

# Cesarean Delivery Rates

## Revisiting a 3-Decades-Old Dogma

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**In 1985, the World Health Organization (WHO)** stated: “There is no justification for any region to have a cesarean delivery rate higher than 10-15%”<sup>1</sup> However, despite a lack of scientific evidence indicating a substantial maternal and perinatal benefit from increasing cesarean deliveries, the rates of this procedure continue to increase worldwide.<sup>2</sup> Cesarean delivery rates have become a major and controversial public health concern with some studies showing that higher rates could be linked to negative consequences such as severe maternal morbidity and mortality, neonatal intensive care unit admission, and consumption of health care resources by procedures without medical indication.<sup>2</sup>



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In this issue of *JAMA*, Molina and colleagues<sup>3</sup> report on data gathered across all 194 WHO member states and examine the relationship between the population-level cesarean delivery rate and resultant maternal and neonatal mortality rates. The authors conducted a cross-sectional, geographical study estimating annual cesarean delivery rates from data collected for the years 2005-2012, coupled with health expenditure per capita, fertility rate, life expectancy, and regional information. Published rates of cesarean deliveries were obtained from the OECD Health Statistics Database, the European Health For All Database, and the Demographic and Health Surveys Database, all recognized to have rigorous quality assurance mechanisms. Cesarean delivery rates from 2012 were obtained from countries where these data were available, whereas the most current cesarean delivery rate was used for countries where the 2012 rates were not available. The authors estimated that in 2012, there were 22.9 million cesarean deliveries

For the 22 countries with no published cesarean delivery rate from 2005-2012, a predictive model was constructed using population and health variables. A sensitivity analysis was performed to verify this predictive model against countries with the highest-quality cesarean delivery rate recordings. Combined data were then analyzed with maternal and neonatal mortality rates from those countries where these were available.

The authors concluded that, across all WHO states, cesarean delivery rates of approximately 19% were associated with optimal levels of maternal and neonatal mortality. Those included 45 countries with a cesarean delivery rate of 7.2 or lower per 100 live births; 48, greater than 7.2 to 19.1; 48, greater than 19.1 to 27.3; and 53, greater than 27.3. This study is novel in its design and in its ability to report on

practices and outcomes across the WHO. Importantly, the findings challenge a 30-year-old message that a cesarean delivery rate of less than 15% should be a target for all health care institutions. These findings have significant implications for the provision of health care worldwide.

In 2013, almost one-third of deliveries that took place in the United States were cesarean deliveries.<sup>4</sup> Canada and Australia have cesarean delivery rates of 27.3% and 32.3%, respectively, whereas the proportion of cesarean deliveries has increased to unprecedented levels in South America with national rates approaching 50%.<sup>5-7</sup> A multinational study examining the incidence of cesarean delivery throughout Europe demonstrated marked differences, with rates varying from 14.8% in Iceland to 52.2% in Cyprus,<sup>8</sup> and rates in private practice in Brazil reportedly approximately 90%.<sup>7</sup>

Increasing rates of cesarean delivery have been driven by a number of factors. Contemporary obstetric practice has led to changes in management of labor and delivery with almost complete elimination of vaginal breech delivery and a significant decrease in the number of operative vaginal deliveries and vaginal birth after cesarean.<sup>9</sup> Dystocia in the first stage of labor has been identified as a significant cause of intrapartum cesarean delivery. Widely accepted definitions of latent and active labor are based on data collected half a century ago,<sup>10</sup> and diagnosing labor arrest based on data from a 1950s patient cohort could lead to altered cesarean delivery rates in contemporary practice. Continuous electronic fetal monitoring has become standard in most prenatal care units in the United States. This increased level of fetal surveillance has led to increased rates of intrapartum cesarean delivery for presumed abnormalities in fetal status, but the use of electronic monitoring has not been shown to improve the overall rate of perinatal mortality or cerebral palsy when compared with intermittent auscultation.<sup>11</sup>

Maternal request for cesarean delivery has been persistently highlighted as a cause for increasing rates of this procedure in recent decades.<sup>12</sup> A national guideline from the United Kingdom has reinforced the right of women to decide the mode of their delivery with appropriate counseling.<sup>13</sup> However, in the United States, guidance has varied and most recently has recommended advising against cesarean delivery for maternal request particularly among those women who desire several children.<sup>14</sup> When a poor outcome follows a vaginal delivery, societal culture may cause a response that seeks to blame the individuals

and institution associated with that patient's intrapartum management, which serves to make clinicians anxious about the legal implications of having failed to perform a cesarean delivery.

