in obstetrics has lagged behind other surgical specialties. Not until 2018 did ERAS Society release Guidelines for cesarean delivery and there remains a dearth of relevant extant data. ERAC may afford unique advantages in the post-partum period during which women face not only the burden of surgery but also new motherhood. In light of the persistently high cesarean delivery rate and the emphasis on high-quality bundled care to reduce maternal morbidity and mortality, ERAC has become more crucial in peripartum care. The role of anesthesiologists in ERAC could fall in the pre-, intra-, or post-operative care of operative periods. With the increased use of epidural analgesia during childbirth, patients might inadvertently require a conversion from epidural analgesia to cesarean delivery. In that case, anesthesiologists may also make a contribution during the preoperative period.

Which stage of labor is suitable for the initiation of intra-spinal analgesia? Policies regarding the timing of starting labor analgesia are inconsistent in many hospitals. It has been widely accepted that epidural analgesia has no adverse effects on maternal and neonatal outcomes. However, it is still controversial whether epidural analgesia is associated with prolongation of the first and second stages of labor.

In 2014, the Obstetrics Group of the Branch of Obstetrics and Gynecology of the Chinese Medical Association

developed an expert consensus on the standards and treatment of the new labor process according to the new labor process curve proposed by Zhang *et al.*^[12] The new partogram advocates that dilation of 6 cm is the starting point of the active stage of delivery and redefines the diagnostic criteria of the stagnation of the active stage and the prolongation of the second stage of labor. Although the specific reasons for the increase of labor duration are not clear, the changes in labor management practice in recent years may be one. Other factors, such as the decreased use of instruments to assist in delivery, the increased average birth weight of newborns, and increased maternal age may affect the length of labor duration.

Labor analgesia can be carried out at any stage of the labor process depending upon maternal needs. More evidence-based medical data regarding the influence of epidural analgesia on labor duration under the new partogram in China is still needed.

How to maintain satisfactory analgesia for the entire duration of labor? The diversification of epidural analgesia modes is one of the recent main efforts aimed at improving labor analgesia. The maintenance of epidural analgesia has evolved from a single injection, continuous and slow infusion with an electronic pump, patient-controlled epidural analgesia (PCEA), to the programmed intermittent epidural bolus mode recently. PCEA with or without background continuous infusion is the most popular and widely used mode of administration for labor analgesia. While the mode of epidural analgesia continues to progress toward full automation and individualization, more frequently, bolus administration with higher driving pressure and faster infusion rate are preferred in clinical practice. Given that the nature and degree of pain change throughout the labor process, bolus administration of narcotic drugs might be a more suitable mode of administration, as this mode can improve the analgesic effect specifically by reducing breakthrough pain, lowering required dosage, decreasing the incidence of maternal motor block, reducing the need for the use of instruments to aid delivery, and generally increasing patient satisfaction.

Post-partum uterine contractive pain is another concern for pain management. Since the experience of post-partum uterine contractive pain is worse for multiparae than primiparas, post-partum continuous analgesia is encouraged for such patients. The use of a pain pump should be continued for a minimum of 24 h following delivery.

China has witnessed a great leap in the improvement of medical and health-care services. Regarding the future of obstetric anesthesia and delivery pain relief, China could still benefit from continuous improvement. This challenge will require anesthesiologists to arm themselves with new concepts, new technologies, and a more intense interdisciplinary collaboration to improve the safety of obstetric anesthesia in China.

New concepts, including earlier involvement of anesthesiologists in the management of high-risk puerperants

and better dissemination of information regarding labor analgesia should be strongly promoted. Newer imaging and monitoring techniques, such as ultrasound, are essential for critical patients, and deserve further consideration. Meanwhile, an evidence-based standard training should reflect real-life clinical situations typically observed in China and should be customized for clinicians. Only such highly trained anesthesiologists are qualified to deal with these complicated and high-risk cases.

Obstetric anesthesia and labor analgesia involve multidisciplinary cooperation. An effective improvement to obstetric anesthesia in China will require an improvement in the awareness of risk prevention among anesthesiologists, obstetricians, and hospital management; solution of the clinical key problems with the risks associated with obstetric anesthesia; a comprehensive management team composed of anesthesiologists and obstetricians in the delivery room; and the promotion of new concepts and the application of new technologies. Easy access to obstetric anesthesia services in settings that currently have few resources is not only essential to the basic needs of pregnant women but also the cornerstone of the “comfortable medicine” blueprint.