Methods of reducing the cesarean delivery rate have been a focus of intense investigation over many years. The American College of Obstetricians and Gynecologists (ACOG) has recognized that prevention of a primary cesarean delivery has potential benefits on the overall cesarean delivery rate. To this end, a Care Consensus released in March 2014 entitled "Safe Prevention of the Primary Cesarean Delivery"<sup>9</sup> provides an evidence-based platform of suggested practice changes that could limit the primary cesarean delivery rate. Since dystocia during labor is the leading cause of primary cesarean delivery, improved distinction of the latent and active phases of labor and better diagnosis of abnormal labor patterns is suggested. A recent study examining labor progress in a contemporary obstetric cohort suggests that active labor does not begin until 6 cm of dilation and that rates of progress may be slower than previously suggested.<sup>15</sup> The ACOG consensus document recommends that a prolonged latent phase or a slowly progressing first stage of active labor should not be considered indications for cesarean delivery. In the presence of abnormal labor progress in the active phase of labor, amniotomy, oxytocin augmentation, or both should be considered and arrest only diagnosed after 4 hours with no change in cervical dilation with adequate uterine activity.<sup>15</sup>

Better understanding of and a uniform approach to the interpretation of fetal heart rate monitoring could reduce the number of unnecessary cesarean deliveries. Higher rates of vaginal birth after cesarean, improved training in operative vaginal delivery and evidence-based management of conditions such as fetal malpresentation, macrosomia, and twin gestation could also lower the overall rate of cesarean delivery. Improved management of labor dystocia and a consistent approach to category 2 fetal heart rate tracings appear to provide the best opportunity for a meaningful reduction in cesarean delivery rates. Each measure mentioned in isolation may serve to lower the cesarean delivery rate, but the cumulative effect is currently unknown.

Other approaches also have been developed with the aim of monitoring, and potentially reducing the rate of cesarean delivery. The WHO recommends the Robson Ten Group Classification System as the most appropriate approach to facilitate auditing, analyzing, and comparing cesarean delivery rates across different settings. The aim of this system is to create and implement effective strategies specifically targeted to optimize cesarean delivery rates

when necessary.<sup>16,17</sup> The system has strength in its simplicity and can be applied immediately to any woman on arrival to the hospital based on fundamental obstetric characteristics (parity, previous cesarean delivery, gestational age, onset of labor, fetal presentation, and number of fetuses). If used on a continuous basis, this classification can provide an institutional overview of which patient groups can be prioritized to improve cesarean delivery rates.

The findings by Molina and colleagues<sup>3</sup> suggest that the optimal estimated rate of cesarean delivery associated with lowest rates of maternal and neonatal mortality is 19%. However, the authors are careful to point out that the relationship between cesarean delivery and mortality observed in this study is not causal. The current enormous variation in international cesarean delivery rates is unacceptable and is antithetical to the achievement of best practices. The optimal cesarean delivery rates will vary from country to country, and the appropriate rate may well reflect, as the authors suggest, a "complex interplay of overall maternal health resources, emergency obstetrical services and other factors."

Cesarean delivery rates have long been viewed as a marker of quality, but viewed in isolation they provide inadequate information regarding the quality of practice in a health care system. Cesarean delivery rates should be considered to be only one of a number of quality criteria used to evaluate an individual or institution, and the primary goal of all obstetric services should be that of patient safety.

Endeavors to lower the cesarean delivery rate should only be attempted if those efforts bring a clear benefit to patient outcomes. The study of Molina et al highlights the need for an evaluation of cesarean delivery rates by the international obstetrical community. The National Institutes of Health or National Academy of Medicine should consider hosting a multidisciplinary "state of the science" forum in collaboration with the appropriate international professional societies on this important health care issue for women with the goal of providing meaningful ranges of risk-adjusted rates of cesarean deliveries for different populations and practices.

The optimal level of cesarean delivery cannot be as simple as a one-fits-all figure to be applied to all institutions and health care systems, and the obstetrical community must accept the fact that "the appropriate" cesarean delivery rate remains unknown. However, it is not whether the cesarean delivery rate is high or low that really matters, but rather whether appropriate performance of cesarean delivery is part of a system that delivers optimal maternal and neonatal care after consideration of all relevant patient and health system information.

#### ARTICLE INFORMATION

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