Conflicts of interest

None.

References

- Liang J, Li X, Kang C, Wang Y, Kulikoff XR, Coates MM, *et al.* Maternal mortality ratios in 2852 Chinese Counties, 1996–2015: and achievement of Millennium Development Goal 5 in China: a subnational analysis of the Global Burden of Disease Study 2016. *Lancet* 2019;393:241–252. doi: 10.1016/S0140-6736(18)31712-4.
- Petersen EE, Davis NL, Goodman D, Cox S, Mayes N, Johnston E, *et al.* Vital signs: pregnancy-related deaths, United States, 2011–2015, and strategies for prevention, 13 states, 2013–2017. *MMWR Morb Mortal Wkly Rep* 2019;68:423–429. doi: 10.15585/mmwr.mm6818e1.
- Souza JP, Gülmezoglu A, Lumbiganon P, Laopaiboon M, Carroli G, Fawole B, *et al.* Caesarean section without medical indications is associated with an increased risk of adverse short-term maternal outcomes: the 2004–2008 WHO Global Survey on Maternal and Perinatal Health. *BMC Med* 2010;8:71. doi: 10.1186/1741-7015-8-71.
- Yaegashi N, Senoo M, Uehara S, Suzuki H, Maeda T, Fujimori K, *et al.* Age-specific incidences of chromosome abnormalities at the second trimester amniocentesis for Japanese mothers aged 35 and older: collaborative study of 5484 cases. *J Hum Genet* 1998;43:85–90. doi: 10.1007/s100380050046.
- Shan D, Qiu PY, Wu YX, Chen Q, Li AL, Ramadoss S, *et al.* Pregnancy outcomes in women of advanced maternal age: a retrospective cohort study from China. *Sci Rep* 2018;8:12239. doi: 10.1038/s41598-018-29889-3.
- Di GH, Yao SL, Wang J, Wu ZL, Liu H, Wang H. Factors influencing the improvement of neuraxial labor analgesia in China: a questionnaire survey. *Chin Med J* 2020;133:613–614. doi: 10.1097/CM9.000000000000529.
- Mol BWJ, Roberts CT, Thangaratnam S, Magee LA, de Groot CJM, Hofmeyr GJ. Pre-eclampsia. *Lancet* 2016;387:999–1011. doi: 10.1016/S0140-6736(15)00070-7.
- Li X, Zhang W, Lin J, Liu H, Yang Z, Teng Y, *et al.* Risk factors for adverse maternal and perinatal outcomes in women with preeclampsia: analysis of 1396 cases. *J Clin Hypertens (Greenwich)* 2018;20:1049–1057. doi: 10.1111/jch.13302.

9. Liu Z, Yang HX, Xin H, Cui SH, Qi HB, Zhang WS. Current status of uterine rupture: a multi-center survey in China (in Chinese). *Chin J Obstet Gynecol* 2019;54:363–368. doi: 10.3760/cma.j.issn.0529-567x.2019.06.002.
 10. Mu Y, McDonnell N, Li Z, Liang J, Wang Y, Zhu J, *et al.* Amniotic fluid embolism as a cause of maternal mortality in China between 1996 and 2013: a population-based retrospective study. *BMC Pregnancy Childbirth* 2016;16:316. doi: 10.1186/s12884-016-1106-6.
 11. Einav S, Leone M. Epidemiology of obstetric critical illness. *Int J Obstet Anesth* 2019;40:128–139. doi: 10.1016/j.ijoa.2019.05.010.
 12. Zhang J, Troendle J, Mikolajczyk R, Sundaram R, Beaver J, Fraser W. The natural history of the normal first stage of labor. *Obstet Gynecol* 2010;115:705–710. doi: 10.1097/AOG.0b013e3181d55925.
-
- How to cite this article:** Wu J, Yao SL. Obstetric anesthesia in China: associated challenges and long-term goals. *Chin Med J* 2020;133:505–508. doi: 10.1097/CM9.0000000000000664